

Retraction

Retracted: Influence of Teaching and Course Evaluation of Performing Arts Students Based on Improved Ant Colony Algorithm and Data Fusion

Security and Communication Networks

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

In addition, our investigation has also shown that one or more of the following human-subject reporting requirements has not been met in this article: ethical approval by an Institutional Review Board (IRB) committee or equivalent, patient/participant consent to participate, and/or agreement to publish patient/participant details (where relevant).

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] L. Bai and Y. He, "Influence of Teaching and Course Evaluation of Performing Arts Students Based on Improved Ant Colony Algorithm and Data Fusion," *Security and Communication Networks*, vol. 2022, Article ID 1971341, 10 pages, 2022.

Research Article

Influence of Teaching and Course Evaluation of Performing Arts Students Based on Improved Ant Colony Algorithm and Data Fusion

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Teaching quality evaluation plays a very important role in the evaluation of teaching and learning in universities, especially in performing arts courses. Therefore, in this study, the application and detailed analysis process of clustering analysis on student performance data is used to finally obtain the guidance of clustering results on teaching and management. A mathematical model of teachers was established using graph theory to transform the evaluation process into a bipartite graph model and to fully utilize the memory capacity, mastery of prior knowledge, adaptability, and collaboration of the ant colony algorithm. Moving back and forth between the two sets of partial graphs completed the evaluation of the teacher teaching process. In addition, the maximum and minimum pheromone strategies were applied in the original ant colony algorithm; the robustness of the algorithm itself was enhanced by making full use of the memory ability and the necessary prior knowledge mastery in solving the teacher teaching evaluation problem. For the unqualified teachers, according to the principle of PDCA (quality environment), regular training, mutual lectures, and further training can be adopted to improve teachers' teaching levels. Through comparison, it is found that the general and practical courses of art performance majors do not have professional characteristics, and the professional courses are mostly dance and performance courses, while physical education, sports training, and other related courses are insufficient. Through the method of this study, all students are concentrated in the group of teachers with higher satisfaction, and "teaching" can achieve the expected effect and provide theoretical and practical basis for the development of performing arts courses.

1. Introduction

Colleges and universities are an important link in cultivating the successors of socialism in China, and realizing the effective combination of physical education in colleges and universities and social sports needs is effective in improving the quality of physical education in colleges and universities and meeting social sports needs [1, 2]. The monotony of mass sports in sports and its traditional development mode have made mass sports lose vitality in development, which is also the main factor leading to the stagnation of mass sports. The emergence of art sports has brought new popular ways to the current mass sports [3]. While the development of popular sports is stagnant, the process of teaching physical

education in colleges and universities is also a "bottleneck" phenomenon [4]. This also puts forward new requirements for the cultivation of sports talents in colleges and universities, especially the cultivation of sports and artistic talents [4]. Literature [5] published the first article on the professional talent cultivation of art performance course and proposed the "one, three, one" professional talent cultivation model of art performance course, namely, the interpretation of "one profession," which answers the question of what is a performance profession; "the interpretation of "three abilities," performance ability, teaching and training ability, and choreography ability, which answers the question of what people should be cultivated in performance profession; the "one-way" analysis, which answers the question of how

to cultivate. This mode of cultivation has influenced the cultivation of professional talents in art and performance for a period of time. Literature [6] published an article “A Re-Examination of the Development of Art Majors in Sports Colleges and Universities in China,” pointing out that the establishment of art majors in colleges and universities has become a trend due to the unclear positioning of the majors and confusion in curriculum settings. The problems restrict the development of art majors.” Sports colleges and universities running good art majors can effectively enhance the brand and influence of the school” [7, 8]. Therefore, all 14 independently set up sports colleges and universities announced by the Ministry of Education have offered art majors [9, 10]. However, “when higher education changes from scale development to quality development, the problems surrounding the construction of sports and arts majors gradually come to the fore, and the construction of majors faces a series of difficulties” [11, 12]. Existing studies on the cultivation of artistic talents in colleges and universities mainly explore the talent cultivation model from a macro perspective and lack analysis and discovery of the characteristics of artistic talents cultivation in sports colleges and universities from the perspective of curriculum setting.

