Innovation in Content Design and Construction Path of University Physical Education Teaching Based on Mathematical Model Evaluation

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Abstracts: Physical education is an indispensable educational content for cultivating qualified talents. Implementing the educational concept of "cultivating morality and cultivating talents" in college physical education classrooms, combining skill teaching with physical exercise, improving students' cognitive level of sports and health, integrating ideological and political teaching content into public physical education courses, emphasizing student process evaluation, using new technological means, and increasing the assessment of students' extracurricular physical exercise. Relying on student sports club activities, Sunshine Sports Alliance, sports team training and competition activities, strengthen the construction of the "second classroom", investigate students' learning attitude and moral quality, pay attention to path innovation, use research and mathematical evaluation analysis methods, calculate the elements and weights of the cultivation of teaching ability of college physical education, and try to establish the teaching content structure and evaluation system of public physical education.

Keywords: University, Physical Education Quality Evaluation, Mathematical Evaluation, Content Integration, Structural Design.

1. INTRODUCTION

Education is source of national creativity and innovation. Education is source of strength for social progress and national rejuvenation. In the final analysis, culture war and science and technology war are still competitions among talents. Education is national and party's major plan. We can't think of the lack of core competitiveness every time we are strangled and locked by science and technology. Only when we think of the lack of innovative talents can we appeal to cultivate people with ingenuity. We must learn from our mistakes and devote ourselves to education. Colleges and universities are "commanding heights" of national education, which shoulder the responsibility of cultivating high-quality talents. University stage is an important learning period for students to learn professionally, independently and grow into talents. It is also a critical period for students to cultivate their world outlook, outlook on life and values. Educators need to cherish this precious period.

Students, teachers and educational administrators are the subject and object of moral education, leading force and the recipient. For students, it is necessary to do a good job in ideological education, mental health education, code of conduct education, and cultivation of will quality. Guided by "socialist core values" [1], they should earnestly carry out practical education, establish positive and positive values, and students should actively accept them, "Take the rise and fall of the world as our own responsibility" [2], and strive to become talents in all walks of life. For teachers and educational administrators, they should not use the public for personal gain, lose national fortune by making personal gains, or lose the overall situation by seeking one field. They should be models, set an example by example, teach by example, and do a good job in education, research and management down to earth [3]. Colleges and universities have relatively complete range of disciplines and modern teaching practice platforms, teams of high-level talents teachers, cultivate healthy, reliable, high-quality builders and successors for national construction and national rejuvenation [4]. College teachers, as a whole, has a high level of education, profound knowledge, solid and profound professional skills, and is responsible for teaching and educating people, scientific research and serving the society.

2. Material and methods of research

2.1. Research Objects

Physical education teachers from some universities in Shanghai, Jiangsu, Anhui, and other regions of China.

2.2. Research Methods

(1) Literature review method: Retrieve a large number of research works related to physical education teaching, curriculum construction, quality evaluation, and other aspects both domestically and internationally. Retrieve the latest research achievements in sports research on China Journal Network, Wanfang Academic Thesis, and China Sports Information Network, and complete literature review research.

(2) Questionnaire survey method: design a survey questionnaire on the elements and characteristics of physical education curriculum teaching content, let experts and scholars rank each element and its characteristics in order of importance, and provide detailed research data support for the transformation of qualitative research into quantitative analysis.

Firstly, collect data on students' physical fitness and health, conduct statistical analysis of the data results, use expert interviews to explore the existing problems in college physical education teaching, assign quantitative values to the research questions, select typical representative problems in physical education curriculum teaching, focus on research, clarify the content structure of physical education curriculum teaching, and redistribute the sports load of physical education curriculum based on the target tasks of skill teaching and physical exercise. Attempt to design a standardized, standardized, and highly practical teaching organization model for pilot use in our school, and promote its application to sister universities. Research on the evaluation of physical education teaching quality, with a focus on solving the composition of students' physical education course grades and monitoring of teaching quality. Scientific research methods (Kendall harmony coefficient method, R-type factor analysis method, Delphi weight method, etc.) are used to screen the core content of physical education teaching from the elements of physical education teaching content (sports culture and etiquette, special physical fitness, sports techniques and tactics, sports games, aerobic relaxation exercise, etc.). Exploring the application of personalized physical fitness training and technical training methods based on students' ability cultivation points (basic theory, moral character, sports quality, sports skills, collaborative spirit, health quality, etc.), and exploring the best organizational mode of physical education classroom teaching.

