

Research Article

Application of Artificial Intelligence Technology in Martial Arts Education Governance

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Received 21 May 2022; Revised 26 June 2022; Accepted 15 July 2022; Published 29 August 2022

Academic Editor: Lele Qin

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Martial arts education has a relatively comprehensive educational function. Compared with other educational methods, it has some unique features. When martial arts education carries out moral education, it not only attaches importance to the teaching of moral norms but also requires martial arts practitioners to practice moral norms, so martial arts education is more practical in improving moral literacy. In fact, the role of martial arts education is far from just playing its role in strengthening the body. This kind of prejudice of mindset conceals the diversity characteristics of martial arts education. This paper proposes to apply artificial intelligence technology in martial arts education governance, which uses the target tracking algorithm based on deep learning to track and analyze the movement of martial arts practitioners. At the same time, this paper uses the pose estimation algorithm of coordinate regression to predict the key points of the human body from the global perspective of the human body and then locates the key points of the human body from the features. It greatly simplifies the prediction of key points and solves the problem of nonstandard movements of students in martial arts education. The experimental analysis part includes the results and analysis of the impact of AI-based flipped classroom teaching on students' martial arts learning and the comparison and analysis of students' martial arts learning in the two classes after the experiment. The analysis results show that the P values of the four aspects of learning interest, active participation attitude, independent exploration ability, and analysis and problem-solving ability of the two classes are all less than 0.01, indicating that there is a significant difference.

1. Introduction

Many studies have shown that there are still many problems in martial arts education in various aspects. For example, martial arts education is not valued in modern society, facing the useless place of mass martial arts education, and the educational value of martial arts has not been fully explored in today's society. Many previous studies have paid attention to the realization of the value of martial arts education, and many great ideas and methods have been put forward. However, there is no effective solution to the governance of martial arts education. According to the development law of martial arts, the martial arts project should be transformed in a centralized manner to reflect the characteristics of its own projects, so that martial arts can better reflect the national characteristics. It combines tradition and fashion

better. The charm of martial arts is that it not only has a smooth body but also has more handsome movements than aerobics, which people from other countries cannot resist. It is necessary to understand how to realize the educational value of martial arts. As an educational program, martial arts have similarities and differences with other educational programs. The application of artificial intelligence technology in martial arts education governance makes modern people like martial arts and to readily accept martial arts education. It needs the majority of martial arts educators to learn from the development law of other projects and to explore the law of martial arts education implementation.

Martial arts education is becoming more and more important all over the world. Sangjin aimed to develop a preschool exercise program utilizing basic mixed martial arts (MMA) techniques to improve the athletic ability of

preschool children. He also validated the effect of the program on their athletic ability, development, and body composition by applying the program to the preschool curriculum [1]. In order to study the importance of physical activity to physical health, Wolfgang research shows that martial arts shed light on the benefits of sports to the public. He also explored the huge but untapped potential of physical activity tailored for public health [2]. To evaluate the use of martial arts (MA) programs in secondary physical education (PE) settings, Rotunda found that MA teaching has the potential to produce physical and psychosocial benefits for both adult and adolescent participants. He seldom implemented systematic programs in schools [3]. Ujuagu et al. aimed to evaluate the pedagogy of junior high school martial arts physical education curriculum and effective self-defense programs and techniques. Using a survey research design, the researchers found that the techniques used in practical teaching are difficult for teachers to implement, and practical ones are usually not taught [4]. At present, martial arts education is involved in the physical education courses of universities, but there are not many courses in primary and secondary schools and high schools, so it still needs greater efforts to incorporate martial arts into education. Akehurst's qualitative case explored part of the extracurricular sports program of taekwondo, measuring the benefits of student learning, health, and well-being. Studies have shown that traditional taekwondo can promote self-regulation in education [5]. In the process of martial arts teaching, the education and inheritance of culture in martial arts teaching is the insufficiency. Wang analyzed and learned the content of martial arts teaching in primary and secondary schools. Through a comprehensive understanding of the role of martial arts in the teaching process of primary and secondary schools, he reintegrated content and culture [6]. However, none of the above studies have highlighted the importance and feasible solutions of martial arts education governance.

It is highly important to formulate a scientific martial arts system teaching and training method. Han considered the above problems and the current popular artificial intelligence technology and built a neural network algorithm to solve [7]. He used a computer to test a study of functional asymmetry in students and schoolchildren practicing martial arts. Bobrova involved students and schoolchildren practicing martial arts (taekwondo, karate) due to software determining functional asymmetry. He used two visual tests [8]. The role of visual learning is critical for a new generation of learners. John and Martin used topic modeling and sentiment analysis to examine a YouTube text feedback data set containing keywords related to martial arts learning. Topic modeling shows that many discussion topics in martial arts are closely related to learning, arts, and humanities [9]. Martial arts are considered a cultural heritage in China, and exploring special learning systems has become a hot research topic. Shibiao discussed the design and implementation of a martial arts learning system based on Silverlight and took Taijiquan as the research object. The conclusion shows that the proposed system is easy to use; therefore, users can better master Tai Chi [10]. However, none of the above studies have

closely integrated artificial intelligence and martial arts education governance.

The novelty of this paper is that the governance of martial arts education will be from the perspective of structural functionalism. It analyzes the decisive role of the structural attributes of martial arts on its educational function and then analyzes the formation process of each individual education in martial arts education and the degree of recognition of these educational functions by experts. The article made a profound summary of the problems of Wushu education, not only made suggestions on the shortcomings of current Wushu education but also made a certain analysis of the development of Wushu education in the future.

2. Problems and Solutions in Governance of Martial Arts Education with Artificial Intelligence Technology

2.1. Structural Attributes of Martial Arts and Influence on Educational Function. According to the theory of structural functionalism, it can be known that the thing or system that has a specific function also has a specific structure. In a sense, the structure of a thing or system determines the function of the thing, and the change of the structure will also lead to the corresponding change of the function [11]. The reason for the change of the structure may be that one or some of the factors that constitute the structure have changed, and it may also be that the mode of action or connection between the factors that constitute the structure has changed. In the practice of martial arts, the structure is a crucial part, and the structure includes the body structure, the movement structure, and the structure that connects the whole. The connection between the structures is very close, and they cooperate with each other to achieve the effect of martial arts. Martial arts education has its own specific functions, that is, some functions that are different from other education methods. It is caused by the three basic factors that constitute martial arts education and their interaction and mutual connection. The greatest impact on their respective educational functions should be the educational content in their intermediary systems. Chinese classic traditional martial arts are shown in Figure 1.