In this study, the PDCA ant colony algorithm is applied to teaching evaluation [13, 14], a relevant algorithmic framework is proposed, and a mathematical model of teachers is established using graph theory to realize the evaluation of teachers’ teaching process in order to effectively improve teaching quality and students’ motivation to learn. Cluster analysis is an important method in data mining, which is widely used in pattern recognition, data analysis, image processing, market analysis, and other fields to find the patterns of similar objects [15, 16]. In teaching evaluation, it is necessary to find out the different factors affecting learning motivation and teaching effectiveness, as well as the reasons for teaching differences among different teachers. Cluster analysis can extract various valuable information from the raw data of teaching evaluation, analyze the characteristics of different types of courses, and provide strong support for evaluating courses and improving teaching.

Aiming at the disciplinary background and the current situation that the basic system and theoretical research of sports and arts courses are in the early stage, we conduct relevant research on the development of sports and arts programs in public physical education courses in colleges and universities, in order to help enrich and improve the teaching theories of physical education disciplines, provide a certain theoretical basis for the development and direction of the future development of sports and arts programs in college sports, and provide the reform of physical education teaching in general colleges and universities. It is expected to provide a theoretical foundation and basis for the reform of physical education in general colleges and universities.

2. Ant Colony Algorithm Based on PDCA Cycle

2.1. Classical Ant Colony Algorithm. The ant colony algorithm (ACO, ant colony optimization) is inspired by ants foraging, in which ants find the shortest path to food without being told where the food is in advance and can search for

new paths according to the change of environment [17, 18]. The main reason is that ants release pheromones on the paths they pass through, which mainly include road information and information intensity, guiding more ants to travel in the direction with more pheromones. ACO is a probabilistic algorithm to find the optimal path by the amount of pheromones. At time t , the probability that ants ($k = 1, 2, \dots, n$) choose node j at node i is as follows:

$$P_{ij}^k = \begin{cases} \frac{\tau_{ij}^\alpha \eta_{ij}^\beta}{\sum_{j \in U_k} \tau_{i,s}^\alpha \eta_{i,s}^\beta} & j \in U_h \\ 0, & j \notin U_k \end{cases}, \quad (1)$$

where τ_{ij} is the pheromone between node i, j ; $\tau_{i,s}$ is the pheromone between node i, s ; η_{ij} is the heuristic factor, indicating the visibility factor, usually $\eta_{ij} = 1/d_{ij}$; d_{ij} is the distance between nodes $i \sim j$. α indicates the information heuristic factor, generally $\alpha = 1-5$, β expectation heuristic factor, generally $\beta = 1-5$, α optimal value in about 1, and β between 2 and 5 is optimal.

After T moments, one cycle of ants ends, and each path pheromone is adjusted according to the following equation:

$$\tau_{ij}(t+T) = (1-\rho)\tau_{ij}(t) + \Delta\tau_{ij}, \quad (2)$$

where $\Delta\tau_{ij}$ denotes the pheromone increment of path (i, j) in this cycle, ρ is the pheromone decay coefficient, and taking $\rho < 1$ can prevent the infinite accumulation of pheromones on the path.

2.2. PDCA Cycle-Based Ant Colony Algorithm Framework.

The PDCA cycle, also called the quality cycle, consists of four parts, plan, do, check, and adjust, and is a trapezoidal ascending cycle. The general idea of the ant colony algorithm based on the PDCA cycle is shown in Figure 1. The university supervises and manages the teaching process of teachers through the teaching management department. The teaching department develops the curriculum for different grades of each major under the guidance of the syllabus according to the special characteristics of each discipline. In the algorithm, only the course number, the instructor, and the students’ satisfaction with the course are required. In the teaching process of teachers, as a course may be taught by several teachers and a particular teacher may teach several courses, students have an overall evaluation of the teacher through their studies. This evaluation can be done in both direct and indirect ways. The direct approach means that students make their evaluations by directly listening to the teacher’s class; the indirect approach means that they make their evaluations through the evaluations of other students and upperclassmen. This concept is similar to the basic principle of the ant colony algorithm: the ant itself is a weak individual, but it can coordinate and cooperate with each other to accomplish relatively complex tasks through the colony effect. Pheromones are the key to ant colony communication and coordination. In this algorithm, students’ direct and indirect evaluations of teachers are considered as