(3) Mathematical analysis method

The mathematical processing of assigning values and quantifying the survey results of the questionnaire is followed by applying the Kendall harmony coefficient calculation method of educational statistics to test the reliability of the quantitative results of the questionnaire. SPSS software is used for statistical testing and factor analysis, and principal component analysis is used to establish a factor model for the elements of physical education teaching content. Finally, the R-type factor weight calculation method of the principal component method (using the load matrix of the initial factor as the weight coefficient) and the Delphi method are comprehensively used to calculate the weight values of each element.

(1) Kendall harmony coefficient calculation method

The calculation formula for Kendall's harmony coefficient:

W =
$$\frac{\sum R^2 - (\sum R)^2 / n}{\frac{1}{12} K^2 (n^3 - n)}$$

("W" is the Kendall's harmony coefficient, "K" is the sample number of survey experts, "n" is the number of ideological and political elements and characteristics of each physical education curriculum, " ΣR " is the sum of the grade scores of each element).

Substitute the data in Table 1 into the formula to obtain the Kendall harmony coefficient (W) of 0.152 for the results of the questionnaire on the characteristics of teaching elements in university physical education courses. Kendall harmony coefficient calculation method is an important method for testing the reliability of measurement results in educational statistics. It has two situations for the reliability test of statistical results: the evaluation level is not the same; The evaluation level has the same level. Due to the fact that the survey questionnaire designed this time is a feature ranking questionnaire, and the rating levels of the raters are not the same, this article only introduces the calculation method for the reliability of the Kendall harmony coefficient test in the first case.

(2) R-type factor weight calculation method

Firstly, the principal component method is used to conduct factor analysis on the elements of college physical education teaching content. Then, the relative importance of each element is determined from the correlation coefficient of the factor load in the initial factor matrix and the numerical value of each factor load.

Ability developm	ant	Factor					
Ability developm	ient	1	2	3	4		
	basic theory	.346	465	420	.439		
Professional ability	knowledge application	.598	275	.552	.609		
	Specialized Skills	5.245E-02	678	406	-8.402E-02		
	Learning attitude	127	.168	541	.660		
Moral literacy	Behavioral habits	4.432E-03	912	.134	-2.036E-01		
,	Practical application	896	7.953E-02	.104	.172		
	Team Spirit	366	.817	.373	472		

Table 1 Initial Factor Load Matrix of Teaching Elements in University Physical Education Courses.

Taking the teaching research of public physical education courses in universities as an example. Firstly, the principal component method is used to conduct factor analysis on the elements of ideological and political education in the curriculum, analysis results are detailed in Table 1. Factor load a_{ij} in the initial factor matrix is the correlation coefficient between the i and j factors (see Table 2 for the initial factor load matrix of ideological and political education education elements in university physical education courses). Therefore, the relative importance of each element can be determined based on its factor load size. The initial factor a_{ij} reflects the degree of correlation between each indicator and the principal component (the magnitude of the correlation depends on the absolute value), and the formula for calculating the weight T is as follows:

$$\mathbf{T}_{i} = \frac{\left|\begin{array}{c}a_{i1}\right|}{\sum\limits_{k=1}^{8}\left|\begin{array}{c}a_{k1}\right|}\right|} + \frac{\left|\begin{array}{c}a_{i2}\right|}{\sum\limits_{k=1}^{8}\left|\begin{array}{c}a_{k2}\right|}\right|} + \frac{\left|\begin{array}{c}a_{i3}\right|}{\sum\limits_{k=1}^{8}\left|\begin{array}{c}a_{k3}\right|\right|} + \frac{\left|\begin{array}{c}a_{i4}\right|}{\sum\limits_{k=1}^{8}\left|\begin{array}{c}a_{k4}\right|\right|}\right|}{\sum\limits_{k=1}^{8}\left|\begin{array}{c}a_{k3}\right|\right|} + \frac{\left|\begin{array}{c}a_{i4}\right|}{\sum\limits_{k=1}^{8}\left|\begin{array}{c}a_{k4}\right|\right|}\right|}$$

Substitute the data in Table 1 into the formula to obtain the weight T, and calculate T as a percentage to obtain the weight values of each element.