As shown in Figure 1, Chinese martial arts include Shaolin, Taiji, Bagua, Wing Chun, Baji, and so on. The specific complex structure of martial arts determines its diverse properties. When martial arts exist in martial arts education as the main content of education, these attributes further determine that martial arts education has various educational functions. It can be said that the multifunctional characteristics of martial arts education are determined by the complex structure and diverse attributes of martial arts [12].

2.1.1. Influence of Martial Arts Attributes on Its Educational Function. The attribute of martial arts refers to martial arts as a social and cultural form, which is a martial art with national cultural characteristics [13]. This is the most fundamental attribute of martial arts, that is, the essential attribute of martial arts, and it has the greatest impact on the

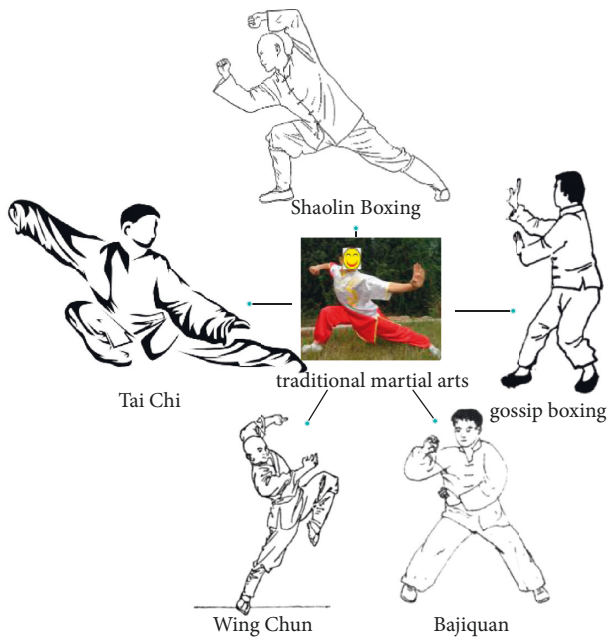


FIGURE 1: Chinese classic traditional martial arts.

educational function of martial arts. First, martial arts attributes require martial arts education to attach importance to moral etiquette education. Due to the violent characteristics of martial arts, martial arts education must pay attention to the promotion of benevolence, integrity, justice, responsibility, and other external morals, so as to regulate the use of violence by these violent holders. Due to the strong confrontational characteristics of martial arts combat, martial arts education must cultivate morality such as bravery and self-confidence because in order to defeat the opponent in actual combat, one must maintain arrogant fighting spirit. It overwhelms opponents in momentum. This requires cultivating students' bravery, self-confidence, and other qualities in the usual martial arts education. Especially for people who are beginners in martial arts, if they want to absorb the spirit and culture of martial arts, they must cultivate excellent qualities such as bravery in practice. Due to the difficult characteristics of martial arts techniques, martial arts education must improve morals such as perseverance, tenacity, and patience. Because it is difficult to achieve success in martial arts without these qualities of will, these qualities are strictly cultivated in students in martial arts education. In the study of martial arts, willpower is one of the most basic requirements. Only after hard training can you achieve better results in martial arts. Second, the martial arts attributes require that martial arts education must develop intelligence. The winning factors of martial arts combat confrontation have various characteristics. To defeat an opponent not only requires superb skills and ingenious tactics but also requires superb wisdom. Martial arts confrontation has always been an activity of fighting wits and courage, so in the usual martial arts education, we must pay attention to developing the intelligence of martial arts practitioners [14].

2.1.2. The Influence of Martial Arts Cultural Attributes on Its Educational Function. The cultural attribute of martial arts refers to the rich cultural connotation of the Chinese nation in martial arts, which is also an important attribute of martial arts. Some scholars even regard the cultural attributes of martial arts as the essential attributes of martial arts. On the one hand, martial arts itself are a kind of culture, and learning martial arts is to learn a distinctive national body culture. On the other hand, martial arts carry rich national cultural connotations, and receiving martial arts education helps to enrich one's own traditional national knowledge.

2.1.3. Influence of Martial Arts Sports Attributes on Its Educational Function. The sports attribute of martial arts means that martial arts have a better function of keeping fit and strengthening the body, which determines that martial arts education has a better function of strengthening the body [15]. On the one hand, many technical movements of martial arts meet the requirements of medical science, and learning these technical movements through martial arts education can play a better role in fitness. On the other hand, the process of martial arts education is also a process of improving physical function, developing physical strength, and enhancing physical fitness. Regular practice is also conducive to the formation of sports habits.

2.2. Basic Structure and Relationship of Martial Arts Teaching Mode. The teaching mode of martial arts is identical with the teaching mode of physical education. They all exist in a certain space and time. The space shows the established teaching theories and goals, the position of teachers and students in teaching and their relationship, and the time shows how to arrange the teachers' "teaching" and the students' "learning" [16]. Therefore, we can think that the basic structure of martial arts teaching is the established teaching theory, teaching objectives, and teacher-student arrangement that appear in time and space. The basic structure of the martial arts teaching mode and its relationship are shown in Figure 2.

As shown in Figure 2, the teaching guiding ideology of artificial intelligence-assisted martial arts elective courses should be the guiding ideology of physical education established on the basis of the national education policy, basic teaching theories, and teaching ideas. It is mainly reflected in the humanized teaching of "student's development as the center," "learning to teach," and "problem-oriented." It can also elevate students' knowledge of martial arts to a higher level, which means that students' knowledge of martial arts does not just stay on the surface of martial arts movements. Through the combination of practical experience, the comprehensive ability of students is improved, and the teaching is "student-centered" throughout. It is also connected with the learning of knowledge before class, the internalization of knowledge in class and after class, and students' autonomous learning and daily life style. It finally achieves the purpose of promoting the all-round development of students' morality, intelligence, physique and