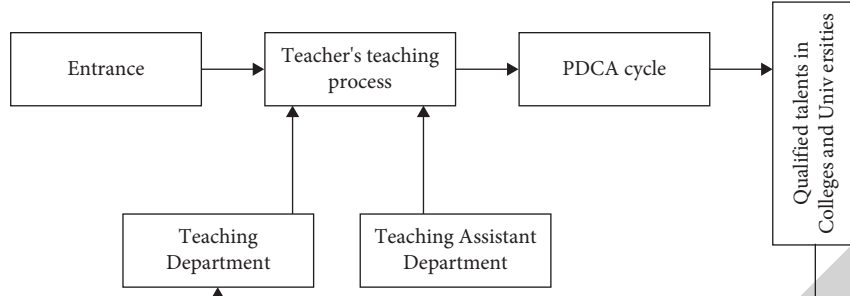


FIGURE 1: Framework structure of ant colony algorithm based on PDCA cycle.

pheromones, and through the cooperation and interaction of pheromones, all students are concentrated in the group of teachers with higher satisfaction, thus making “teaching” achieve the desired effect.

2.3. Algorithm Description

- (1) *Determination of Weights.* A class as a whole is abstracted as an ant, and each ant must have the ability to remember. The weights are determined by comparing the data in the relational model G. A PG taboo list is provided for each ant to record whether the current ant has been assigned out or not. the PG table needs to be continuously updated and needs to be emptied in time before the next start.
- (2) *Teacher-Course Matching.* For a teacher who can teach multiple courses and a course can be taught by multiple teachers, it is necessary to find which teacher is most suitable to teach which course in the relational model. This is similar to the ant colony algorithm, in which ants complete a match and compare it with the last best match to find the one with the highest weight among all edges with entitled values.
- (3) *Pheromone Selection.* Pheromone is the degree of influence of students who have completed a course on new students taking a course instructor. Pheromone volatile characteristics include the teacher’s mood and state of the day, as well as other factors influence, should also include the student’s learning state of the day.
- (4) *The Effective Use of Positive and Negative Feedback of the Algorithm.* In order to prevent the algorithm from converging too early and the operation time being too long, the pheromone strategy in MMAS algorithm is selected, and probability selection is applied in the algorithm in order to meet the requirements of the algorithm for randomness.

3. Mathematical Model of Ant Colony Algorithm Based on PDCA Cycle

3.1. Mathematical Model. The above ACO is slow in convergence and poor in global search capability, so it has limitations in direct application to the PDCA data fusion algorithm with a large number of sensor nodes. In addition,

the ACO does not take into account the node energy, which may lead to the premature death of the cluster head node if it is applied directly. To address these problems, we try to make some improvements to ACO:

$$P_{ij}^k(t) = \begin{cases} \frac{[\tau_{ij}(t)]^\alpha [\eta_{ij}]^\beta}{\sum_{s \in \text{allowed}_k} [\tau_{is}(t)]^\alpha [\eta_{is}]^\beta} & j \in \text{allowed}_k, \\ 0 & \end{cases} \quad (3)$$

tabu_k ($k = 1, 2, 3, \dots, n$) denotes the set of all nodes currently traveled by ant k and allowed_k denotes the set of untraveled points by ant k :

$$\begin{aligned} \tau_{ij}(t+n) &= (1-\rho) \cdot \tau_{ij}(t) + \Delta\tau_{ij}, \\ \Delta\tau_{ij} &= \sum_{k=1}^m \Delta\tau_{ij}^k, \end{aligned} \quad (4)$$

where ρ denotes the pheromone volatilization factor, then $(1-\rho)$ denotes the pheromone residual factor, and $\Delta\tau_{ij}$ denotes the pheromone increment on path (i, j) in this cycle and denotes the amount of information residual on path (i, j) by the k th ant in this cycle:

$$\Delta\tau_{ij}^k = \begin{cases} \frac{Q}{L_k} \\ 0 \end{cases}. \quad (5)$$

If the k th ant passes through (i, j) in this cycle,

$$\eta_{ij} = \frac{1}{(100 - d_{ij})}, \quad (6)$$

where d_{ij} is the degree of student satisfaction with a particular course taught by a particular instructor. The parameters in the algorithm, such as the information heuristic factor α , the expectation heuristic factor β , the number of ants m , and the fluctuation factor ρ , are derived from the TSPLIB simulation experiments on the scheduling class of problems based on the ant colony algorithm. In the algorithm, $m = 5$, maximum number of iterations = 40, $\alpha = 1$, $\beta = 5$, $\rho = 0.3$, $\tau_{\max} = 1000$, $\tau_{\min} = 0.01$, and $Q = 20$.

