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The Sustainable Development of Psychological Education in Students' Learning Concept in Physical Education Based on Machine Learning and the Internet of Things

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Abstract: Aim: This paper aims to enhance the emphasis of college physical education (P.E.) in the psychological education of P.E. students and provide a reference for the innovation of P.E. teaching methods. Methodology and procedures: On the basis of the Internet of Things (IoT) and a deep-learning algorithm, combined with psychological education, the teaching effect and the influence on learning philosophy are comprehensively evaluated through the construction of teaching evaluation index system for college P.E. students. Results: The theoretical courses of P.E. students in colleges and universities lack the integration of psychological-education concepts. It is found that the new teaching mode not only has a significant effect on improvement of training courses, but also promotes learning enthusiasm and theoretical courses. In the aspect of psychological quality evaluation, emotional-control ability significantly improved, the average score increased from below 60 to above 79, and self-challenge ability and adaptability to adversity also effectively improved. In the evaluation of deep-learning ability, students' critical thinking ability improved most obviously, and their complex problem-solving ability also improved to some extent. Conclusions: Based on the IoT and machine learning, college P.E. teaching mode can effectively improve students' psychological quality and ability, effectively improve students' training and theoretical achievements, and significantly improve their academic achievements. It can also improve students' self-learning ability. Practical applications: This paper reforms the traditional P.E. teaching mode, effectively demonstrates the hypothesis through practical teaching, designs the teaching evaluation index system of college P.E. students, and improves their learning ability and comprehensive achievements.

Keywords: Internet of Things; deep learning; physical-education teaching; psychological education; learning evaluation

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1. Introduction

With the continuous development of the Internet of Things (IoT) and machine learning technology, IoT technology and machine learning algorithms have gradually penetrated into the field of education. In recent years, teaching methods of college physical education (P.E.) are constantly being reformed, which plays an important role in improving the comprehensive ability of college P.E. students. In education and teaching, traditional sports theoretical knowledge pays more attention to the teaching of theoretical knowledge, ignoring the education of students' psychological quality and comprehensive ability [1]. In order to improve the psychological quality of P.E. students, make up for the shortcomings of traditional college P.E. teaching, and improve the comprehensive ability of college students, psychological-education theory is integrated into college P.E. teaching, and Internet of Things technology and a machine learning algorithm are integrated into teaching methods. It plays a vital role in the healthy growth of P.E. students' psychology and an improvement in their comprehensive ability [2].

Many scholars have conducted research on teaching and made some achievements. In terms of teaching methods, Zhang et al. (2021) proposed a new teaching and learning optimization algorithm integrating cognitive psychology theory for students with learning difficulties and tested the performance of the algorithm [3]. Malik and Akkaya (2021) studied the influence of psychological education on primary school students' learning habits through a psychological-education-intervention experiment [4]. Hu et al. (2021) took primary school students as the research object and used the methods of literature and a questionnaire to study the scale of influencing factors of primary school students' interest in P.E. and its mechanisms [5]. In terms of teaching evaluation, in order to more accurately evaluate various indicators of the human body, Lin et al. (2021) proposed a physical measurement evaluation algorithm based on machine learning and established an evaluation model of athletes' physical condition by using particle swarm optimization method [6]. Under the background of big-data application, Liu (2021) re-explored and determined the evaluation index of college P.E. teaching according to the problems existing in the evaluation of P.E. teaching in a university [7]. Cheng (2021) constructed a P.E. teaching evaluation system based on web-embedded systems and virtual reality [8]. Lin et al. (2022) used standardized measurement tools to conduct a large number of investigations and studies and analyzed the psychological factors that affect the learning behavior of P.E. students [9]. Research on previous research results found the infiltration of psychological theory in teaching methods. There are few literature studies on psychological education in college P.E. Although some scholars have evaluated P.E. teaching, research is very scarce on methods based on IoT technology and machine learning-related algorithms combined with the theory of psychological education to study the teaching effect of college P.E. students and evaluate the effect of the article. In the traditional theory course of college education majors, teachers mostly adopt the teaching method to instill theoretical knowledge. The teaching method is singular, and the teaching characteristics and students' characteristics are not grasped, which leads to a difference between the teaching effect and the expected effect. Some students pay more attention to technology than theory, which leads to unsatisfactory theoretical results. A Convolutional Neural Network (CNN) is a typical deep-learning model, which uses local connections between internal layers and has few model parameters. It has obvious advantages in processing speech recognition and image recognition, data-feature mining, and extraction [10].