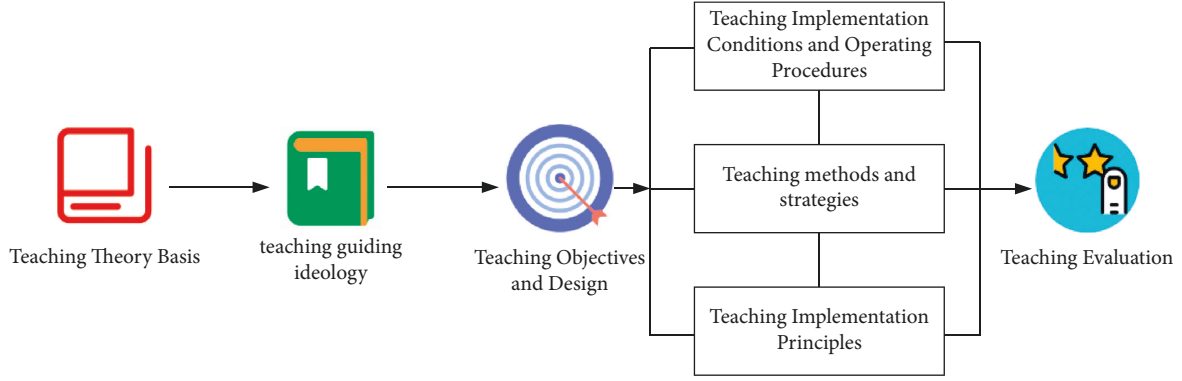


FIGURE 2: Basic structure and relationship of martial arts teaching mode.

beauty. The classic martial arts movements are shown in Figure 3.

As shown in Figure 3, artificial intelligence is a product born under the highly informatized society, which is different from traditional martial arts classroom teaching. Traditional martial arts teaching is mainly “teacher-centered,” occupying the entire classroom with knowledge and skills, explanations, and demonstrations. In addition, the teaching form of large-class elective courses (more than 40 people or more) cannot well cultivate students’ interest in martial arts and develop students’ personality and comprehensive practical ability [17]. On the contrary, the teaching of artificial intelligence-assisted martial arts electives builds a good online learning environment for students with the new media (artificial intelligence) teaching platform. It realizes equal opportunities for teachers and students to communicate before, during, and after class. Its training of students has changed from “indoctrination” to “targeted” guidance, allowing students to explore the mysteries of martial arts independently. Students are participants and masters of learning. Finally, they can share their research results, exchange topics, experience fun, and learning experiences with the whole class, so as to realize the deep internalization of knowledge and skills. By cultivating students’ interest in martial arts learning, it improves students’ comprehensive practice ability and develops students’ learning personality. This makes the teaching and learning process more fun, and the teacher-student relationship is more harmonious [18].

2.3. Target Tracking Algorithm Based on Deep Learning.

In this paper, combined with the background of actual camera shooting and the dynamic model of martial arts movement, we establish a new martial arts tracking system to achieve high-precision tracking. At the same time, once the tracking fails, the target recognition calculation is used to recalculate the position of the martial arts in the screen and continue to execute the target tracking algorithm. For the other part, the algorithms for estimating rotational speed and rotational direction require the use of martial arts spatial structures and camera models. It estimates three-dimensional spatial structure information on a two-dimensional image. Such an information structure can enable better data

transmission, higher efficiency in the system, and accurate positioning of human joints when modeling martial arts postures. In the case of obtaining enough data, a visualization system for martial arts data analysis is built to facilitate martial arts students and martial arts coaches to obtain the required information [19]. This paper proposes an end-to-end approach that combines human pose prediction and human action recognition, as shown in Figure 4.

As shown in Figure 4, by combining the reflected spatial 3D information with the skeleton data, richer behavioral features can be obtained, and the final recognition rate can be improved [20]. Therefore, this paper proposes a two-stream fusion method to fuse video data and skeletal joint data, as shown in Figure 5.

As shown in Figure 5, after introducing the attention mechanism, each frame of the video image is first generated by the convolutional network with the attention mechanism. It then feeds the data into a convolutional long short-term memory network in time series and extracts the results.

2.3.1. Constructing Spatiotemporal Graph Convolution.

The convolution of the graph needs to deal with discrete feature points in space, and its definition is different from the two-dimensional convolution. The traditional two-dimensional convolution algorithm is image-based, and the convolution operation can be achieved by using a filter and an image pixel matrix to perform a dot product operation [21]. We can think of the input image and output feature map as a two-dimensional matrix grid, and the two-dimensional convolution operation can be understood as a nonlinear mapping of input features to output features. The output of a 2D convolution operation at m positions can be defined:

$$f_{\text{out}}(m) = \sum_i^H \sum_j^H f_{\text{in}}(K(m, i, j)) * \omega(i, j). \quad (1)$$

Then, by redefining the sampling function K and the weighting function ω , the above convolution formula can be extended to a graph convolution formula. It completes the extraction of local features of key points in the space through the graph convolution operation in the spatial domain. It connects the temporal convolution network (TCN) after the spatial domain graph convolution to extract the local



FIGURE 3: Classic martial arts moves.

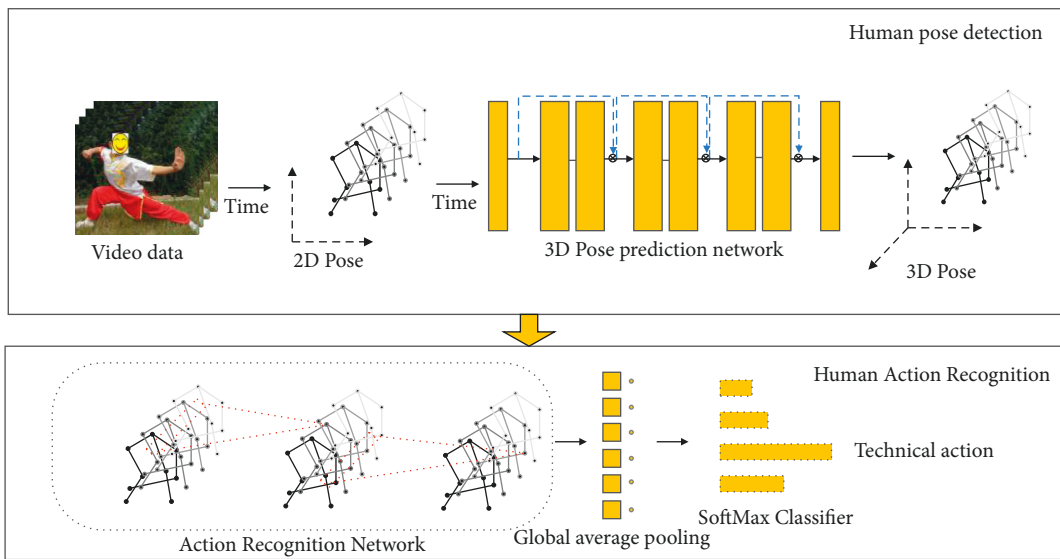


FIGURE 4: Martial arts action recognition method based on local node information.

features of key points between adjacent frames, as shown in Figure 6.