3.2. MMAS Pheromone. After each cycle, only one ant performs the pheromone update. The value range of pheromone for each ant is restricted to $[\tau_{\min}, \tau_{\max}]$; when the

TABLE 1: Student evaluation indicators and weights.

Index number	Evaluating indicator	Weight	Score
Zb1	Abide by discipline and strict management	0.06	6
Zb2	Knowledge mastering and ability training	0.08	8
Zb3	Develop thinking and stimulate interest	0.07	7
Zb4	Prepare lessons well and be a teacher	0.04	4
Zb5	Clear views and concepts	0.15	5
Zb6	Select content and update knowledge	0.15	15
Zb7	With practice, examples are appropriate	0.08	8
Zb8	Focused and organized	0.07	7
Zb9	Teach students according to their aptitude and pay attention to inspiration	0.12	12
Zb10	The language is vivid and easy to understand	0.08	8

TABLE 2: Distance matrix $D^{(0)}$.

	G_1^0	G_2^0	G_3^0	G_4^0	G_5^0	G_6^0	G_7^0	G_8^0	G_9^0	G_{10}^0
G_1^0	0									
G_2^0	0.261	0								
G_3^0	0.44	0.32	0							
G_4^0	0.47	0.37	0.31	0						
G_5^0	0.59	0.44	0.21	0.44	0					
G_6^0	1.05	0.87	0.65	0.78	0.52	0				
G_7^0	0.54	0.71	0.94	0.82	1.07	1.52	0			
G_8^0	0.44	0.43	0.94	0.35	0.67	1.06	0.55	0		
G_9^0	0.44	0.31	0.25	0.27	0.45	0.78	0.84	0.39	0	
G_{10}^0	1.54	1.79	1.56	1.67	1.5	0.97	2.42	2.05	1.72	0

value of pheromone $\tau > \tau_{\max}$, $\tau = \tau_{\max}$ and vice versa; when the value of pheromone $\tau < \tau_{\min}$, $\tau = \tau_{\min}$.

4. Application of Cluster Analysis

4.1. Data Preparation. Each evaluation index in the teaching quality evaluation system is determined by using different evaluation indexes, weights, and percentages occupied by each evaluation system according to the teaching purpose and teaching effect of art performance courses. Taking our teaching quality evaluation system as an example, the evaluation system is mainly based on student evaluation and combined with other assessments to give the final evaluation results. Here, the student evaluation data is used as an example to study the role of cluster analysis. The indicators and weights of student evaluation are listed in Table 1.

4.2. Cluster Analysis Process

- (1) Considering each teacher as a sample as a cluster $G_1^0 = \{X_1\}, G_2^0 = \{X_2\}, G_3^0 = \{X_3\}, G_4^0 = \{X_4\}, G_5^0 = \{X_5\}, G_6^0 = \{X_6\}, G_7^0 = \{X_7\}, G_8^0 = \{X_8\}, G_9^0 = \{X_9\}, G_{10}^0 = \{X_{10}\}$, the distance matrix V was calculated as follows: $d_f = \sqrt{\sum (x_i - x_j)^2}$. The results of the calculation are listed in Table 2.
- (2) The smallest element in $D^{(0)}$ is 0.22, and G_3^0 is the distance between G_5^0 and the new cluster: $G_1^1 = \{X_1\}, G_2^1 = \{X_2\}, G_3^1 = \{X_3\}, G_4^1 = \{X_4\}, G_5^1 = \{X_4\}, G_6^1 = \{X_6\}, G_7^1 = \{X_7\}, G_8^1 = \{X_8\}, G_9^1 = \{X_9\}$,

$G_{10}^1 = \{X_{10}\}$. The combined distance matrix $D^{(1)}$ is calculated until all clusters are completely combined.

- (3) For the clustering results, these 10 teachers can be divided into 7 iterative processes:

The first iteration process is the teacher numbered {20103, 20105}.

The second iteration process joins the teacher numbered {20109}.

In the third iteration process, teachers numbered {20104}{20101,20102} were added respectively.

The fourth iteration process joins teachers with numbers {20101, 20102, 20104}.

The fifth iteration process joins the teacher numbered {20108}.

The sixth iteration process joins the teacher numbered {20106}.

The seventh iteration process joins the teacher numbered {20107}.

The eighth iteration process joins the teacher numbered {20110}.