Based on the above theory, this paper integrates psychological-education theory into college P.E. and taps the key advantages of technology on the basis of the IoT and a deep-learning algorithm, forming a P.E. teaching mode based on the IoT and machine learning. The IoT and a machine learning algorithm are applied to the practice of college P.E. teaching methods, and the teaching effect after application is analyzed. This paper studies the influence of new teaching methods on students' learning concept and makes a comprehensive evaluation from three target levels: academic performance improvement, psychological quality, and deep-learning ability. The innovation of this paper is to apply psychological-education theory and a deep-learning algorithm to the teaching implementation of college P.E. students and form a teaching-effect evaluation index system for college P.E. students. The purpose of this paper is to enhance the university's emphasis on the psychological education of sports students, innovation, and reform of P.E. teaching models to enhance the overall quality of sports students. It provides some research references for improving the quality of P.E. and promoting the all-round development of students.

2. Theoretical Basis and Method Research

2.1. Integration Theory of Psychological Education and P.E

2.1.1. Theory of Positive Psychology and Sports Psychology

In the field of sports training, some scholars believe that psychological education is a kind of education that strengthens athletes' ideals and beliefs and improves their psychological skills, positive-thinking ability, and self-awareness [11]. From the perspective of positive psychology and the cultivation and education of sports talents, psychological

education is defined as an educational activity with sports students as the object, with the cultivation of sports students' psychological skills, self-consciousness, and psychological self-help ability as the main content, with psychological training, counselling, and treatment as the main means, and with the purpose of promoting the all-round development of sports students' psychology [12].

Positive psychology differs from traditional psychology in that the function of positive psychology is the ability to expand and construct the direct thoughts or behaviors of individuals. Positive psychology provides sufficient resources for an individual's direct thoughts or behaviors, enabling individuals to respond more accurately, recognize more comprehensively, and think more creatively [13]. Positive psychology plays an important role in individual work, study, and life. In addition to schools and families, the cultivation of college students' self-management ability is more important than the role of their psychology [14]. The research level of positive psychology includes three aspects. The details are shown in Figure 1.

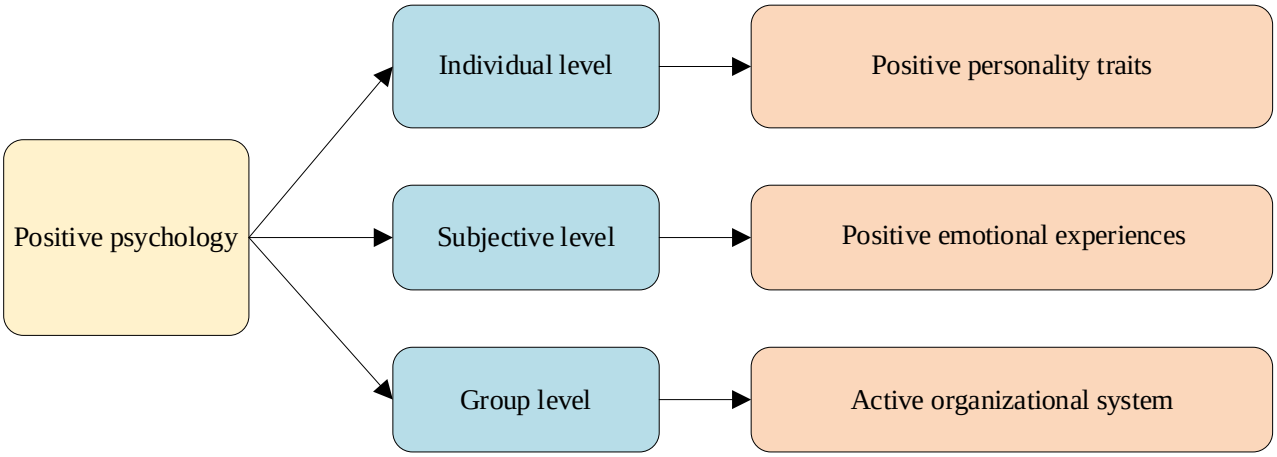

Figure 1. The level of research in positive psychology (Adapted from relevant theories of positive psychology).

In Figure 1, positive personality traits show people's virtues and positive strength. In terms of positive emotional experience, they show people's happiness, pleasure, and love. In terms of positive organizational system, they show positive social relations and positive family influence [15].

Sports psychology is a science that applies psychological principles to sports situations. It studies the influence of psychological factors and emotional factors on sports performance and exercise effect. It is applied in people's daily sports through gradual improvement and perfection [16]. At present, the fields involved in sports psychology mainly include campus sports, physical fitness, and competitive sports.

2.1.2. The Importance of Integrating P.E. and Psychological Education

The integration of college P.E. and psychological education plays an important role in the following three aspects, as shown in Figure 2.