As shown in Figure 6, in the time-domain graph convolution, each convolution operation is equivalent to completing the convolution operation on t frame nodes. It then moves to the next frame according to the step size, completes the convolution of all frames of this node, and then performs the convolution of the next node [22].

2.3.2. Sampling Function and Weight Function. For a two-dimensional convolution operation, the sampling function is defined on a pixel matrix centered at position x and with filters as regions. Therefore, the sampling function can be defined as follows:

$$K(p_{bm}, p_{bn}) = p_{bn}. \tag{2}$$

On the graph, the weight function w defines a filter similar to a 2D convolution. Each position in the two-dimensional convolution operation provides a weight value, so the weight function of graph convolution can be constructed in this way, the weight function $\omega(p_{bm}, p_{bn})$.

$$\omega(p_{bm}, p_{bn}) = \omega'(w_{bm}(p_{bn})). \tag{3}$$

2.3.3. Constructing Spatial Graph Convolution. By using the sampling and weighting functions defined in formulas (2) and (3), formula (1) can be reconstructed to obtain the convolution expression for the spatial graph:

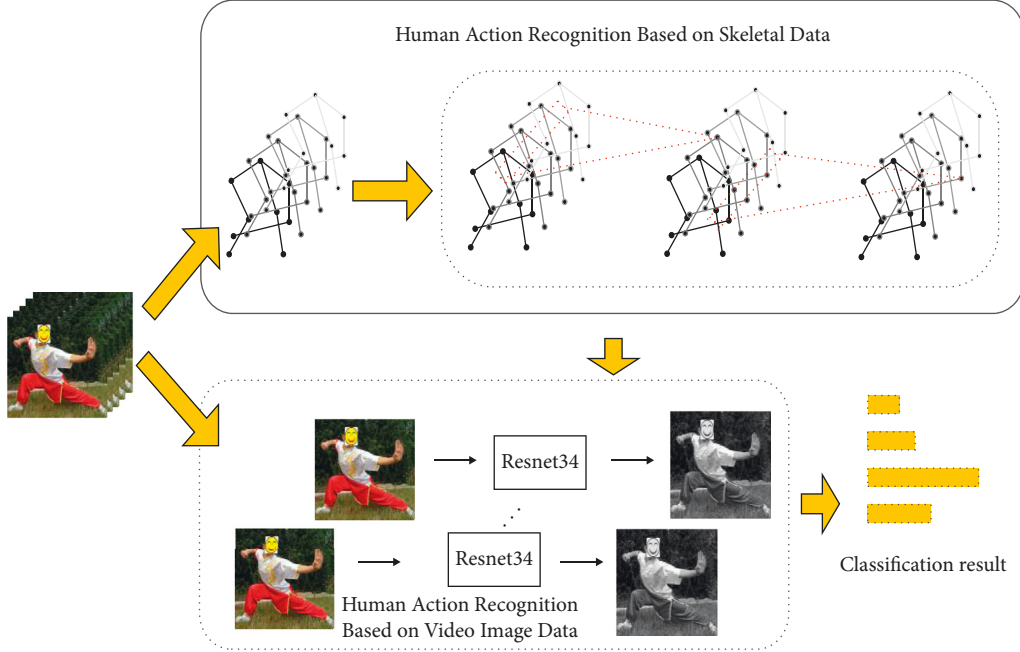


FIGURE 5: Two-stream fusion method combining video image data and skeletal joint point data.

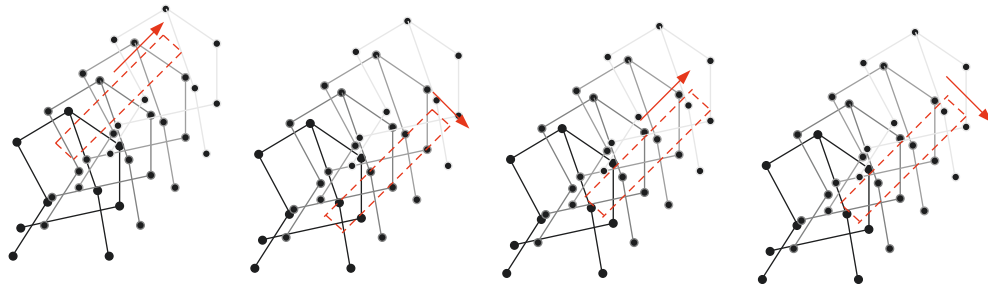


FIGURE 6: Time domain graph convolution process.

$$f_{\text{out}}(p_{bm}) = \sum_{p_{bn} \in T_{p_{bm}}} \frac{1}{\phi_{bm}(p_{bn})} f_{\text{in}}(p_{bn}) * \omega(p_{bm}, p_{bn}). \quad (4)$$

After substituting formulas (2) and (3) into formula (4), the final graph convolution formula in space is obtained as shown in

$$f_{\text{out}}(p_{bm}) = \sum_{p_{bn} \in T_{p_{bm}}} \frac{1}{\phi_{bm}(p_{bn})} f_{\text{in}}(p_{bn}) * \omega'(w_{bm}(p_{bn})). \quad (5)$$

However, the skeleton diagram sequence can only represent the node information of each frame in the video, which represents a kind of information in the spatial dimension. But it cannot represent the coherence between video frames [23]. In this way, the human body posture in martial arts learning is modeled, and the simulation of joint points is deep into the space, so that the simulation of human body posture can achieve high accuracy. The spatiotemporal modeling of the video frame sequence is shown in Figure 7.

As shown in Figure 7, the spatiotemporal modeling in this paper is to obtain the spatiotemporal model by

connecting the same nodes between two adjacent skeleton graphs, which is a data model starting from the spatio-temporal structure. The significance of this model is to explore the movement trajectories of the same joint points in the process of time change, so as to judge the behavior of the characters [24, 25]. There are two kinds of edges in the constructed spatiotemporal model. One is the spatial edge formed by natural connectivity between nodes in the space, and the other is the connected edge between the same nodes in the time dimension.