4.3. Clustering Result Tree. The clustering result tree of nearest distance clustering was used for students' evaluation scores of teaching, as shown in Figure 2, and the clustering of each observation can be clearly seen from the tree result graph with an obvious clustering effect. The above comparison results show that the algorithm has different degrees of improvement in the evaluation indexes in each dataset compared with the traditional algorithm, and the algorithm outperforms other improved algorithms in terms of overall effect compared with other algorithms.

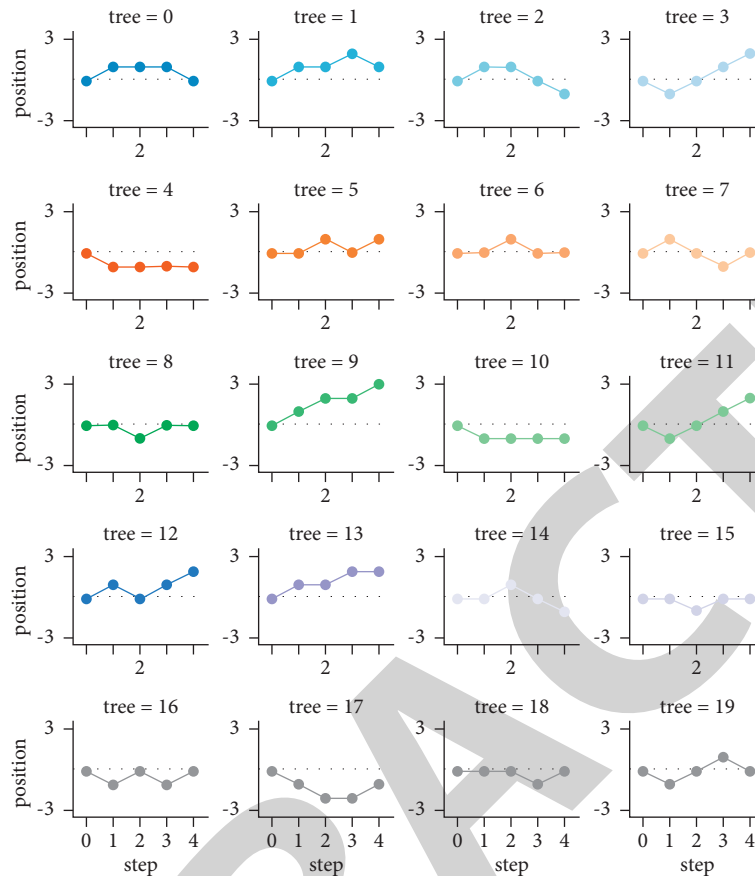


FIGURE 2: Tree results.

5. Research Objects and Methods

5.1. *A Comparative Study on the Curriculum of Art Majors in Four Universities.* Course structure mainly refers to the components of the curriculum system, and there are two main types of course structure systems in general: one is set up according to public courses, professional courses, and practical courses; the other is set up according to general education course modules, professional course modules, and practical course modules. Although the names are different, the actual classification is the same. General courses mainly correspond to the ideological quality requirements of talent training requirements, foreign languages, computers, physical education, and other basic knowledge and work ability requirements, general courses are basically divided into two kinds of compulsory courses and elective courses, compulsory courses are the courses that students must complete in school, and elective courses are based on their own interests and strengths, in the courses offered by the school for elective, to meet a certain number of credits; the second category is the professional courses. At present, the curriculum system of professional courses mainly includes two kinds of compulsory courses and elective courses, which may vary from school to school; the third category is practical courses, which are narrowly and broadly defined. The narrowly defined practical courses mainly refer to practical activities conducted outside the classroom, while

the broadly defined practical courses include both in-class and out-of-class practical activities. In the talent training program, the practical course is a narrow concept in the curriculum structure, and some refer to it as a comprehensive practical course.

As can be seen from Table 3, the credit requirements of art majors in sports colleges are basically between 150 and 160, and the ratio of course structure is basically general courses : specialized courses : practical courses = 3 : 6 : 1, and the total number of credit hours required is between 2500 and 2600. For example, the total credit hours of Jilin Institute of Physical Education are 2200, which does not include the 21 credit hours of practical courses. According to the algorithm of talent training program, the practical courses should meet at least 300 credit hours; the credit requirement of Hebei Institute of Physical Education is 165 credits, of which 10 are bonus credits. For example, Shanghai Institute of Sports has set up a separate module of innovation and entrepreneurship and a module of discipline foundation course; Shandong Institute of Sports has set up a separate module of second class and innovation and entrepreneurship; Jilin Institute of Sports has divided the practical education courses into basic practical courses, social practical courses and practical courses of discipline competition, and so on. Jilin College of Physical Education has divided the practical education courses into three categories, including basic practical courses, social practical courses, and

TABLE 3: List of the curriculum structure of the four sports colleges and universities where the art majors are located.