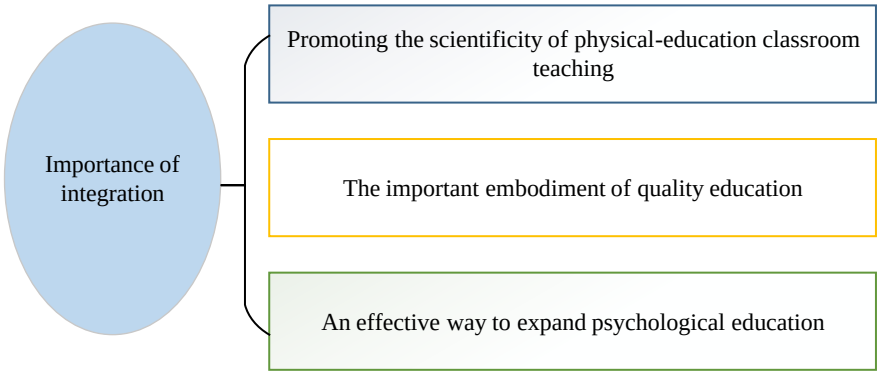

Figure 2. The importance of integrating P.E. and psychological education in CAUs (Adapted from theories related to the role of self-psychology in college teaching).

Figure 2 shows the integration of P.E. into psychological education can first promote the scientific nature of P.E. classroom teaching. Firstly, students have different psychological qualities and will obtain learning results. For sports students, psychological education is especially important for trainees or athletes. Using sports psychology knowledge can bring better training results [17]. Secondly, the integration of P.E. into psychological education is an important manifestation of quality education. It can take students as the main body and promote the comprehensive and coordinated development of students' bodies and minds. Thirdly, integrating P.E. into psychological education is an effective way to expand psychological education. It can not only enrich the quality of education, but also realize the quality of teaching [18].

2.1.3. Principles of Psycho-Educational-Model Construction

According to the physiological characteristics, cognitive characteristics, emotional characteristics, and social characteristics of the development of P.E. students in CAUs, the psychological-education model needs to follow certain principles, which are mainly divided into five aspects, as shown in Figure 3.

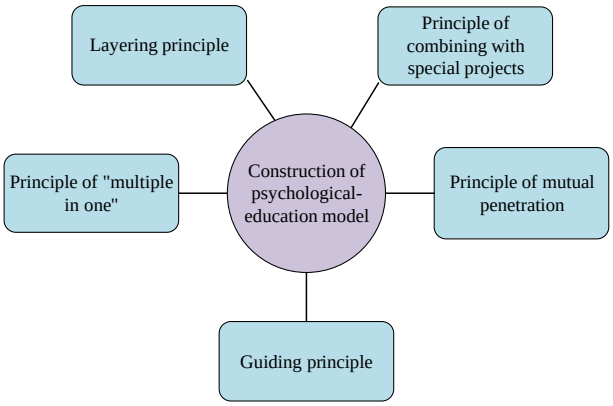

Figure 3. Principles of constructing psychological-education model for college sports students (Adapted from the theory of psychological characteristics of college P.E. students and the role of psychological education in teaching).

As shown in Figure 3, the first is the principle of psychological-education stratification. There are certain differences in the physical and psychological development of P.E. students of different ages. For example, students from freshman to senior year have different physical and psychological characteristics. The second is the principle of combining psychological education with special projects. Different sports and study subjects require different

psychological qualities. The third is the principle of mutual penetration. Psychological education focuses on the integration and penetration of subject knowledge. The fourth is the guiding principle. The implementation of psychological education promotes the healthy development of personality, which is based on education, and focuses on guidance [19].

2.2. P.E. teaching Technology Based on the Internet of Things and Machine Learning

2.2.1. Design of P.E. Teaching Mode Based on the Internet of Things and Machine Learning

The characteristics of college P.E. activities are dynamic and practical. Combining the IoT for real-time P.E. activities using IoT technology, combined with machine learning methods and information technology, a new P.E. teaching and learning model is formed [20]. Figure 4 shows the hierarchical structure of the learning model of P.E.