2.4. Attitude Estimation Algorithm Based on Coordinate Regression.

Deep pose is one of the first methods to use coordinate regression in deep neural networks. It uses an end-to-end approach to predict the human body key points from the global perspective of the human body and then locates the human body key points from the features. It greatly simplifies the prediction of key points. The pose estimation algorithm based on coordinate regression takes a whole image as the input of the model and uses a simple 7-layer convolutional neural network as the characteristic

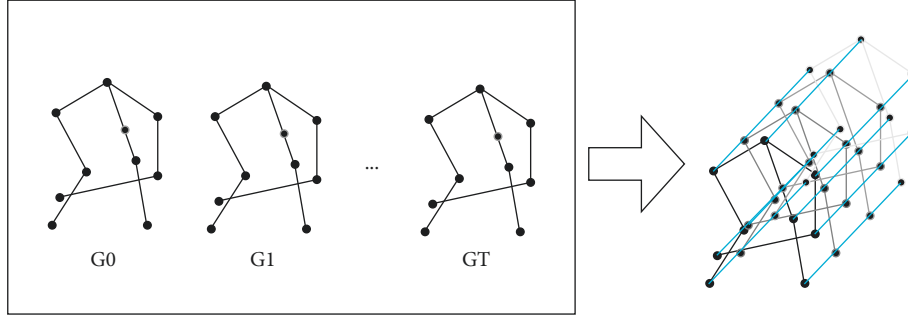


FIGURE 7: Sequence spatiotemporal modeling.

special zone network. Finally, it is fully connected into a multidimensional vector of corresponding coordinates, such as (x, y) representing the coordinates of a key point. It needs to return to five key points in total, then the vector and supervision information output by the network are both a vector of length 10.

For the posture of the human body, the joint points are the best way to measure the action, and the overall movement of the human body can be simulated through the movement of the joint points. Suppose the human body has k joint points, represented by a vector:

$$z = (\dots, z_i^T, \dots)^T, \quad (6)$$

$$i = \{1, \dots, k\}.$$

Representing the absolute coordinates of the predicted pose vector as in

$$z^* = \psi(x; \theta). \quad (7)$$

The loss function used is L2 loss, and then the model can be written as follows:

$$\arg \min_{\theta} \sum_{(x,z) \in D_N} \sum_{i=1}^k \|z_i - \phi(x; \theta)\|_2^2. \quad (8)$$

In essence, the convolutional neural network based on coordinate regression is to regress the size offset of each key point from the image boundary. However, the information provided by this supervision method is relatively small, the convergence speed of the entire network is slowed down, and the error in the actual model training is large.

For convolutional neural networks, the calculation formula of a single convolutional layer is as follows:

$$\begin{aligned} \text{params}_l &= \text{weights} + \text{bias}, \\ \text{params}_l &= c_{\text{out}}^l \times (k_{\text{width}}^l \times k_{\text{height}}^l \times c_{\text{in}}^l) + c_{\text{out}}^l. \end{aligned} \quad (9)$$

In particular, in depthwise separable convolutional layers

$$\text{params}_l = c_{\text{in}}^l \times (k_{\text{width}}^l \times k_{\text{height}}^l) + c_{\text{in}}^l. \quad (10)$$

At this time, $c_{\text{in}}^l = c_{\text{out}}^l$ and $(k_{\text{width}}^l \times k_{\text{height}}^l)$ in parentheses represent the number of weights of a convolution kernel. Then, the total parameters of the model are

$$\text{Params} = \sum_{l=1}^L \text{params}_L. \quad (11)$$

Each motion detection algorithm has its own characteristics. If it uses background subtraction, it must build the same background model as the actual background. The difference operation can only be performed if a valid background model has been established. In order to find the area of interest, it is necessary to build a background model, and the method of building a solid background model is the most important step of background subtraction.

Assuming that the background image model is $f_d(t)$ and the current frame image is $f_c(t)$, the image after the difference algorithm is shown in

$$f_d(a, b, t) = |f_b(a, b, t) - f_c(a, b, t)|. \quad (12)$$

On the premise that the scene environment is not so complicated, statistical filtering can be used to infer the background image. Adaptive background correction can be achieved by performing multiple averaging operations on the background image, as shown in

$$B_k = \frac{1}{N} (f_k + f_{k-1} + \dots + f_{k-N+1}). \quad (13)$$

The parameters are important parameters for correcting background images using statistical averaging. If the object to be moved is not always displayed in the background image, better results can be obtained by properly selecting the parameters, and a more accurate background model can be obtained.

The mean filter method is most often used to construct the background model, as shown in

$$B_t(a, b) = \frac{1}{L} \sum_{i=0}^{L-1} A_{t-1}(a, b). \quad (14)$$

The premise of this algorithm is to have a memory space that can store frame video images. The background calculation formula is shown in

$$B_t(a, b) = \lambda A_t(a, b) + (1 - \lambda) B_{t-1}(a, b). \quad (15)$$

In the moving target detection algorithm, the biggest advantage of background subtraction is that the operation is simple, the implementation is simple, and the calculation amount is small. Therefore, the purpose of real-time detection can be basically achieved, and detection of the target to be moved can also be performed correctly.

After minimizing the above formula, we get:

$$H_t = \frac{\sum_{j=1}^t \overline{G}_j F_j}{\sum_{j=1}^t \overline{F}_j F_j}. \quad (16)$$

During the training process, the numerator and denominator of the above formula are regarded as a whole for iterative optimization. After the training is completed, if there is a new image area z , first calculate the value Z after its discrete Fourier transformation, and then obtain the response score of this area by the following formula:

$$y = \alpha^{-1} \{ \overline{H}_t Z \}. \quad (17)$$

α^{-1} stands for inverse Fourier variation, and finding the largest y finds the location of the tracked martial arts performer.

When estimating the scale of martial arts performers, it is similar to the above calculation, except that the position and scale dimensions are considered at the same time, and f is the characteristic area. There are a total of d scale dimensions; h and g are also similar to the above, but only have more scale dimensions. The loss function to be optimized is calculated as follows:

$$\xi = \sum_{l=1}^d \|h^l * f^l\|^2 = \lambda \sum_{l=1}^d \|h^l\|^2. \quad (18)$$

Among them, λ represents the regular term, and the H of the Fourier space is obtained after solving:

$$H^l = \frac{\overline{G} F^l}{\sum_{k=1}^d F^k F^k + \lambda}. \quad (19)$$

3. Experiment of Artificial Intelligence Technology in Martial Arts Education Governance

3.1. Importance of Martial Arts Education in Various Aspects

3.1.1. Martial Arts Education Enriches Physical Knowledge and Increases Physical Skills. In the process of development, martial arts have been influenced and nurtured by traditional Chinese medicine and health preservation. Many scientific knowledge and theories of traditional Chinese medicine and health preservation have become the guiding ideology of martial arts practice, and martial arts technical movements are also formed under the guidance of traditional Chinese medicine theory. These technological movements also correspond to modern scientific knowledge and theories. Martial arts education has always been a traditional fitness program and has an important position in the elderly group. With the development of martial arts

culture, more and more young groups love fitness sports and combine them with modern fitness theory. The effect of martial arts education on enriching physical knowledge and increasing physical skills is shown in Figure 8.

