International Journal of Sociologies and Anthropologies Science Reviews
Volume 5 Issue 2: March-April 2025: ISSN 2985-2730
Website: https://so07.tci-thaijo.org/index.php/IJSASR/index

Development of Indicator Swimming Teaching Model for Higher Education Student

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Received 03/09/2024 Revised 18/09/2024 Accepted 18/10/2024

Abstract
Background and Aim: With the continuous advancement of the reform of physical education in colleges and universities, swimming course plays an increasingly prominent role in college physical education. The objective of this research was to develop the indicator swimming teaching model for higher education students, to improve the teaching quality of college swimming courses and students' comprehensive quality.
Materials and Methods: This research is mixed methods research type. The participants in this research can be divided into four groups, which are as follows:(1) 540 students and 36 teachers from 12 universities in Henan China were chosen to engage in responding to the questionnaires; (2) 7 experts were invited to in-depth interview; (3) 19 experts were invited to conduct two-round Delphi study; and (4) 9 experts were invited to discuss and confirm the constructed developing the indicator swimming teaching model for higher education students. The average and standard deviation are utilized to analyze the data obtained from the questionnaire, the consensus data is analyzed by using the median and interquartile range, with criteria set at a median of ≥ 3.50 and an interquartile range of ≤ 1.50.
Results: The results show that the indicator swimming teaching model for higher education students is composed of 6 factors, namely: (A) Course objective; (B) Teaching content and organization; (C) Teaching methods and means; (D) Teaching practice, (E) Assessment and evaluation; and (F) Teaching resources and safety assurance, 19 components and 61 indicators.
Conclusion: The results show that the indicator swimming teaching model for higher education students is composed of 6 factors, 19 components, and 61 indicators. The content and application of this model have been evaluated and confirmed by 9 experts. It provides an effective tool for the evaluation and decision-making of the swimming teaching model of college students in Henan province. This teaching model is expected to change the traditional swimming teaching model and set a benchmark for other provinces.
Keywords: Swimming Teaching Model; Indicator; Higher Education

Introduction

With the continuous reform of physical education and the continuous advancement of quality education, the report of the second Tenth Party proposed that it is necessary to extensively carry out the national fitness campaign, strengthen the youth sports work, promote the comprehensive development of mass sports and competitive sports, and accelerate the construction of sports power. The second is to enable students to master 1-2 sports skills; The third is to enhance students' physique, and improve students' health; The fourth is to improve the mood through physical exercise so that students maintain an optimistic attitude towards life; The fifth is to improve students' social adaptability through physical exercise. (General Administration of Sport of China and Ministry of Education, 2021)

As a whole-body sport, swimming can not only exercise physical quality but also has important survival skill value. In college physical education, the development of swimming courses plays an important role in cultivating students' sports ability, health consciousness, and comprehensive accomplishment. However, the traditional swimming teaching mode has gradually exposed some limitations in practice, which makes it difficult to fully meet students' learning needs and interests.

The current swimming teaching method may be outdated, and lacks innovation and attraction, resulting in students' learning enthusiasm is not high, and the teaching effect is not ideal. (Guo, 2018). The lack of swimming teaching facilities and teachers in some colleges and universities limits the extensive development and quality improvement of swimming teaching. The existing evaluation methods often focus on skill assessment, ignoring students' learning process, progress, and individual differences, and cannot fully and accurately reflect the teaching effect and students' learning status. With the development of information technology, digital means such as online courses and virtual teaching provide new ways and possibilities for swimming teaching. It has become a new trend in the

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field of education to use data analysis to evaluate students' learning performance and develop personalized teaching plans, and it is necessary to introduce this concept in swimming teaching.

At present, the research on the swimming teaching model for higher education students is relatively few, and the existing research has some shortcomings in the aspects of systematicness, scientificity, and practicability. (Dang, 2020). There is a lack of research on how to guide teaching practice and improve teaching quality by clarifying specific teaching indicators.

To sum up, it is urgent and important to develop a swimming teaching index model for higher education students. By establishing a scientific and effective teaching model, the quality of swimming teaching can be improved, the diversified needs of students can be met, and the development of higher education sports can be promoted.

The background of this study lies in the field of higher education, where there is a growing emphasis on effective teaching methods in swimming. Swimming is not only a valuable physical activity but also an important life skill. However, traditional swimming teaching models in higher education may have limitations and fail to meet the diverse needs and learning abilities of students. The research problem addressed in this paper is how to develop an indicator swimming teaching model that is specifically tailored for higher education students. This model aims to enhance teaching effectiveness, improve students' swimming skills and performance, and promote their overall development and interest in swimming, ultimately providing a more efficient and targeted approach to swimming education in the higher education context.

Objectives

To develop the indicator swimming teaching model for higher education students.