Name of institution	Total credits	Total class hours	Credit	General course		Professional courses			Practice course		
				Class hours	Proportion (%)	Credit	Class hours	Proportion (%)	Credit	Class hours	Proportion (%)
Shanghai Institute of Physical Education	152	2574	41	127	27.1	89	1921	58.4	22	647	14.2
Shandong Sports Institute	174	2417	44	741	30.74	90	1426	58.21	18	287	11.3
Hebei Institute of Physical Education	158	1542	42	1023	41.84	91	1472	46.74	22	310	12.3
Jilin Institute of Physical Education	156	2410	43	714	28.12	93	1247	58.32	23	0	13.4

TABLE 4: Curriculum settings of general courses in the majors of aerobics in the four colleges and universities.

School name	Credits of compulsory courses	Elective course credits	Compulsory characteristic courses	Same or similar courses
Shanghai Institute of Physical Education	34 (9 doors)	8	English is offered for four semesters	
Shandong Sports Institute	43 (11 doors)	5	College physical education, and college Chinese	Mao Zedong thought and socialism with Chinese characteristics, introduction to marxism, outline of modern Chinese history, situation and policy, ideological and moral cultivation and legal basis, college English, computer foundation, college students' mental health education, and college students' career planning
Jilin Institute of Physical Education	44.5 (12 doors)	6 (at least 3 doors)	Basic education courses of military theory, employment guidance, and entrepreneurship College Chinese, military theory, calligraphy, Putonghua, pedagogy, psychology, principles of physical education, sports injury and massage,	
Hebei Institute of Physical Education	57 (21 doors)	12	Hebei folk Wushu, track and field, gymnastics, and football	

discipline competition practical courses, which further refine the types of practical courses [19, 20].

From Tables 3 and 4, it can be seen that the general education courses in several colleges and universities have the following characteristics: First, in the curriculum setting, the credits of general education courses in Shandong Institute of Physical Education, Jilin Institute of Physical Education, and Shanghai Institute of Physical Education are between 40 and 40. Under the setting of the total credits of the course, the proportion of physical education courses is 30% or less; while the general courses in our school of physical education account for 41.8%, such as computer application foundation, College English, college students' mental health education, and other courses; third, in the characteristic general courses, Shanghai Institute of Physical Education pays more attention to students' foreign language ability, English courses are completed for four semesters, and other schools start 2–3 semesters; Shandong Institute of Physical Education has made college physical education and college Chinese as general required courses for dance performance majors; Hebei Institute of Physical Education has made pedagogy, psychology, principles of physical education, sports injury and massage, Hebei folk martial arts, track and field, soccer, and gymnastics as public courses.

It can be seen from Tables 4 and 5 that the professional curriculum settings of the four colleges and universities mainly show the following characteristics: first, the proportion of professional course credits in the total credits is between 50% and 60%. The ratio of required courses to elective courses in Shanghai Institute of Physical Education is 1:1, the ratio of required courses to required courses in Shandong Institute of Physical Education and Hebei Institute of Physical Education is close to 2.5:1, the ratio of compulsory courses and elective courses of Jilin Institute of Physical Education is 4:5. Second, in the professional compulsory courses, there are four courses that are the same. The foundation and practice of dance choreography, the basic theory of performance, the basic theory of music, and the basic training of ballet are all set in the professional compulsory courses of the four schools. The credits are set differently. For example, the Jilin Institute of Physical Education is setting 4 credits for these four courses, and it is basically set to take classes in the first three semesters. The ballet training foundation of Shanghai Institute of Physical Education has three semesters, a total of 7.5 credits, the other three courses are set to 2 credits like Shandong Institute of Physical Education and Hebei Institute of Physical Education, and the credit hours are 32, which are basically offered

TABLE 5: List of professional courses for aerobics in four colleges and universities.