As shown in Figure 8, the proportion of experts who believe that martial arts training is very useful for enriching sports knowledge is 70.2%, indicating that most experts recognize the role of martial arts training in enriching sports knowledge. In terms of increasing physical skills, the percentage of experts who thought martial arts training is very useful in increasing physical skills was 83%, indicating that most experts recognized the role of martial arts training in increasing physical skills.

3.1.2. Martial Arts Education Develops Practitioners' Physical Strength and Develops Sports Habits. Physical fitness refers to the physical ability to perform a sport or activity. It includes the ability to perform sports, occupations, and a range of other physical movements. It is not identical to the concept of physical fitness but focuses on the expression of the functional level of physical movement. In China, it includes physical qualities such as strength, speed, and coordination, as well as protective qualities such as adaptability, endurance, and immunity. Physical fitness is a reflection of individual physical fitness. In China, the measurement of physical fitness is also a test that every college student needs to pass. Physical fitness is also an important indicator to measure a person's potential and ability. Through martial arts education, the functions of body organs and tissues can be trained. This helps develop physical qualities such as strength, speed, stamina, and flexibility and improves the body's defenses such as fitness and stamina. The role of martial arts training in developing physical habits and fitness is shown in Figure 9.

As shown in Figure 9, the proportion of experts who think that martial arts education is very or relatively large in developing sports habits is 83.0%, which indicates that most experts agree that martial arts education plays a role in developing sports habits. The proportion of experts who think that martial arts education plays a very large or relatively large role in developing physical strength is 78.7%, which shows that most experts approve of the role of martial arts education in developing physical strength.

3.1.3. Martial Arts Education Cultivates Self-Awareness and Cultivates Independence. In terms of student self-control, martial arts education will cultivate students' effective self-regulation. Martial arts education attaches great importance to the education of students' independence, autonomy, and self-discipline. It requires students to learn to think independently, learn to rely on themselves, learn to control themselves, learn to persist, and learn to motivate themselves. Because only with these abilities and these qualities can he achieve his dream of becoming a martial arts master. This long-term education and edification process is conducive to students' effective self-regulation. The effect of martial arts education on developing self-awareness and fostering independence is shown in Figure 10.

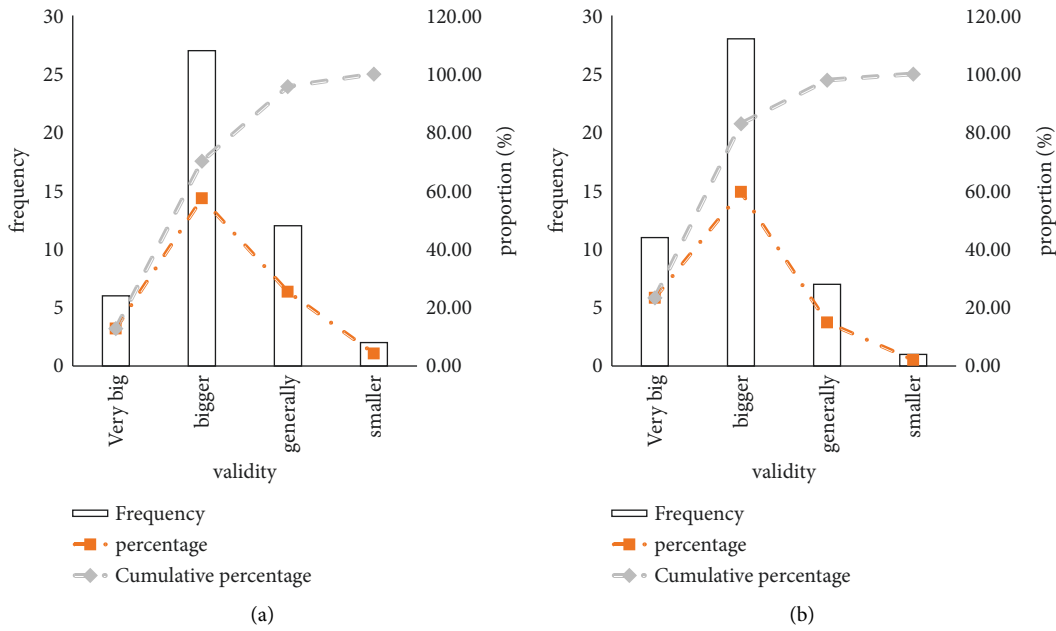


FIGURE 8: The effect of martial arts education on enriching physical knowledge and increasing physical skills: (a) effects on enriching physical knowledge and (b) effects on increasing physical skills.

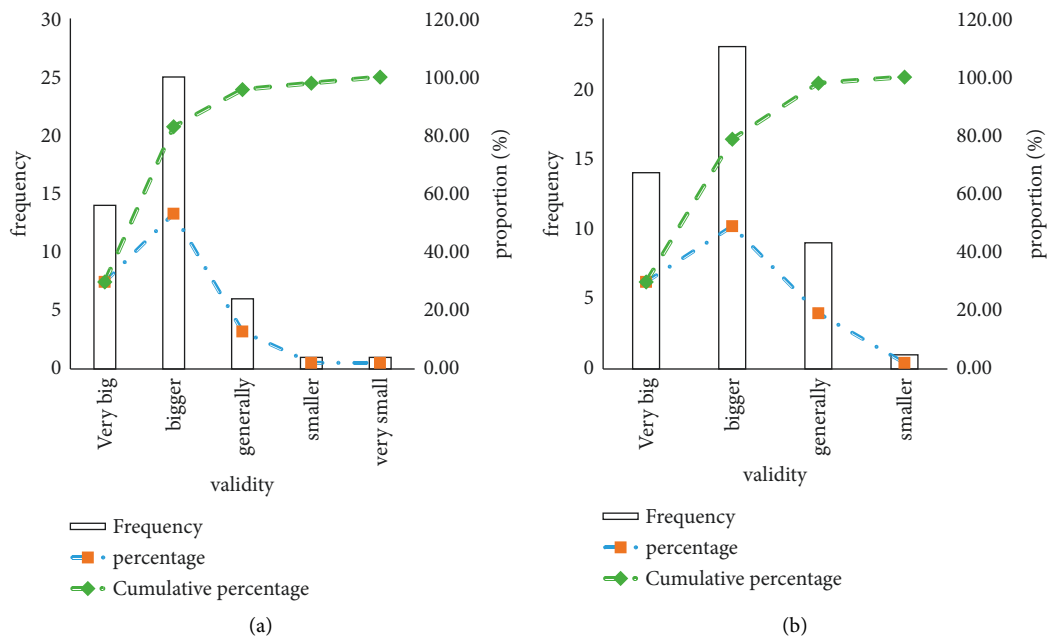


FIGURE 9: The effect of martial arts education on developing sports habits and developing physical strength: (a) the effect of martial arts on the formation of sports habits and (b) the effect of martial arts on the development of physical strength.