Literature Review

Research on swimming teaching

Swimming not only presents distinct professional and technical characteristics, but it needs to make a systematic teaching plan; It also needs related safety measures and supporting services, so how to carry out swimming teaching activities smoothly and efficiently has become an important issue for some schools to think about. Cheng (2012) made an in-depth analysis of the objectives, contents, and teaching methods of swimming teaching in colleges and universities in Chongqing, and found that the teaching concepts of swimming in colleges and universities in Chongqing were outdated and the understanding of swimming was insufficient. Swimming skills teaching simplification; The teaching hours are relatively insufficient, which cannot meet the actual needs of students; The imbalance of teachers' professional level leads to low teaching quality. The teaching form is simple, the teaching effect is not obvious; College swimming teaching venues, equipment, and supporting facilities cannot keep up with the development of teaching several problems.

Guo (2018) selected 20 institutions of higher learning in Fuzhou and Xiamen of Fujian Province as key research objects and sorted out their swimming infrastructure, teaching development, and swimming teacher teams. According to the current situation of the investigation, it is suggested to change the teaching ideas of college teachers, improve the special ability of teachers, optimize the teaching mode, and improve the site facilities. Li (2022) pointed out that swimming teaching in colleges and universities pays too much attention to swimming safety, resulting in the timeliness of teaching. In addition, the teaching method of swimming skills is too simple, the class time is too short, and some teachers' teaching ability is limited. To improve the quality of college students' swimming teaching and solve the difficulties in swimming teaching, there is still a long way to go.

Research on a teaching model

The teaching model is not uniform, it can be gradually improved or replaced with the progress of The Times and the development of society. Different teaching modes can be selected according to educational objectives, student characteristics, and textbook content. Wang (2018) proved that the flipped classroom teaching model itself has many characteristics and effective roles. His point of view is that the advantages and characteristics of the flipped classroom teaching model can enable it to achieve more and more effective teaching effects in the process of course physical education. Finally, he also points out that there may be some problems in the current flipped classroom teaching model

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entering course public physical education, such as students' self-management ability of independent learning not meeting the requirements. The professional and comprehensive quality of PE teachers needs to be further improved, and the equipment needed for flipped classrooms in schools is not perfect. Guo (2012) put forward and introduced the implementation process of the "procedure-cooperation" teaching model in Swimming Class Construction. In the same physical education teaching unit or class, the flexible choice of program teaching method and cooperative teaching method can better achieve the teaching goal of the swimming course.

Li (2004) a famous professor at East China Normal University, analyzed blended teaching and pointed out that online teaching and traditional face-to-face teaching should be organically integrated, and the advantages of both should be fully utilized to complete the prescribed teaching tasks in turn. Teachers make innovative designs of teaching content according to the teaching model, and students have a sense of freshness so that they can quickly adapt to the new teaching model and effectively improve the teaching effect. Hao (2019) conducted flipped classroom and traditional teaching experiments in the teaching of backstroke, breaststroke, and freestyle in course swimming classes. The scholar combines online classes with offline classes to deepen students' understanding of skills. Record or find the technical movements of swimming celebrities in advance to make some swimming teaching videos, and preview them before class, to facilitate students to establish a superficial impression; After class, students' problems in class will be summarized and added to the teaching guide plan, so that students can have a correct knowledge review of the technical movements they have learned.

Research on the application of indicators in teaching

This research selects three theoretical bases, among which "the theory of all-round development of humans" as the theoretical basis, the theory as the support point of the paper, mainly reflects the need to strengthen the habit of students' independent exercise and emphasize the all-round development of students; The synergy theory is also used in this study. There is a serious disconnect between inside and outside classes in college swimming courses, and there is a lack of consistency and integrity in curriculum objectives, implementation, and evaluation. The synergy theory will effectively promote students' sports skills and the quality of college physical education courses. Finally, the system theory is selected to understand the operation process of the system comprehensively and systematically and to promote the development of college swimming courses.

In teaching, the application of indicators has been proven to improve the effectiveness of teaching and the accuracy of quality assessment. For example, in mathematics and language teaching, clear learning indicators help students define their goals and provide a basis for teachers to adjust their teaching (Thompson, 2017; Garcia, 2019). In physical education teaching, some studies have begun to introduce indicators to measure students' skill levels and progress. Sun (2011) focused on the quantity and quality of teaching results, while Zhang (2018) argued that the teaching effect means that teachers are not only proficient in teaching but also flexible in using various advanced teaching methods to better impart professional knowledge to students.

Zhong and Wang (2017) used the program teaching method in swimming teaching. First of all, the teaching program is prepared according to the situation of students and the teaching content, and the teaching is carried out in order. After completing part of the teaching content, the students are tested. According to the feedback information on whether the students reach the standard, the students are judged to continue to improve the movement or learn new content, and the ability to find and solve problems is cultivated in the process.