School name	Credits of compulsory courses	Elective course credits	Compulsory characteristic courses	Compulsory same or similar courses
Shanghai Institute of Physical Education	42.5 (13)	45.7	Introduction to art, history of Chinese and foreign dance, basis of literary script creation, stage creation and practice, multimedia creativity and production, sports anatomy, basic ballet training (7.5), dance choreography techniques (7.5), modern dance, and impromptu choreography	
Shandong Sports Institute	64 (10)	26	Introduction to art, pedagogy, educational psychology, basic gymnastics, special physical training, special theory, and practice (42 credits)	Basic dance choreography and practice, basic performance theory, basic music theory, and basic ballet training
Jilin Institute of Physical Education	40 (16)	54	Performing makeup art and practice, artistic repertoire performance and design, Chinese folk dance, modern dance, introduction to sports art, scientific basis of sports human body, rhythmic gymnastics/hip-hop dance, aerobics, yoga, sports dance, cheerleading, artistic innovation, and entrepreneurship methods	
Hebei Institute of Physical Education	54 (9)	23	Introduction to art, special theory and practice (30 credits), sports training, sports physiology, and sports anatomy	

TABLE 6: Comparison of practical projects and credits.

School name	Practical projects and credits
Shanghai Institute of Physical Education	Comprehensive practice projects mainly include military theory and training (2 credits), internship (6 credits), art practice (4 credits), professional skill practice and test (2 credits), basic physical fitness test (2 credits), and graduation thesis (6 credits)
Shandong Sports Institute	Entrance education and military training, professional skill training practice (6 credits), professional practice (6 credits), and graduation thesis (6 credits)
Jilin Institute of Physical Education	Practical education courses mainly include basic practical courses (19 credits), social practical courses (2 credits). basic practical courses include entrance education and military training (1.5 credits), educational practice (10.5 credits), graduation design (5 credits), graduation education (0.5 credits), and physical fitness test (1.5 credits); social practice courses include five compulsory items: social investigation activities, labor and public welfare activities, campus cultural activities, social work and skill training. participation in subject competitions, and sports competitions and community activities can replace optional courses
Hebei Institute of Physical Education	Second class (2 credits), internship (10 credits), thesis (6 credits), and public welfare labor (2 credits)

in 1–3 semesters. Third, the characteristic professional curriculum of the four schools is reflected in that the curriculum of Shanghai Institute of Physical Education emphasizes dance foundation and choreography. Cultivating specialized talents in different professional directions is for students to have a deeper understanding of their majors and master professional knowledge; Jilin College of Physical Education focuses on cultivating students’ professional knowledge by making several dance types as compulsory courses and giving more choices. In order to give full play to students’ initiative, major improvement courses and minor improvement courses are offered as elective courses to meet the needs of students in different professional directions when recruiting students for further studies.

From Tables 3 and 6, it can be seen that the credits of practical courses in the four schools are arranged at about 20 points, which mainly include practical activities such as professional practice, graduation thesis, entrance education, and military training. The physical education courses of some colleges and universities do not specify the specific hours of activities. For example, the practical courses of Jilin Institute of physical education are not included in the total hours of the courses. In the curriculum system of Shandong Institute of Physical Education, according to the different elective courses that students take, the credits of practical courses in class, extracurricular, on-campus, and off-campus add up to the total credits of 50.6–65.3%. It is stipulated in the graduation conditions that the credits of the compulsory

TABLE 7: Scores of teachers and students' evaluation of the theoretical content of physical training.

Theoretical content	Teacher score	Sort	Student score	Sort
The origin and development of body training	3.2	20	3.6	21
Classification and characteristics of physical training	3.56	20	3.65	20
Significance and function of body training	3.96	18	3.54	18
Body training terminology	4.37	8	3.83	19
Thoughts, principles, and methods of creating physical training	4.47	6	4.62	2
Contents and methods of physical training	4.48	6	4.62	2
Contents and methods of form training	4.21	12	4.32	6

practice link account for the credits required for graduation of 53.8%.

5.2. Evaluation of the Performance Courses. With the rise of sports and arts performance majors, society has put forward new requirements for the talent training of sports and arts performance programs, and the reform of physical training course content has drawn the attention of experts and scholars in sports and arts performance programs. Curriculum content reform has always been one of the core of teaching reform, which involves what kind of knowledge and ability students can learn in the future [20, 21]. Educational production with quality but not quantity is inefficient educational production, and educational production with quantity but not quality is inferior educational production [22, 23]. Teachers and students, as an integral part of the curriculum, are the creators and subjects of the curriculum, and their needs for the content of physical training courses are an important basis for the content of the curriculum.