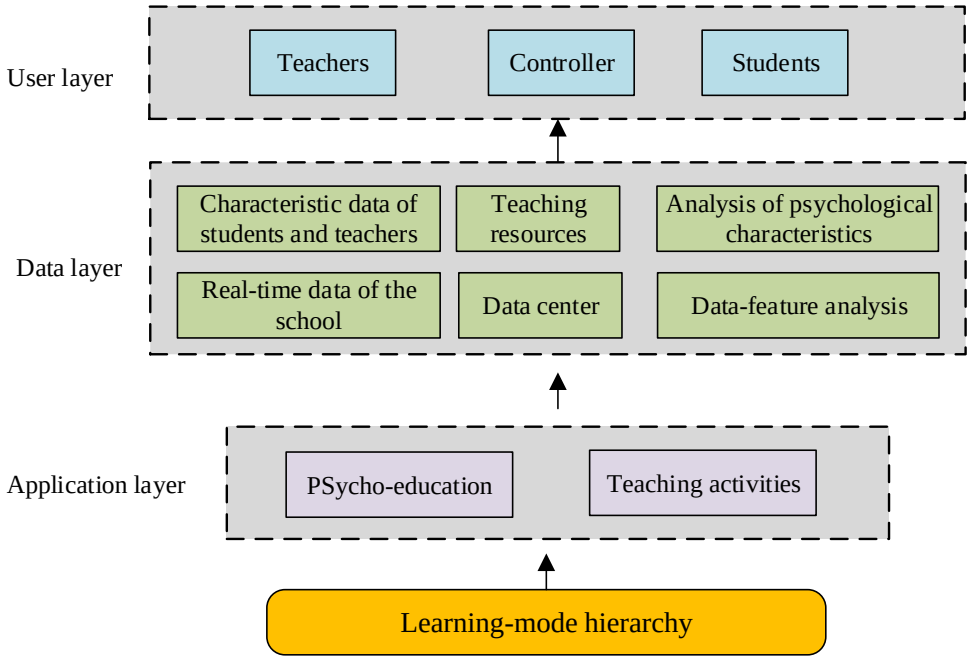

Figure 4. The hierarchical structure of the learning model of P.E. teaching in CAUs (Adapted from the theoretical research on the application of the Internet of Things in teaching).

Figure 4 shows that teachers, students, and managers constitute the user layer of the schema. Real-time teaching activity data are collected and stored in the data center through the IoT and wireless network, which constitutes the system data layer. The original data are finally displayed by data-mining technology. The application layer is mainly used for real-time P.E. activities and psychological-education applications [21]. Using IoT technology to collect real-time data of each sports student, teacher, and school to form data analysis nodes can make the presentation of digital resources more flexible, and the teaching resources related to P.E. are richer and more innovative. It can greatly improve the interaction of classroom teaching and shorten the time of teaching data analysis.

2.2.2. Deep-Learning Technology

Deep learning is a way of simulating the visual system of the human brain to process visual information, which can extract feature information. It is a method in supervised learning algorithms. A CNN is one of the typical algorithms in deep-learning algorithms. A CNN consists of an input layer, convolution layer, pooling layer, full connection layer, and output layer [22]. Its model structure is shown in Figure 5.

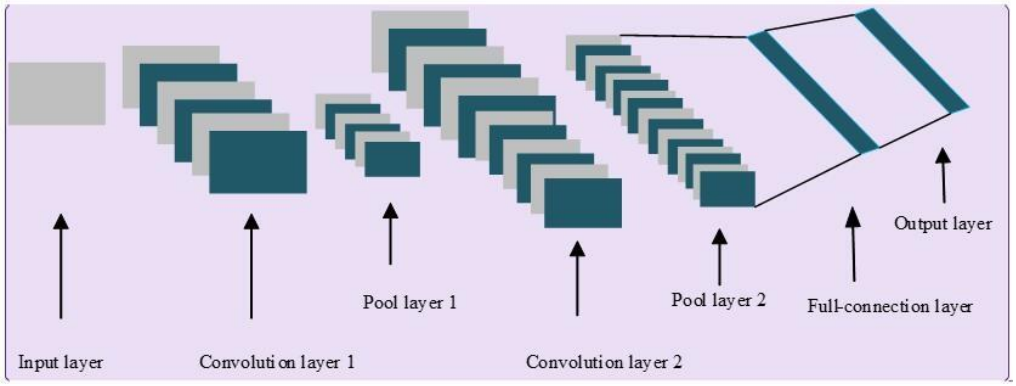

Figure 5. CNN model structure (Adapted from the research on self-convolution neural network models).

The first layer of a CNN is the input layer, which is used to input unprocessed multi-dimensional image data. The data are then pre-processed. The second is the convolution layer, which uses convolution to extract multiple features of data or images to achieve the purpose of data mining. When the convolution kernel is performing convolution processing, it scans the input data according to a certain step size, performs matrix multiplication and summation in the convolution kernel, and adds the deviation [23]. The calculation method is shown in Equation (1).

$$\begin{aligned} D^{l+1}(i,j) &= \left[D^l \otimes w^{l+1}\right](i,j) + b \\ &= \sum_{k=1}^{K_l} \sum_{x=1}^{f} \sum_{y=1}^{f} \left[D_k^l(s_0 i + x, s_0 i + y) w_k^{l+1}(x,y)\right] + b \end{aligned} \tag{1}$$

b is the deviation. D^l and D^{l+1} are the convolution input and output of the $l+1$th layer. $D(i,j)$ is the pixel of the feature map, k is the number of channels of the feature map, f is the convolution kernel size, and s_0 is the convolution stride.