Relates research

In foreign countries, many countries have long included swimming as an important part of the school physical education curriculum and actively explore the effective combination of swimming lessons and activities. Seonghwan (2010) inspired by the current situation of education in South Korea, the author conducted a survey and concluded that education consists of teaching and learning, and the teaching content should not be limited to regular subjects, but also include the teaching model of integrating family, school and society, and the teaching activities are aimed at lifelong physical education, with different requirements in different periods of the teaching process. The integrated teaching model of family parent participation, school education, and social influence. Burac (2013)

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uses games to define how swimming teaching can improve the quality, efficiency, and speed of swimming teaching, encourage students at different stages to learn swimming through games and competitions, and avoid monotonous teaching and stereotypes. The application of the game teaching method in integrated swimming teaching can not only increase students' interest in learning swimming but also encourage teachers to carry out swimming teaching more conveniently. Some colleges and universities in the United States stimulate the enthusiasm of students by launching swimming clubs and holding swimming competitions on campus. Australia pays attention to the combination of swimming teaching and water safety education to cultivate students' self-rescue and mutual rescue abilities.

Jon (2023) Design and development of the Swimming Ability Assessment Scale (SCAS) to measure children's water skills in the Norwegian primary school physical education curriculum. A three-round modified Delphi study involving 22 national aquatic specialists was conducted. For the water entry, backstroke, surface diving, float/quiet, backstroke, and water out of six water skills tests, experts in the observation table and coding table reached a consensus on the scale items. The findings suggest that SCAS is an effective tool for researchers and practitioners to observe and record children's proficiency in water sports, which can be used for screening and conducting water sports education.

To sum up, the literature review encompasses multiple aspects related to the development of an indicator swimming teaching model for higher education students. It examines swimming teaching in general, covering various approaches and their effectiveness. It delves into different teaching models, exploring their structures and impacts on student learning. The review also focuses on research regarding the application of indicators in teaching, analyzing how they can be utilized to measure and enhance instructional quality. Additionally, it incorporates related research that provides valuable context and comparisons. Collectively, these diverse strands of literature form a comprehensive foundation for understanding the current state of knowledge and identifying gaps in the development of the proposed swimming teaching model for higher education students.

To better measure and improve the quality of swimming teaching, researchers put forward the concept of the "swimming teaching index system". This system aims to systematically evaluate all aspects of swimming teaching in colleges and universities through scientific index design and evaluation methods, to guide teaching practice and improve teaching effect. The swimming teaching index system is a comprehensive evaluation tool composed of multiple concrete indicators, covering teaching objectives, teaching content, teaching methods, teaching evaluation, and so on. Through this system, the quality and effect of swimming teaching can be systematically reflected, and a scientific basis for teaching improvement can be provided. In the research of swimming teaching in colleges and universities, some scholars have deeply discussed the teaching content, methods, and evaluation system, and put forward some preliminary index systems. For example, some studies have proposed evaluation indicators based on teaching objectives, emphasizing the mastery of technical skills, physical improvement, and mental health promotion. However, most of the existing research focuses on the discussion of individual indicators and lacks a comprehensive and systematic index system. Although some studies have preliminarily discussed the construction of swimming teaching indicators, there are still some research gaps and challenges.

Conceptual Framework

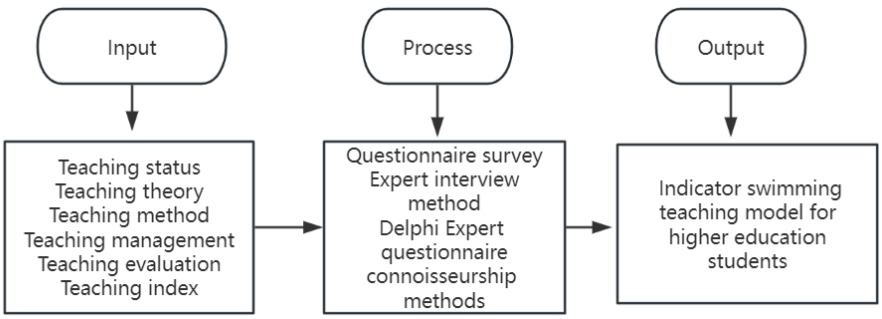

Figure 1 Conceptual framework of this research

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Methodology

1. Population and sample

In this study, a random sample was selected to distribute questionnaires to freshmen and sophomores in 12 colleges and universities in Henan Province. The sample size of this study is 576 people, among them, there are 540 students, 294 boys and 246 girls, and 36 teachers, including 24 male teachers and 12 female teachers.

Participants: Through a purposive sample method, 5 experts were selected for IOC, 7 experts were selected for expert interview, 19 experts were selected for the Delphi method, and 9 experts were selected for the Connoisseurship method.