It can be seen from Table 7 that although there are considerable differences in the number of teachers and students surveyed, the judgment of the importance of theoretical knowledge content is the same in many places. In addition, the content and methods of temperament training, the structure and implementation of physical fitness training courses, the content and methods of teaching physical fitness training courses, sports injuries and prevention of physical fitness training, and scientific exercise methods of physical fitness training were ranked first. It is evident that teachers and students pay equal attention to the teaching, creation, and fitness instruction of physical training, and theoretical knowledge that is closely integrated with practice.

The content of theoretical knowledge that teachers and students rated as low at the same time are as follows: the origin and development of physical training, classification and characteristics, the meaning and function of physical training, the self-supervision system of physical training, and the formulation and implementation of physical training exercise prescriptions. It can be seen that teachers and students do not pay enough attention to theoretical content that is not clearly integrated with technical content.

This is an indispensable theoretical knowledge for physical training and fitness guidance, organizational teaching, and

scientific research. Students do not rate this kind of knowledge highly. In the future, middle school students should pay attention to improving their theoretical cultivation.

From Table 8, it can be seen that the evaluations of both teachers and students are higher than the average: physical dexterity practice teachers score 4.58, ranking third; students score 4.62, ranking first; ballet body training teachers score 4.46, ranking seventh; students ranked 6th with a score of 4.41, ranked 7th with a score of 4.46 for basic bar training, ranked 2nd with a score of 4.51 for students, ranked 6th with a score of 4.50 for flexibility training, ranked 7th with a score of 4.40 for students, and ranked 7th with a score of physical coordination. The value is 4.38, ranking 9th, and the student score is 4.50, ranking 3rd.

Some technical components were rated significantly higher by students than by teachers. For example, teachers of yoga form training ranked 17th with a score of 4.00 and students ranked 3rd with a score of 4.50; teachers of muscle conditioning exercises using equipment ranked 24th with a score of 3.83 and students ranked 3rd with a score of 4.50. As can be seen, there is a tendency for students to catch up.

Some technical content teachers' evaluation scores were significantly higher than students' evaluation scores. For example, the basic posture teacher's score was 4.54, ranking 4th, the student's score was 4.00, ranking 23rd, the basic posture exercise teacher's score was 4.62, ranking 2nd, and the student's score was 4.12, ranking 19th., and basic posture exercises and other content training repeated a lot and felt relatively boring, so students did not rate these contents highly.

From the evaluation of teachers and students' knowledge of physical training techniques, we can see that both teachers and students pay more attention to physical fitness and some traditional technical contents, teachers pay more attention to basic physical training than students, and students prefer the trendy contents.

In the context of promoting quality education, innovative education, and deepening education reform across the country, the importance of ability has been pushed to a new level. Capability is a multilevel complex, and various measures must be taken to strengthen capability development. Since the formation of ability has two essential characteristics of phase and continuity, this requires that in the whole

TABLE 8: Scores of teachers and students' evaluation of physical training technical content.

Technical content	Teacher score	Sort	Student score	Sort
Basic posture	4.54	4	4	23
Basic position exercise	4.62	2	4.12	19
Smile and eyes	2.33	29	2.55	29
Basic steps	4	17	4.01	22
Swing and winding	4.63	1	4.25	9
Bouncing and moving center of gravity	3.47	27	3.29	28
Torso bending and waves	4.25	12	4.03	21
Basic dance and balance exercises	4.23	13	4.31	11
Swivel exercise	4.54	12	4.03	8
Jumping practice	4	17	3.58	8

learning process, not only should we pay attention to the guiding ideology that runs through the cultivation of students' ability as the core, but also at different teaching stages, according to the actual situation of the students, combined with each other. Some courses focus on the cultivation of students' abilities.

6. Conclusions

In this study, a mathematical model of the teacher was established using graph theory to transform the evaluation process into a bipartite graph model and fully utilize the ant colony algorithm for memory capacity, mastery of prior knowledge, adaptability, and collaboration. Moving back and forth between the two sets of partial graphs completed the evaluation of the teacher teaching process. In addition, the maximal and minimal pheromone strategies were applied in the original ant colony algorithm; the robustness of the algorithm itself was enhanced by making full use of the memory capacity and the necessary prior knowledge mastery in solving the teacher teaching evaluation problem. The investigation and research on the development and cultivation status of art students in physical dance are conducive to the timely identification of problems and deficiencies in the cultivation of physical dance majors, the promotion of healthy and benign development of physical dance, and the perfect integration of physical education and art education in schools.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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