The value range and calculation method of the pixel (i,j) are shown in Equations (2) and (3).

$$(i,j) \in \{0, 1, \ldots, C_{l+1}\} \tag{2}$$

$$C_{l+1} = \frac{C_1 + 2p - f}{s_0} + 1 \tag{3}$$

p is padding and C_{l+1} is the size of D^{l+1}.

The pooling layer compresses the convolutional features and uses the pooling function to count the value of each region in the feature map [24]. The pooling method is shown in Equation (4).

$$A_k^l(i,j) = \left[\sum_{x=1}^{f} \sum_{y=1}^{f} A_k^l(s_0 i + x, s_0 i + y)^p\right]^{\frac{1}{p}} \tag{4}$$

The pixel (i,j) is the same as the convolutional layer, p is the pooling parameter, and when $p = 1$, it is mean pooling. When p tends to be maximized, it refers to max pooling. When it is mean pooling and max pooling, it means that some feature information is lost. Pooling also includes hybrid pooling, as shown in Equation (5).

$$A_k^l = \lambda C_1\left(A_k^l\right) + C_\infty\left(A_k^l\right), \lambda \in [0,\ 1] \tag{5}$$

After the image passes through the convolutional layer pooling layer, it is tiled and passed to the fully connected layer. At this time, the image loses its spatial characteristics and takes the form of a vector [25].

The convolution layer and the pooling layer are implemented by operating on the matrix. The model is a linear operation method, and an activation function needs to be added to perform nonlinear transformation on the model.

Activation functions usually include Sigmoid, *Relu* (Rectified Linear Unit), *Tanh*, *Prelu*, etc. The sigmoid function maps the input x value to a number in the (0,1) interval [26]. The expression is shown in Equation (6).

$$S(X) = \frac{1}{1 + e^{-X}} \tag{6}$$

The *Tanh* function is a hyperbolic tangent function, as shown in Equation (7).

$$Tanh(X) = \frac{e^{X} - e^{-X}}{e^{X} + e^{-X}} \tag{7}$$

The *Relu* function is a leaping activation function, as shown in Equation (8).

$$Relu(X) = max(X, 0) \tag{8}$$

The *Prelu* function is shown in Equation (9).

$$Prelu(X) = \begin{cases} X, X \geq 0 \\ aX, X < 0 \end{cases} \tag{9}$$

a is a hyperparameter. The exponential part is added to the *Relu* function, and the part of $X < 0$ is replaced by e^X. In order to avoid the step phenomenon of the function, the two functions are spliced at $e^X = 1|_{X=0}$, and the function is moved down. The result is shown in Equation (10).

$$f(X) = e^{X} - 1 \tag{10}$$

By multiplying Equation (10) by a, the result is shown in Equation (11).

$$f(X) = ae^{X} - a \tag{11}$$

Through deep learning, students' characteristics, learning characteristics, and psychological characteristics can be deeply excavated and stored, so that teachers can quickly understand students, analyze students, and update teaching methods in time. The teaching mode in CAUs has the law of random changes, and deep learning has good self-learning ability, which enables accurate fitting of the fixed and random changes of teaching in CAUs and effective evaluation of the teaching mode.

2.3. Psychological Education Based on the Internet of Things and Machine Learning to Evaluate Students' Learning Concepts

2.3.1. Evaluation Scale Design

The designed learning mode is applied to practical teaching. According to the physiological and psychological characteristics of sports students, combined with the actual situation of college teaching, combined with relevant literature theory, and soliciting relevant expert opinions, the learning situation of college sports students in S province is evaluated. The influence of psychological-education learning mode based on the IoT and machine learning on students' learning concept is studied. The evaluation index system of sports students' learning concept is established [27], as shown in Figure 6.