2. Research tools

In this research, the research tools are as follows: (1) Questionnaire for students; (2) Questionnaire for teachers; (3) Interviewing form for experts; (4) Questionnaire for Delphi; (5) Evaluation form for Connoisseurship.

3. Data Collection

1. Consult relevant literature, analyze the current situation by questionnaire survey, preliminarily determine elements according to the results of questionnaire survey combine the opinions of experts in interviews, and design the Delphi expert questionnaire.

2. Select experts in related fields and conduct research using the Delphi method. The analytic hierarchy process is used to determine the weight of each evaluation element.

3. The method of connoisseurship is used to verify the effectiveness, feasibility, and improvement direction of the teaching model.

4. Data Analysis

1. Descriptive statistical methods, including the computation of the average and standard deviation, are utilized to analyze the data obtained from the questionnaire.

2. Descriptive statistics, specifically the median and interquartile range, were employed to analyze the Delphi consensus data. The criteria for the analysis included a median of ≥ 3.50 and an interquartile range of ≤ 1.50.

3. Evaluate the content validity of the questionnaire using the elements of Items of Objective Congruence (IOC). The standard range of IOC is 0.88 (0.60-1.00) with high consistency and can be retained.

4. In considering the average score obtained from the information provided by experts. The researcher used the Likert scale to determine the average score of the measure. The meanings of 5 scale evaluation are 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. The details of the score criteria are as follows (Best John W, 1977):

Average score range	Meaning
1.00 - 1.79	Strongly Disagree
1.80 – 2.59	Disagree
2.60 – 3.39	Neutral
3.40 – 4.19	Agree
4.20 – 5.00	Strongly Agree

Results

1. Investigate the current situation and existing problems of swimming lessons in colleges and universities in Henan Province.

1.1 Students' questionnaire survey

After sending questionnaires to 540 students from 12 universities, they completed the survey. The results of the questionnaire responses can be analyzed as follows:

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Table 1 Students' questionnaire survey results on the current status and problems

Questionnaire Items	Total Score		Result
	$\bar{X}$	S.D.	
1. Are you satisfied with the school's swimming facilities?	3.06	0.64	Neutral
2. How satisfied do you think the existing swimming venues in the school are with the teaching of swimming courses	1.28	0.45	Strongly Disagree
3. Do you like swimming lessons?	4.66	0.60	Strongly Agree
4. Are you satisfied with the weekly arrangement of swimming class	1.30	0.45	Strongly Disagree
5. Are you satisfied with the teaching content of the swimming class	2.90	0.67	Neutral
6. Do you think the teaching methods adopted by your swimming teacher in class apply to you?	3.36	0.73	Neutral
7. Do you think the practice times and density of each class are satisfactory	2.57	0.50	Disagree
8. In the process of swimming learning, encounter difficult problems will take the initiative to ask teachers or classmates	4.49	0.66	Strongly Agree
9. Are you satisfied with the auxiliary equipment provided by the swimming class?	3.53	0.70	Agree
10. Do you think in the process of learning to swim, a swimming teacher can effectively mobilize your learning enthusiasm and initiative	2.90	0.70	Neutral
11. The number of swimming practice activities in extracurricular time	3.70	0.65	Agree
12. If your class has a swimming practice group, you will join it	3.90	0.57	Agree
13. Swimming lessons stimulate your interest in sports	3.46	0.74	Agree
14. Participate in swimming lessons, help to develop their team spirit and sense of cooperation	4.26	0.66	Strongly Agree
15. Are you satisfied with the assessment of swimming lessons?	3.64	0.76	Agree
Total	3.26	0.63	

From Table 1 question 2, how satisfied do you think the existing swimming venues in the school are with the teaching of swimming courses ($\bar{x}$ = 1.28) question 4: Are you satisfied with the weekly arrangement of swimming class ($\bar{x}$ = 1.30) the result is " Strongly Disagree". Question 7: Are you satisfied with the arrangement of practice times and density of each class ($\bar{x}$ = 2.57) the result is "Disagree". It is because most colleges and universities in Henan have a large student base for swimming classes, and the venues that can be accommodated are limited, resulting in the average number of hours per student being unable to increase, and students are not satisfied with the number of hours.