Table 2 Integrated Data T	Table of the Ranking Order of	Teaching Elements in L	Jniversity Physical Education Courses.
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	R1	R2	R3	R4	R5	R6	R7	Σ
R	97	84	106	115	93	52	67	614
R ²	9409	7056	11236	13225	8649	2704	4489	56768

3 Analytical Hierarchy Process

Based on literature research on sports specific activities, this study categorizes physical education teaching and

curriculum evaluation, studies the cultivation points of students' core abilities and elements of physical education teaching, and constructs a grading index system, indicator system is detailed in Table 3.

Target layer	Criteria layer	Measure Layer
		1. Actively respond to student learning needs
	Teaching attitude	Well-prepared, conscientious and committed to teaching
		3. Teaching and educating people, focusing on the overall development of students
Teaching evaluation indicators	Teaching Level	 4. Familiar with the material, clear explanation and clear thinking 5. Proficiency in the application of modern teaching methods 6. Explain theoretical issues with practice, not boring 7. Flexible and varied teaching methods to suit the characteristics of the class 8. Effective use examples explained 9. Good at managing classroom atmosphere and pacing 10. The contents of the lectures are linked to the frontiers and directions of the discipline
	Teaching Effect	11. Students grasp firmly and learn something 12. The content presented stimulated the students' thinking

Table 3 Teaching evaluation index system.

Hierarchical analysis is used to solve the problem of determining evaluation factors, selecting the evaluation factors contained in the index system, preserving those factors that are more important for the teacher evaluation model and removing those that have less influence on the evaluation results. Finally, the BP neural network algorithm is used to establish the teaching evaluation model to solve the problem of artificially assigned index weights, and also to solve the model problem of non-linear relationship between each evaluation index and teaching effect.

3. Result Analysis and Discussion

3.1. Teaching content of public physical education in colleges and cultivation of students' ability

Main content of physical education: sports and health knowledge, exercising, physical ability and skills, sports competitions, sports exchange activities, etc. For example, sports competitions are important pillar of campus sports culture [5]. Establishment of traditional sports events on campus is also one of the important contents of campus culture construction [6] Sports events can enhance students' collective sense of honor and sense of team responsibility, stimulate students' enthusiasm to participate in sports activities, improve students' motivation to engage in sports activities, and create a colorful and positive campus sports culture atmosphere, Many sports events can meet different learning needs and value pursuits, so that students can strengthen their personal physique, improve sports skills, cultivate their will quality and develop lifelong sports habits in sports [7].

Build "whole college, whole process and whole course" physical education pattern, and form a joint force between public physical education courses and students' moral education, structural mode is shown in Figure 1. Physical education teachers should intentionally, interestingly and effectively conduct moral education to students in the process of public physical education teaching in universities, take the cultivation of students' moral quality as an important goal of course teaching, and combine it with ability development, give full play to the moral role of physical education courses, refine the cultural elements and values of physical education courses, make the idea of "building morality and cultivating people" concrete and vivid, and actively cultivate and practice the core socialist values, In the process of knowledge learning, skill teaching and physical exercise, students' core qualities (humanistic quality, scientific spirit, learning to learn, healthy life, responsibility, practice and innovation) are comprehensively improved.



Fig. 1. Structure model of teaching content and ability cultivation of public physical education in college.

3.2. Reflections on the integration of moral education elements into physical education teaching in college

As long as the method is appropriate, students will stand out in the teaching, training and competition of a certain project and shine in the sports arena of fair competition through repeated practice and persistent exercise [8]. As long as they work hard, students can gain high self-esteem experience in sports, reflect their personal value, win the respect of teammates and opponents, expand their interpersonal contacts, and obtain higher levels of psychological satisfaction. These will further encourage students to love sports, adhere to exercise, and finally develop lifelong sports habits.