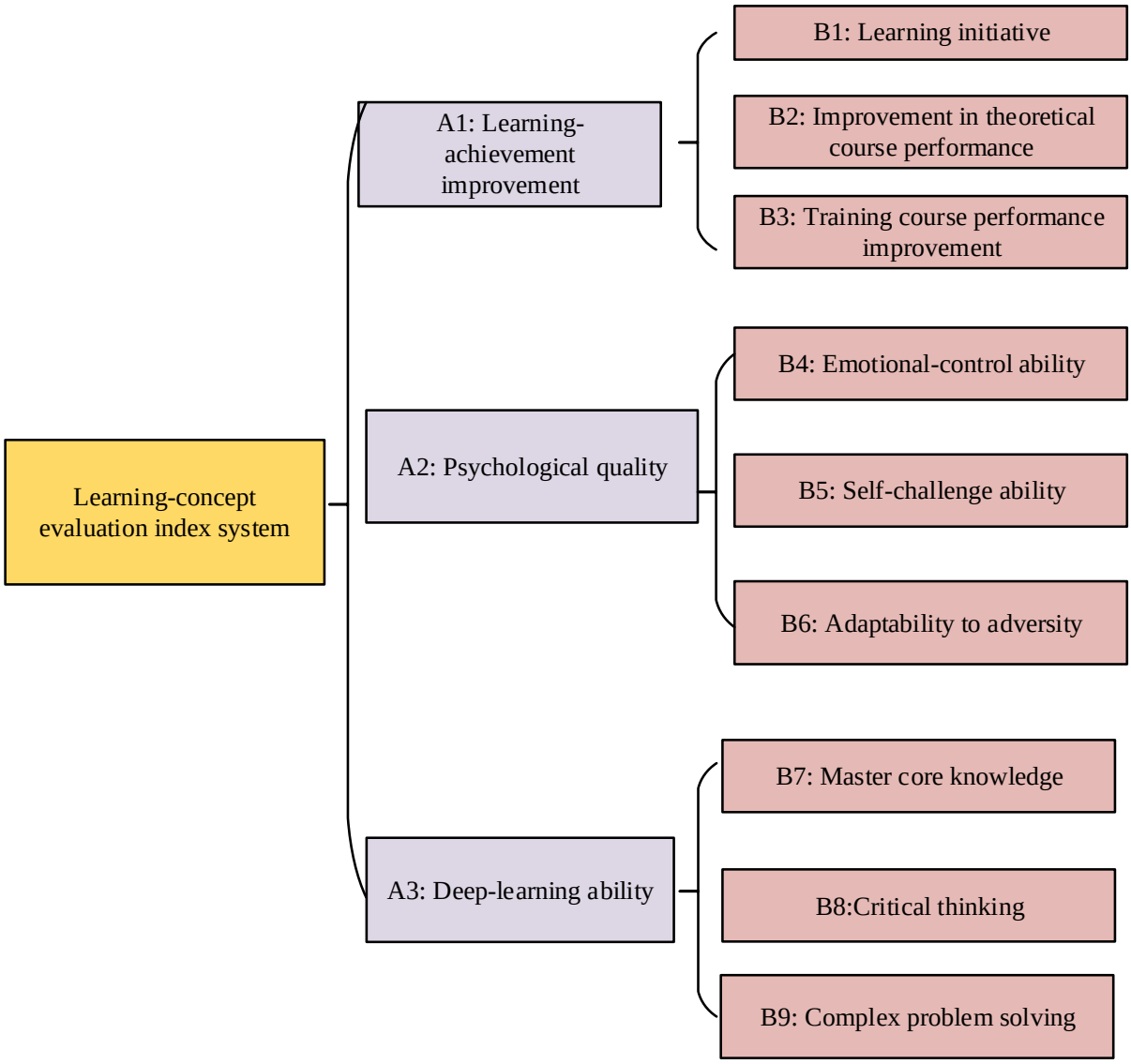

Figure 6. The evaluation index system of P.E. students' learning concept (Adapted from the research on teaching evaluation of P.E. students).

Figure 6 shows that the target layer includes three aspects, namely, academic performance improvement, psychological quality, and deep-learning ability. The three target layers contain 3 indicators, respectively, and the indicator layer contains 9 indicators. The learning performance improvement indicator layers are B1 learning initiative, B2 improvement in theoretical course performance, and B3 training course performance improvement. The psychological quality index level indicators are B4 emotional-control ability, B5 self-challenge ability, and B6 adaptability to adversity. The deep-learning ability index layer includes B7 master core knowledge, B8 critical thinking, and B9 complex problem-solving ability.

2.3.2. Evaluation Method of College Teaching Mode Based on Deep-Learning Algorithm

Firstly, data are collected according to the evaluation index system, and data are preprocessed, singular values are removed, and normalized processing is carried out, as shown in Equation (12):

$$X_i = \frac{X_i - min(X)}{max(X) - min(X)} \quad (12)$$

$max(X)$ represents the maximum value of a feature, and $min(X)$ represents the minimum value of a feature.

Secondly, some data are randomly selected from the pre-processed evaluation data of college teaching mode to form a training sample set, and the corresponding test sample set is established to set the evaluation model parameters. Then, the evaluation model is used to analyze the sample data and output the evaluation results.

The test environment is as follows: the Central Processing Unit (CPU) type is Advanced Micro Devices (AMD), the number of CPU cores is 6, the working frequency of the CPU is 3.0, the memory is 32 GB, the operating system is Windows, and the programming language is Java.