1.2 Teachers' questionnaire survey

The questionnaire was sent to 36 teachers in 12 universities. After they completed the questionnaire, the results were as follows:

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Table 2 Teachers' questionnaire survey results on the current status and problems (N=36)

Questionnaire Items	Total Score		Result
	$\bar{X}$	S.D.	
1. Can the swimming venues and equipment of your school meet the needs of swimming teaching	2.25	0.44	Disagree
2. Your satisfaction with the swimming teaching materials used in your school	4.11	0.71	Agree
3. Are you satisfied with the teaching content of the swimming class	2.83	0.88	Neutral
4. How satisfied do you think the number of swimming course teachers in the school is with daily teaching	1.36	0.49	Strongly Disagree
5. The degree of guidance of the teachers who specialize in extracurricular swimming activities in your school	1.97	0.74	Disagree
6. The importance of school leaders in swimming	3.22	0.68	Neutral
7. The improvement of your school's supervision mechanism for the development of swimming sports	2.94	0.79	Neutral
8. Reasonable arrangement of the school's regular swimming competitions	3.03	0.77	Neutral
9. The formation of the school swimming training team	3.31	0.58	Neutral
10. School participation in internal and external swimming competitions	1.92	0.65	Disagree
11. How open your school's swimming venue is to students after school hours	2.72	0.70	Neutral
12. The formation of the school swimming student society	3.69	0.89	Agree
Total	2.77	0.69	

From Table 2 question 4: The degree to which the number of swimming course teachers in schools meets daily teaching ($\bar{x}$ = 1.36), the result is "Strongly disapprove". Question 1: Can swimming venues and equipment meet the needs of swimming teaching ($\bar{x}$ = 2.25) the result is "disapprove". It can be seen that swimming venues and equipment in schools cannot meet the needs of swimming teaching. This directly affects the quality of teaching and the learning experience of students. However, the number of swimming course teachers is not satisfied with daily teaching, which directly leads to the unsatisfactory situation in the organization of swimming competitions and the support for students' participation in swimming competitions in question 5, the level of teachers' guidance in extra-curricular swimming activities in schools ($\bar{x}$ = 1.94), and the situation in question 10, the situation in schools' participation in swimming competitions inside and outside schools ($\bar{x}$ = 1.92).

2. Expert interview

After a questionnaire survey on the current situation of swimming courses in colleges and universities in Henan Province, 7 experts were interviewed to list the requirements that can reflect the teaching mode and formulate the framework of elements.

The experts recommended the key to promoting the development of swimming in colleges and universities is to optimize the curriculum, strengthen teachers, improve facilities, organize activities, and strengthen publicity. The conventional swimming teaching model has the advantages of standardization and emphasis on foundation, but it has the shortcomings of a single method, ignoring individual differences and cultivating interest. The teaching methods are mainly demonstration, decomposition, repetition, and group cooperation. Institutional factors include school policy, curriculum planning, teacher allocation, funding input, and supervision. Factors that affect students' learning include their situation, curriculum arrangement, teaching quality, and venue conditions. Assessment should be a combination of skills, theory, daily performance, and

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practical application. To improve teaching conditions, schools need to increase investment, cooperate to introduce resources, optimize management, and learn from experience.

3. Delphi Method survey results

A questionnaire containing 96 indicators was compiled from the results of the questionnaire survey and expert interview. After two rounds of opinions and suggestions of the Delphi method, 6 components and 4 indicators were deleted.

Table 3 Second round of Delphi results

Item	elements	Mdn.	IQR	Result
(A) Course objective		5	0.5	Retained
A1 Motor ability goal		5	0.5	Retained
A1.1	Mastery of swimming skill	5	0.5	Retained
A1.2	Improve swimming speed and endurance	5	0.5	Retained
A1.3	Improve swimming coordination	5	0.5	Retained
A2 Healthy Behavior Goals		5	0.5	Retained
A2.1	Physical skill development	5	0.5	Retained
A2.2	Mental adjustment ability	5	0.5	Retained
A2.3	Develop good exercise habits and health awareness	5	0.5	Retained
A3 Goal of sports morality		5	0.5	Retained
A3.1	Cultivate courage and tenacity	5	0.5	Retained
A3.2	Respect and fairness	5	0.5	Retained
A3.3	Enhance the sense of teamwork and competition	5	0.5	Retained
(B) Teaching content and organization		5	0.5	Retained
B1 Instructional materials		4	0.5	Retained
B1.1	Selection of authoritative teaching materials	4	0.5	Retained
B1.2	Development of school-based teaching materials	4	0.5	Retained
B1.3	Integration of multimedia teaching resources	4	0.5	Retained
B2Course content settings		5	0.5	Retained
B2.1	Basic theoretical knowledge	4	0.5	Retained
B2.2	Swimming technique teaching	5	0.5	Retained
B2.3	Swimming psychological training	5	0.5	Retained
B2.4	Swimming competition rules and refereeing methods	5	0.5	Retained
B2.5	Water safety and life-saving knowledge	4	0.5	Retained
B4 Teaching arrangement		4	0.5	Retained
B4.1	Course schedule planning	4	0.5	Retained
B4.2	Class size and grouping	5	0.5	Retained
B4.3	Teaching space arrangement	5	0.0	Retained
B4.4	Teaching facilities and equipment	5	0.5	Retained
(C) Teaching methods and means		4	0.5	Retained
C1 Traditional teaching methods		5	0.5	Retained
C1.1	Demonstrate and explain	5	0.5	Retained
C1.2	Exercise method	5	0.5	Retained
C1.3	Play method	5	0.5	Retained
C1.4	A team or individual swimming competition	4	0.5	Retained
C2 Multimedia-assisted teaching		5	0.5	Retained