Physical education is a process of cultivating and shaping people. Integrating health knowledge, improving sports thinking, improving the level of sports knowledge transmission, and helping students develop good sports habits. It can not only stay in the marginal discipline position, but also integrate multidisciplinary knowledge into physical education classroom to improve students' cognitive level of physical education. For example, thinking about the origin of the Olympic Movement, the symbiosis and development of sports and social change, the development relationship between modern sports and scientific and technological revolution, sports health and the construction of a community with a shared future for mankind. From the process of the birth, development, inheritance and celebration of the Olympic Games, we should find materials or themes that conform to the ideological and political education, actively guide students, establish positive ideology and values, such as the spirit of women's volleyball, table tennis diplomacy, and the experience and lessons of the defeat in Seoul. We should select the charismatic heroes in the Olympic movement, and take them as examples Telling the legendary stories of sports figures in a humorous way and exerting a positive influence on the students' spiritual character may change the students' choice of life direction, help them grow up and eventually become talents.

A small sports project requires a group of people to know how to love, respect and cherish it. Only in this way can the sports project have a story, light, charm and vitality. Sports people need to have a sincere feeling, a tenacious spirit, persistent belief and the pursuit of courage. This process will change themselves, change destiny, and even change people around them. This is the charm of sports. Therefore, it will become a legend, unforgettable and unforgettable, which will be talked about by later generations.

Schematic diagram of the construction path of physical education courses is detailed in Figure 2. Construction of physical education courses should leverage strengths and avoid weaknesses, and utilize interdisciplinary resources (such as philosophy, ideological and political education, mathematics, management, etc.) to leverage the unique advantages of physical education to achieve a comprehensive educational effect. We should actively and flexibly utilize online teaching resources, establish a physical education teaching evaluation model using data methods, 1724

effectively improve teaching quality, actively guide students to participate in extracurricular exercise activities, timely feedback exercise information, provide positive reinforcement, and cultivate students' lifelong sports habits.



Fig. 2. Schematic diagram of physical education curriculum construction path.

3.3. Structural Design and Teaching Practice of Public Physical Education Courses in Colleges

From the birth and development process of physical education, we should find materials or themes that meet the requirements of public physical education courses, implement the national mainstream ideological education in physical education, select positive cases, exert positive influence on students' spiritual character, help students grow up and eventually move towards the road to success.

Public physical education courses in colleges needs evaluation, and the evaluation results are directly related to students' curriculum scores, calculation results of the weight of physical education curriculum elements are detailed in table 4, table 5, table 6 and table 7. How to achieve quantitative evaluation of moral education imperceptibly needs to be solved urgently. However, if students' character evaluation scores are added to the final grades of each course, teachers are required to investigate students' learning attitude and professional quality in addition to attendance in daily teaching. The usual scores cannot be based on attendance alone, learning process also needs to be reflected.

Table 4 Weight assignment and consistency test results of the criterion layer (Consistency ratio: 0.0245).

Teaching	Teaching	Teaching ability	Teaching	W_{i}
Quality	attitude		Effectiveness	, i
Teaching	1.165	0.473	0.368	0.371
attitude				
Teaching ability	2.265	0.940	1.113	0.423
Teaching	0.521	0.100	0.413	0.455
Effectiveness				

Table 5 Weights of each indicator in the overall objective.

Target layer	Guideline layer	Weights	Indicator Level	Weights	
	Toophing offitudo	0.007	Class Preparation	0.149	
	Teaching attitude	0.337	Classroom performance	0.188	
Quality of physical			Professional theory level	0.062	
education in colleges			Demonstration level	0.128	
and universities	Teaching ability	0.508	Use of teaching materials	0.085	
			Organizational level of	0.000	
			teaching	0.233	

		Classroom atmosphere	0.148
Teaching Effect	0.194	Improvement of students'	0.046
		0.040	

The analysis results of the elements of teacher teaching evaluation indicators are detailed in Tables 4 and Tables 5. It is believed that among the elements of teaching evaluation indicators for physical education teachers in universities, the highest weight value of the second level element is teaching ability. The teaching ability of teachers includes professional theory, teaching demonstration, use of teaching materials, teaching organization level, and other elements, among which the teaching organization level has the highest weight value among the third level elements. The weight of classroom performance in teachers' teaching attitude is slightly higher than that of pre class preparation, indicating the nature and characteristics of physical education courses and placing more emphasis on practice. The weight value of classroom atmosphere in teaching effectiveness is higher than that of students' ability improvement, which needs to be taken seriously by physical education teachers.