As shown in Figure 10, 70.2% of experts believe that martial arts education has a very large or relatively large role in developing self-awareness and independence. This shows that most experts agree on the role of martial arts education in developing self-awareness and independence.

3.2. Results of the Impact of AI-Based Flipped Classroom Teaching on Students' Martial Arts Learning. The students were divided into experimental group and control group to conduct martial arts teaching experiments. After the

teaching experiment, the martial arts skills, theory, active participation attitude, learning attitude, self-inquiry ability, analysis, and problem-solving ability of the students in the two classes were tested and analyzed. In this paper, the independent sample *T* test was carried out on the obtained data, and the paired *T* test was carried out on the data of the students in the two groups before and after the experiment. Table 1 shows the comparative analysis of students' martial arts learning in the first two classes of the experiment.

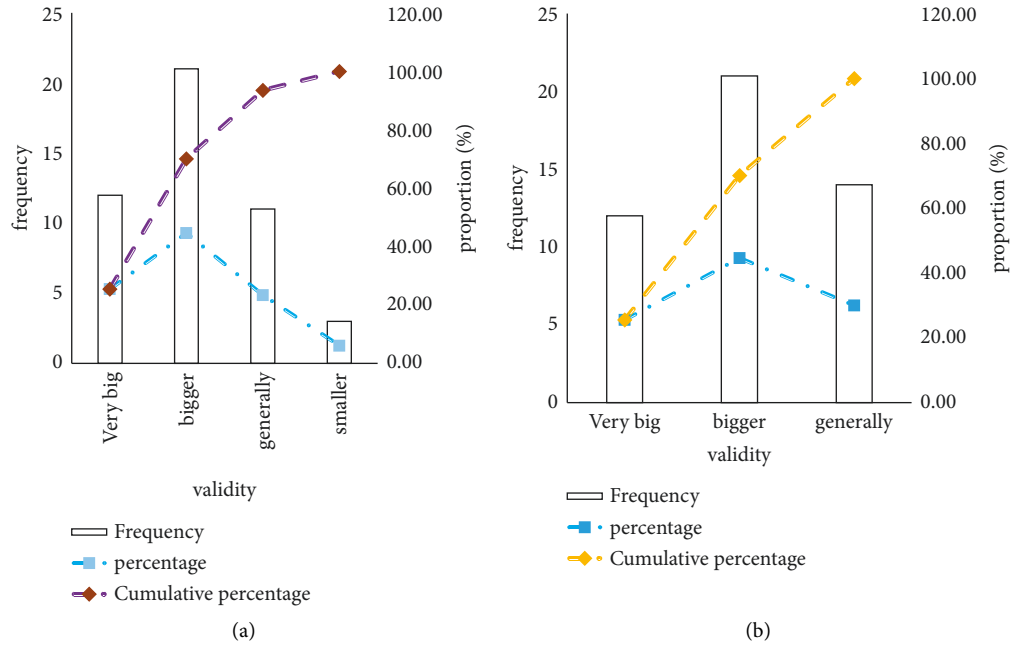


FIGURE 10: The effect of martial arts education on developing self-awareness and developing independence: (a) effect on developing self-awareness and (b) effect on developing independence.

TABLE 1: Analysis of martial arts learning situation of students in the first two classes of the experiment.

Survey dimensions	Experimental class	Control class	<i>T</i> value	<i>P</i> value
Learning interest	14.00 ± 2.28	13.57 ± 2.39	0.529	0.648
Independent research ability	14.30 ± 2.14	13.87 ± 2.17	0.453	0.945
Active participation attitude	12.87 ± 2.77	13.90 ± 1.93	0.099	0.077
Analytical problem-solving skills	12.97 ± 2.24	12.87 ± 1.53	0.824	0.062

As shown in Table 1, students in the first two classes of the experiment conducted a questionnaire on their learning situation. The learning situation is mainly analyzed from the four dimensions: students' learning interest, active participation attitude, self-inquiry ability, and problem-solving ability. This paper analyzes the data obtained from the questionnaire. The analysis results show that the *P* value of students' interest in learning in the two classes is 0.648, the *P* value of independent inquiry ability is 0.945, the *P* value of active participation attitude is 0.077, and the ability to analyze and solve problems is 0.062. The *P* values of the four dimensions are all greater than 0.05, and the data show that the learning situation of the students in the two classes is basically the same, and there is no significant difference. Table 2 shows the comparative analysis of students' martial arts learning situation in the two classes before and after the experiment.

As shown in Table 2, the analysis results show that there are some changes in the values of students' interest in learning, active participation attitude, self-exploration ability, and analysis and problem-solving ability of the students in the control class, but the changes are not large. The *P* value of learning interest is 0.725, the *P* value of independent inquiry ability is 0.078, the *P* value of active participation attitude is 0.835, and the *P* value of analytical problem-solving ability is 0.000. Except for analyzing the

problem-solving ability, the *P* values for the remaining three were all greater than 0.05. It indicated that there was no significant difference in the students' active participation attitude, learning interest, and self-inquiry ability before and after the experiment. The *P* value for analyzing problem-solving ability was 0.001. If the *P* value is less than 0.01, it means that there is a very significant difference in the problem-solving ability of the students in the control class.