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Item	elements	Mdn.	IQR	Result
C2.1	Swimming teaching video	5	0.5	Retained
C2.2	Use motion analysis software	5	0.5	Retained
C3 Personalized guidance		4	0.5	Retained
C3.1	Adjust teaching for individual differences	5	0.5	Retained
C3.2	Develop an exclusive training plan	5	0.5	Retained
C4 Cooperative learning in small groups		4	0.5	Retained
C4.1	Group cooperative learning	5	0.5	Retained
C4.2	Team competition	4	0.5	Retained
(D) Teaching practice		4	0.5	Retained
D1Activities and training		4	0.5	Retained
D1.1	Classroom practice activity	4	0.5	Retained
D1.2	Extracurricular autonomous training	4	0.5	Retained
D1.3	Swimming standard test activity	4	0.5	Retained
D2Competitions and club activities		5	0.5	Retained
D2.1	In-school swimming competitions	4	0.5	Retained
D2.2	Extracurricular swimming Associations	4	0.5	Retained
D3 Outreach activities		4	0.5	Retained
D3.1	Swimming exchange competition	4	0.5	Retained
D3.2	Community swimming service	5	0.0	Retained
D3.3	Charity swimming activities	5	0.5	Retained
D3.4	Swimming culture research	4	0.5	Retained
(E) Assessment and evaluation		4	0.5	Retained
E1 Student Assessment		5	0.5	Retained
E1.1	Skill assessment	5	0.5	Retained
E1.2	Physical fitness	4	0.5	Retained
E1.3	Theoretical assessment	5	0.5	Retained
E1.4	Learning attitude and participation assessment	5	0.5	Retained
E2 Teacher Teaching Assessment		5	0.0	Retained
E2.1	Evaluation of teachers' professional qualities	5	0.5	Retained
E2.2	Achievement of teaching objectives	4	0.5	Retained
E2.3	Evaluation of the adaptability of teaching content	4	0.5	Retained
E3Evaluation of the curriculum		4	0.5	Retained
E3.1	Overall planning and evaluation of swimming courses	4	0.5	Retained
E3.2	Rationality of teaching content	5	0.5	Retained
E3.3	Arrangement of teaching progress	4	0.5	Retained
E3.4	Evaluation of teaching resource utilization	4	0.5	Retained
E3.5	Evaluation of swimming activity effects	4	0.5	Retained
(F) Teaching resources and safety assurance		4	0.5	Retained
F1 Construction of teaching staff		5	0.5	Retained
F1.1	Professional skill level of teachers	5	0.5	Retained
F1.2	Teacher's teaching ability	5	0.5	Retained
F1.3	Teacher refresher and training	4	0.5	Retained
F1.4	Exchange of experience inside and outside the school	4	0.5	Retained
F3 Safety rules and regulations		5	0.5	Retained

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International Journal of Sociologies and Anthropologies Science Reviews
Volume 5 Issue 2: March-April 2025: ISSN 2985-2730
Website: https://so07.tci-thaijo.org/index.php/IJSASR/index

Item	elements	Mdn.	IQR	Result
F3.1	Rules and regulations for the use of swimming pools	4	0.5	Retained
F3.2	Safety operating standards during teaching	4	0.0	Retained
F3.3	Lifeguard staffing and equipment improvement	4	0.5	Retained
F4 Safety education and training		5	0.0	Retained
F4.1	Provide regular safety education to students	4	0.5	Retained
F4.2	Organize teachers and lifeguards to participate in safety training	5	0.5	Retained

Therefore, it can be inferred that 86 definite factors are the factors that affect the development of the indicator swimming teaching model for higher education students.

Following the second round of the Delphi survey, there was no necessity to eliminate, alter, or introduce any influencing factors.

Drawing from the results of the two rounds of the Delphi method, all items conformed to the criteria of Mdn. ≥ 3.50 and IQR ≤ 1.50. Consequently, it can be inferred that all items were considered crucial and deemed suitable for inclusion in the model.

4. Connoisseurship method for confirming the indicator swimming teaching model

To ensure the satisfaction, utility, and practicality of this model, the researcher conducted a connoisseurship panel. A total of 9 experts, encompassing authorities in swimming, university leaders, and physical education teachers, were invited to participate in discussions. The aim was to validate the feasibility and reasonableness of the element model for the development of an indicator swimming teaching model for higher education students.