Based on the teaching model and evaluation index, the following hypothesis is proposed:

H1. *The proposed teaching mode can promote improvement in students' academic performance.*

H2. *The proposed teaching mode can promote improvement in students' psychological quality and ability.*

H3. *The proposed teaching mode can improve students' self-deep-learning ability.*

2.3.3. Survey Method and Object

In order to study the application effect of teaching methods, through questionnaire survey and conversation, P.E. students in three colleges and universities were selected as investigation objects, and each school formed an experimental class. A total of 200 questionnaires were distributed and 195 were recovered. The questionnaire recovery rate was 97.5%. There were 180 valid questionnaires, with an effective rate of 92.3%. The final set of classes were Experiment 1, Experiment 2, and Experiment 3, respectively. The basic information of the students is shown in Table 1.

Table 1. Basic information of students.

Category		Number of People	Proportion
Gender	Male	117	65%
	Female	63	35%
Grade	Freshman	63	35%
	Sophomore	54	30%
	Junior	45	25%
	Senior	18	10%

2.3.4. Reliability and Validity Test of Evaluation Index System

Statistical Product and Service Solutions (SPSS) 25.0 was used to test the reliability and validity of the evaluation indicators of the questionnaire survey content. For the nine evaluation indicators, the "Cronbach α" coefficient was above 0.9, and the evaluation content was good. The Kaiser–Meyer–Olkin (KMO) and Bartlett sphericity test were used to determine whether the index could be used for factor analysis, and the KMO was 0.885, which is greater than 0.7, and each index was suitable for factor analysis. Bartlett's sphericity test with associated probability less than 0.01 is also suitable for factor analysis. Through the review of relevant experts, the review was also unanimously passed, and the indicators were set reasonably.

3. Results and Discussion

3.1. Research on the Psychological Quality of P.E. Students in CAUs

The problems existing in the psychological quality of college sports students are studied, and four problems are summarized, as shown in Figure 7.

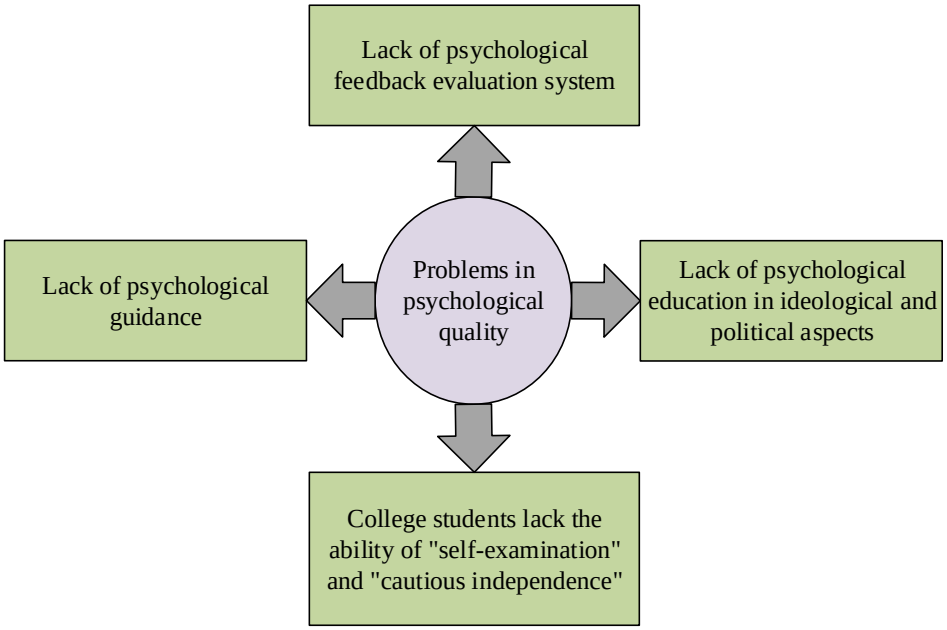

Figure 7. Mental-quality problems (Adapted from the research on psychological-education college students).

Figure 7 shows that the main problem of quality is the lack of a psychological feedback evaluation system. At present, CAUs lack an evaluation system for college students' psychological feedback, and it is difficult to truly understand the reasons for the occurrence and development of college students' psychological problems. The second is the lack of psychological-education content in ideological and political aspects. The third is the lack of "introspection" and "independence" ability of college students. The fourth is the lack of psychological guidance. "Introspection" is a kind of psychological-education method based on ideological and political theory for self-education, regulation, criticism, reflection, and evaluation. "Cautious independence" is the ability to control one's own psychological desires without relying on the supervision of others.

3.2. Analysis on the Evaluation Index of P.E. Students' Learning Concept

3.2.1. Evaluation and Analysis of Learning Performance Improvement

The students in Class 1, Class 2, and Class 3 of the experiment are evaluated for improvement in their academic performance, and are analyzed from three aspects: learning enthusiasm, improvement in theoretical course performance, and improvement in training course performance, and compared the results of pre-test and post-test, as shown in Figure 8.