It can be seen from the above results that the students in the control class have improved their ability to analyze and solve problems under the traditional classroom learning. Learning interest, active participation attitude, and self-inquiry ability did not improve. The reason for this result may be the traditional classroom teaching method is relatively boring and single. The way of class has not changed for so many years. During the class, the teacher will explain, demonstrate, and correct errors. Most of the time in the class is the teacher's demonstration and the students imitate the movements. The whole practice process loses interest. It cannot fully mobilize students' enthusiasm and interest in learning and cannot make students fall in love with martial arts. In traditional classrooms, teachers will organize students to practice in groups throughout the teaching process, and students will discuss and analyze in groups. For the movements that do not know, we collectively discuss and practice. Therefore, this is what makes the students'

TABLE 2: Comparative analysis of students' martial arts learning situation in the two classes before and after the experiment.

Survey dimensions	Experimental class	Control class	<i>T</i> value	<i>P</i> value
Learning interest	13.57 ± 2.59	13.77 ± 1.68	-0.352	0.725
Independent research ability	13.87 ± 2.17	14.70 ± 1.57	-1.757	0.078
Active participation attitude	13.90 ± 1.93	13.77 ± 2.24	0.145	0.835
Analytical problem-solving skills	12.87 ± 1.53	14.73 ± 2.25	-4.24	≤0.001

TABLE 3: Test of martial arts learning situation of students in experimental class before and after the experiment.

Survey dimensions	Experimental class	Control class	<i>T</i> value	<i>P</i> value
Learning interest	14.00 ± 2.52	16.80 ± 1.78	-5.457	≤0.001
Independent research ability	14.30 ± 2.57	16.87 ± 1.27	-5.147	≤0.001
Active participation attitude	12.87 ± 2.87	16.70 ± 1.76	-6.167	≤0.001
Analytical problem-solving skills	12.97 ± 2.27	15.87 ± 1.57	-6.13	≤0.001

TABLE 4: Test of students' martial arts learning situation in the two classes after the experiment.

Survey dimensions	Experimental class	Control class	<i>T</i> value	<i>P</i> value
Learning interest	16.80 ± 1.42	13.77 ± 1.72	7.683	≤0.001
Independent research ability	16.87 ± 1.52	14.70 ± 1.27	5.673	≤0.001
Active participation attitude	16.70 ± 1.75	13.77 ± 2.27	6.125	≤0.001
Analytical problem-solving skills	15.87 ± 1.25	14.73 ± 2.12	2.525	0.014

analytical and problem-solving abilities improve. Table 3 shows the test of martial arts learning of students in the experimental class before and after the experiment.

As shown in Table 3, the analysis results show that the values of students' interest in learning, active participation attitude, self-exploration ability, and analytical problem-solving ability have changed, and the changes have been large. The *P* value of the students' learning interest before and after the experiment was 0.001, the *P* value of active participation attitude was 0.001, the *P* value of active inquiry ability was 0.001, and the *P* value of analysis and problem-solving ability was 0.001. The *P* values of the four are less than 0.01, which means that the students in the experimental class have very significant differences in their active participation attitude, learning interest, self-inquiry ability, and analysis and problem-solving ability. After 4 weeks of experiments, it is shown that AI flipped classroom teaching can improve students' interest in learning martial arts, drive students' enthusiasm for learning, and cultivate students' ability to actively explore and solve problems. The reason for this result may be students preview the Taijiquan video uploaded by the teacher before class and learn about the history and culture of Taijiquan through online Taijiquan materials and links. Before class, they restrained themselves according to the teacher's requirements, conducted online classroom learning, discussed with their classmates and teachers about the problems they did not understand, and completed the homework. During class, students learn with their own preclass questions, and the teacher will focus on teaching the students' feedback. The difficult points before the class are solved by the teacher's explanation in the class, and their own practice is solved. After class, they review carefully. Students review the content of the previous class online and preview the new content of the next class. Before class, during class, and after

class, students will be organized to discuss difficult points to improve students' ability to explore and solve problems by themselves. Table 4 shows the test table of students' martial arts learning situation in the two classes after the experiment.

As shown in Table 4, the analysis results show that the *P* value of students' interest in learning in the two classes is 0.001, the *P* value of active participation attitude is 0.001, and the *P* value of independent inquiry ability is 0.001. The three *P* values are all less than 0.01, which means there is a very significant difference. The *P* value of analytical problem-solving ability is 0.014, which is less than 0.05, indicating a significant difference. From the above results, we know that the overall effect of AI flipped classroom is better than that of traditional classroom, and AI flipped classroom can not only mobilize students' interest in learning but also improve students' active participation attitude, self-inquiry ability, and problem-solving ability. The AI teaching model can improve the learning effect of students. Most of the reasons are due to vivid and flexible teaching videos and online self-learning without time and geographical restrictions. To a large extent, it has stimulated students' enthusiasm for learning and improved students' interest in learning.

4. Conclusion

According to the actual situation of teaching, it should flexibly use as many teaching methods, learning organization forms, and teaching aids as possible. It helps to stimulate students' interest in learning, improve students' learning enthusiasm and initiative, and thus promote the teaching effect. The design of teaching methods is related to the presentation of teaching effects. At present, Wushu education relies more on interest as the driving force for learning. In the future, it should be standardized with

systematic teaching theories, so that teaching methods and teaching effects can promote each other. In the past, teaching methods were mainly based on lectures and demonstrations, and the organizational form of learning was relatively stable. There is a method in teaching, but there is no fixed method. Martial arts teachers should actively seek some teaching methods that are suitable for martial arts teaching and can stimulate the interest of learners. It can also innovate some teaching methods and means that are suitable for martial arts teaching and that students like, so as to stimulate students' interest, improve teaching efficiency, and ensure the realization of teaching purposes. At present, more electronic teaching methods can be used in martial arts teaching. This teaching method can be used not only in technical teaching but also in traditional culture teaching and martial arts education. By watching videos of martial arts technique moves, one can gain a deeper understanding of the technique and learn faster and more regularly. Watching different martial arts competition videos can also stimulate interest in martial arts and broaden students' horizons. By allowing students to appreciate some educational martial arts movies, animations, etc., it can make students nurtured and infected, which is beneficial to moral education. The role of the teacher in the overall classroom design is crucial, and a large part of the student's learning effect depends on the way the teacher teaches. This is especially true for martial arts teachers. Without a rich theoretical foundation, it is not effective to teach movements unilaterally.

Data Availability

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

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Acknowledgments

This work was supported by the Ministry of Education's Industry-University Cooperation Collaborative Education Project (project No. 202102277012); Heilongjiang Province Philosophy and Social Sciences Support and Joint Construction Project (project No. 20TYE332); Chinese University Sports Association Project (project No. L202103001); and the Ministry of Education Humanities and Social Sciences Research Youth Fund Project (No. 21YJC890016).

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