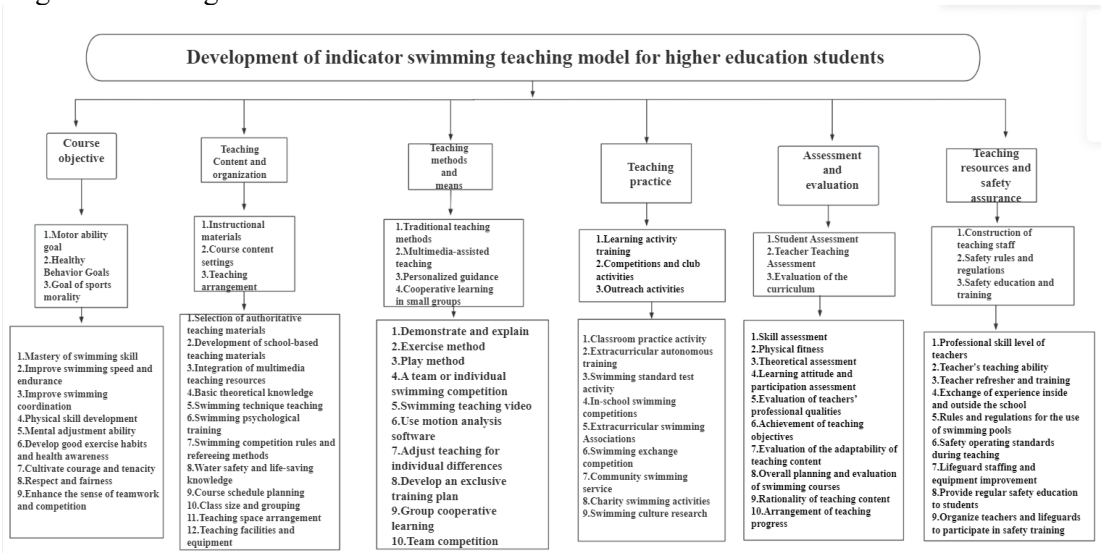

Figure 2 The model for the development of indicator swimming teaching model for higher education students

As can be seen from Figure 2, the element model of Development of indicator swimming teaching model for higher education students consists of 6 factors, they are composed of Course objective; Teaching Content and organization; Teaching methods and means; Teaching methods and means; Assessment and evaluation, and Teaching resources and safety assurance. 19 components and 61 indicators and a total of 86 indicators. The content and application of the model were evaluated and confirmed by 9 experts, and the evaluation score was the highest, which confirmed the applicability of the model.

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Conclusion

This study successfully constructed an index swimming teaching model suitable for higher education students, including 6 factors, 19 components, and 61 indicators, a total of 86 indicators. The model of the indicator swimming teaching model for higher education students is summarized as follows:

Table 4 The detail of the model of development of the indicator swimming teaching model for higher education students.

First Level elements	Second Level elements	Third Level elements
1. Course objective	1. Motor ability goal	1. Mastery of swimming skill
		2. Improve swimming speed and endurance
		3. Improve swimming coordination
	2. Healthy Behavior Goals	1. Physical skill development
		2. Mental adjustment ability
		3. Develop good exercise habits and health awareness
	3. Goal of sports morality	1. Cultivate courage and tenacity
		2. Respect and fairness
		3. Enhance the sense of teamwork and competition
2. Teaching Content and organization	1. Instructional materials	1. Selection of authoritative teaching materials
		2. Development of school-based teaching materials
		3. Integration of multimedia teaching resources
	2. Course content settings	1. Basic theoretical knowledge
		2. Swimming technique teaching
		3. Swimming psychological training
		4. Swimming competition rules and refereeing methods
		5. Water safety and life-saving knowledge
	3. Teaching arrangement	1. Course schedule planning
		2. Class size and grouping
		3. Teaching space arrangement
		4. Teaching facilities and equipment
3. Teaching methods and means	1. Traditional teaching methods	1. Demonstrate and explain
		2. Exercise method
		3. Play method
		4. A team or individual swimming competition
	2. Multimedia-assisted teaching	1. Swimming teaching video
		2. Use motion analysis software
	3. Personalized guidance	1. Adjust teaching for individual differences
		2. Develop an exclusive training plan
	4. Cooperative learning in small groups	1. Group cooperative learning
		2. Team competition
4. Teaching practice	1. Activities and training	1. Classroom practice activity
		2. Extracurricular autonomous training
		3. Swimming standard test activity
	2. Competitions and club activities	1. In-school swimming competitions
		2. Extracurricular swimming Associations