Table 6 Weight Matrix and Consistency Test Results of Learning and Ability Cultivation Elements for College
Physical Education Curriculum Students

						-		
Student learning	basic theory	knowledge application	Special ized Skills	Learni ng attitude	Behavi oral habits	Practic al application	Team Spirit	W_i
basic theory	0.565	0.365	0.165	0.365	0.245	0.273	0.668	0.378
knowledge application	1.265	1.165	3.245	2.062	1.925	2.940	1.113	0.232
Specialized Skills	2.165	2.025	2.065	2.615	1.325	3.865	1.812	0.335
Learning attitude	1.765	1.285	3.268	2.161	2.883	2.112	0.965	0.285
Behavioral habits	0.865	2.262	1.934	2.973	2.854	2.282	2.135	0.371
Practical application	0.465	1.115	2.165	1.165	2.295	3.012	2.352	0.405
Team Spirit	0.521	1.054	1.285	2.093	1.857	2.101	1.413	0.293

	Professional ability				Moral literacy				
	basic theory	knowledge application	Specialized Skills	Learning attitude	Behavioral habits	Practical application	Team Spirit		
physical education courses	0.145	0.141	0.162	0.145	0.157	0.135	0.115		

The analysis results of the elements of student learning and ability development indicators are detailed in Tables 6 and 7. It is believed that in the study of physical education courses in universities, the weight value of special skills in the aspect of special ability learning is the highest (0.162); The weight value of behavioral habit development in moral education literacy cultivation is the highest (0.157).

Based on the calculation results, a theoretical basis has been provided for the redesign of the proportion scores of public physical education curriculum composition. The assessment of physical education performance should not only focus on basic knowledge and knowledge application, but also assess students' moral education literacy (including learning attitude, behavioral literacy, practical ability, and team spirit) and professional literacy (subject professional basic theory, knowledge application, and special ability), The focus should be on examining students' mastery of specialized skills and the development of sports behavior habits. Through the analysis of the weight calculation results of various factors, it is recommended to determine the performance of public physical education courses based on three main evaluation forms: examination, teacher evaluation, and course attendance, with emphasis on the evaluation and evaluation of student processes. The process evaluation is mainly based on

teacher evaluation, which comprehensively evaluates students' learning attitude and character literacy. The daily attendance records of students can also reflect their emphasis on the course, learning attitude, and learning spirit. Tests and exams can be used to evaluate students with the help of regular assignments, classroom tests and Final examination.

			Assessment content							
NO	Forms		Profe	Professionalism		Moral quality				
			Theory	Knowledg e	skills	attitude	Morality	practical	cooperation	_ (%)
1	Test/ exam	assignment		\checkmark		\checkmark		$\sqrt{4}$		20
		exam	$\sqrt{\blacksquare}$	$\sqrt{\blacksquare}$	$\sqrt{\blacksquare}$					30
2	Evaluation	Process				\checkmark	$\sqrt{\blacksquare}$	\checkmark	\checkmark	30
3	attendance	Record				$\sqrt{4}$				20
	То	tal	60			20	5	10	5	100

Table 8 Composition of Public Physical Education Course Scores and Design of Score Proportion.

3.4. Design of "333" teaching model of college public sports

"333" ("Three Elements+Three Platforms+Three Linkages", detailed in the figure3) teaching management model of college public physical education curriculum is designed and constructed to organically integrate ideological and political education, special skills, sports fitness, physical health and other contents, which are inclusive and different. Integration of moral education elements into teaching will endow physical education with a new soul, make the boring sports more vivid, the goal of physical education learning more clearly, and the content of physical education more abundant, which will change the rigid teaching of traditional physical education classroom and build a platform for innovative education [9].





3.4.1. "Three elements"

(1) Practical application of the basic principles of philosophy. Explore the cross integration of multiple disciplines, and explain the value of sports by applying philosophical principles, such as applying the concept of connection and development to solve the practical problems of sports, and applying the theory of quantitative change and

qualitative change to explain the improvement of sports on human muscle, bone, heart and lung function and nervous system.

(2) National policies, laws and regulations. Grasp the basic policy basis for the next five years, focus on learning the relevant sports theories, school sports regulations and other policy documents corresponding to the Party, the state and the competent business departments, standardize the content of sports classroom teaching, improve the quality of public sports teaching, and improve the weight of sports courses.