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First Level elements	Second Level elements	Third Level elements
	3. Outreach activities	1. Swimming exchange competition
		2. Community swimming service
		3. Charity swimming activities
		4. Swimming culture research
5. Assessment and evaluation	1. Student Assessment	1. Skill assessment
		2. Physical fitness
		3. Theoretical assessment
		4. Learning attitude and participation assessment
	2. Teacher Teaching Assessment	1. Evaluation of teachers' professional qualities
		2. Achievement of teaching objectives
		3. Evaluation of the adaptability of teaching content
	3. Evaluation of the curriculum	1. Overall planning and evaluation of swimming courses
		2. Rationality of teaching content
		3. Arrangement of teaching progress
		4. Evaluation of teaching resource utilization
		5. Evaluation of swimming activity effects
6. Teaching resources and safety assurance	1. Construction of teaching staff	1. Professional skill level of teachers
		2. Teacher's teaching ability
		3. Teacher refresher and training
		4. Exchange of experience inside and outside the school
	2. Safety rules and regulations	1. Rules and regulations for the use of swimming pools
		2. Safety operating standards during teaching
		3. Lifeguard staffing and equipment improvement
	3. Safety Education and training	1. Provide regular safety education to students
		2. Organize teachers and lifeguards to participate in safety training

Discussion

This study is devoted to developing the indicator swimming teaching model for higher education students. Based on a questionnaire survey, expert interview, Delphi consensus, and connoisseurship method, the indicator swimming teaching model for higher education students with 81 indicators, including 6 factors, 19 components, and 61 indicators is finally developed. The factors of this model include Course objectives, teaching content and organization, teaching methods and means, teaching practice, assessment, and evaluation, teaching resources, and security, which are consistent with the results (Wang and Ji, 2008). He emphasized the clarity of curriculum objectives, the scientificity of teaching content and organization, the diversity of teaching methods, the feedback mechanism of teaching practice, and the safety guarantee in the teaching process. These index systems aim to provide a comprehensive and systematic framework for the teaching design, implementation, and evaluation of swimming courses.

Most of the international research on swimming teaching mode focuses on technical training and the improvement of student's physical fitness, while most of the domestic research focuses on teaching methods. However, this study introduces "teaching resources and safety guarantee" as an independent first-level element, emphasizing the importance of safety and reasonable allocation of resources in the teaching process. In the application of specific teaching methods, it is necessary to carefully identify the differences and characteristics among teaching methods such as case teaching method, group discussion method, mastery learning method, cooperative learning method, and independent learning method (Wang, 2008). In the teaching process, flexible use and implementation should be carried out according to needs, and the practical role of holistic teaching methods and individual tutoring methods should also be taken into account. The emphasis on modern teaching methods is consistent in the study, but its specific application in swimming teaching is further detailed.

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The evaluation system index of swimming teaching for college sports majors, including process evaluation, input evaluation, result evaluation and background evaluation, swimming teaching condition evaluation, swimming teaching process evaluation, swimming teaching input evaluation, and swimming teaching effect evaluation (Li, 2022), should be constructed. This multi-dimensional evaluation method not only conforms to the trend of diversified educational evaluation but also provides a new perspective for the overall development of swimming courses in colleges and universities.

The swimming teaching model constructed in this study has a high degree of operability in practical teaching. First of all, the clear indicators in the model provide teachers with clear teaching guidance, which is conducive to the systematic and standardized design of the curriculum. By using these indicators, teachers can better organize teaching content and adopt diversified teaching methods. It is believed that the organic combination of various swimming teaching methods in college swimming teaching is more conducive to college swimming teaching (Zhang and Lu 2012). Ensure the orderly conduct of teaching activities. Taking the swimming major of Yunnan University as an example, Li (2022) carried out practical application experiments on the constructed index and improved the evaluation index system of college sports majors. The index system itself can be used as a reference for other evaluation studies, as well as a reference basis for the evaluation of swimming courses of college sports majors. It also provides a quantitative basis for course evaluation and improvement, which helps improve teaching effect.

To sum up, the index swimming teaching model constructed in this study provides a comprehensive guiding framework for swimming teaching in higher education by integrating multi-dimensional teaching elements. This model not only expands the research field of swimming course design in theory but also provides a concrete operation basis for curriculum implementation and teaching improvement in practice. Future research should continue to explore and improve this model, to better serve the development needs of physical education.

Recommendation

1. Student management: Establish learning files, and regularly communicate with students to improve teaching, sound evaluation, and reward, stimulate students' enthusiasm, and improve the teaching effect of swimming courses and student satisfaction.

2. Optimize teaching resource management: Reasonable planning of swimming pool use time to ensure sufficient teaching time. Increase the investment in teaching equipment, do a good job of maintenance and update, and improve the utilization efficiency of swimming teaching resources.

3. Strengthen the security management mechanism: Improve the safety management system, clarify responsibilities, ensure the safety of students, equip relevant personnel and equipment to respond to emergency rescue needs, and establish a comprehensive safety system.

4. Strengthen teacher training: Encourage teachers to carry out teaching research and reward those with outstanding achievements, to promote the development of swimming teaching.

Future research direction: Long-term tracking evaluation of teaching effect, integration with other disciplines, application of intelligent teaching methods.

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