(3) Inheritance and development of theory and knowledge. Combining the school running goal and the training direction of professional talents, we should integrate college sports teaching resources, stagger the development of regional sports, develop characteristic sports events that meet the development of the school, strengthen the construction of characteristic sports teams, promote learning through competitions, and promote teaching through competitions, gradually improve the actual effect of the second class of sports, and help cultivate high-quality talents with comprehensive quality and all-round development.

3.4.2. "Three Platforms"

(1) Physical education platform: the advantages of public physical education teaching platform, teachers' demonstration, teaching interaction, demonstration exercises, morning exercises, extracurricular exercises, etc., establish students' correct sports values, "learn from high school as a teacher, be upright as a model", stand by virtue, learn by virtue, teach by virtue, light up the ideal lamp for students, and illuminate the way forward.

(2) Sport skills channel: moral education elements such as determination, courage to take responsibility, and will quality should integrate into skills teaching, physical training, and physique evaluation to cultivate students' sports spirit and will quality and promote their physical and mental health.

(3) Innovative methods of training: combination of learning and training, rich methods and means of physical education teaching. HHIT intermittent physical training and sports games enrich classroom content, activate the classroom atmosphere, cultivate students' sense of participation and interest in sports, and integrate such moral education elements as interaction and cooperation, team spirit and sense of collectivism honor.

3.4.3. "Three linkage"

(1) Course team. According to the top-level design of the school, the ideological and political elements are integrated into the public physical education teaching, which is valued by the school management. A curriculum guidance group is established to promote the ideological and political teaching of the curriculum.

(2) Teachers. The sense of responsibility of "safety first", arriving in class in advance, answering students' questions in time, organizing the class in a standardized and orderly way, and guiding the exercise task should be highly serious.

(3) Students. Don't be late for class, skip class, leave early, don't play with your mobile phone in class, greet your teacher when you see him, be diligent and eager to learn, and earnestly complete the exercises in and out of class assigned by the teacher.

Research Conclusion

(1) After the test and baptism of the "war epidemic", China must re-examine its future and development. In the post epidemic era, new directions, new fields, new ideas and new strategies for national construction emerge as the times require. Moral education in public physical education courses in colleges and universities must face new opportunities and accept new challenges.

(2) The core concept of moral education will be integrated into the practice of physical education teaching to

build a platform for the innovation of college public physical education teaching and mobilize the enthusiasm, enthusiasm and creativity of teachers and students. The cross integration of multiple disciplines will certainly become a very attractive new landscape in college physical education.

(3) Increase the assessment content of moral education accomplishment (including students' learning attitude, moral character accomplishment, practical ability and cooperation spirit), reconstruct the assessment content and score proportion of public physical education course results, and focus on students' process evaluation. The assessment content includes: moral character accomplishment, daily attendance, daily work, basic knowledge, sports skills, physical quality, etc.

(4) Integrate teaching resources, focus on the school's talent training objectives and student ability training, integrate public sports teaching content (sports culture and etiquette, health knowledge, sports skills, sports tactics, sports games, physical training and teaching competitions, etc.), design teaching programs, and make sports teaching more dynamic by means of sports activities, skill learning, physical exercise, sports competitions, etc.

(5) Take students as the main body, apply the control theories such as the grading of exercise load intensity and the monitoring of physiological indicators to classroom teaching, and creatively design the three-dimensional teaching model of physical education courses. The application of new technology products, such as smart watches, sports bracelets, monitoring heart rate, blood pressure, cardiac index, etc., can effectively ensure the safety of teaching.

Author contribution statement

Chuanzhong Wu: Performed the experiments; Analysed and interpreted the data; Wrote the paper. Jin Xie: Performed the experiments; Contributed reagents, materials, analysis tools or data. Li Xu: Conceived and designed the experiments; Wrote the paper. Jun Tian: Analysed and interpreted the data; Contributed reagents, materials, analysis tools or data. Cheng Li: Performed the experiments; Analysed and interpreted the data.

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Data availability statement

Data contained in the article is the final numerical results of this study, which are true and valid.

Declaration of interest's statement

The authors declare no competing interests.

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