In Figure 8, from the average satisfaction, the post-test satisfaction results of the three experimental classes are all higher than the pre-test satisfaction results. Students' performance in training class is the most obvious, with a big difference in satisfaction before and after, with the lowest overall satisfaction of 89% and the highest satisfaction of 95%. In the pre-test results, the highest satisfaction among the three classes is 75%. The satisfaction of the three classes in the pre-test results of theoretical courses is below 70%, while the lowest satisfaction of the three classes in the post-test results is 79% and the highest is 86%. In terms of learning enthusiasm and theoretical course achievement, the degree of satisfaction is the same. The learning mode of this paper has a significant role in improving the training course, and it also plays a certain role in improving the learning enthusiasm and theoretical course results. The new teaching mode has changed the boring state of the traditional theory course, which can solve the problem of improving the achievement of the theory course to a certain extent. The H1 hypothesis put forward is well-verified. Therefore,

the teaching mode based on the IoT and machine learning can promote improvement in students' comprehensive scores, change their learning enthusiasm and attitude, and the new teaching mode has a positive impact on the learning philosophy of sports students.

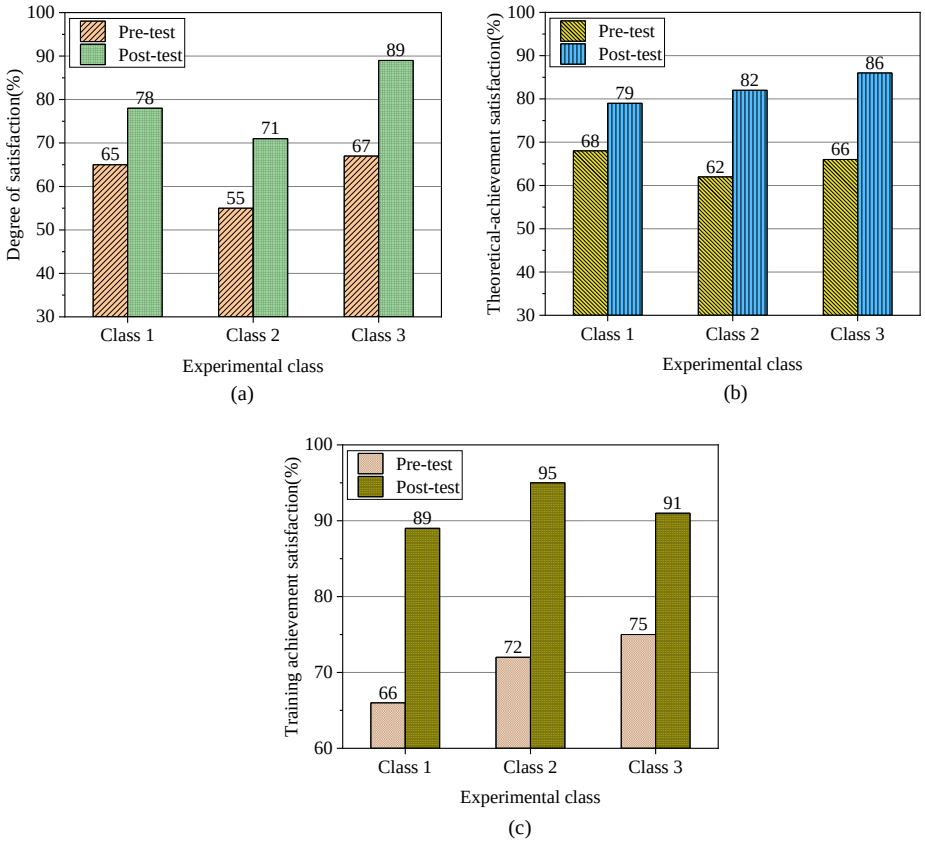

Figure 8. Learning-performance improvement evaluation. (**a**) Evaluation of learning enthusiasm; (**b**) Evaluation of performance improvement in theoretical courses; (**c**) Evaluation of performance improvement in training courses. (Adapted from questionnaire data results).

3.2.2. Evaluation and Analysis of Psychological Quality

The psychological quality of college sports students is evaluated and analyzed from three aspects: emotional-control ability, self-challenge ability, and adversity adaptability, and the results of pre-test and post-test are compared, as shown in Figure 9.

Figure 9 shows that the post-test psychological quality scores of the three experimental classes are higher than the pre-test. The most significant improvement in scores is in emotional control, from failing to an average score close to 80. Following the improvement in self-challenging ability, the score increased from below 70 points to above 80 points. Finally, there is the ability to adapt to adversity. The grade of Class 1 shows the most obvious improvement, from 67 to 76. Although the final overall scores of the three classes are not very high, compared with the pre-test scores, there is a certain percentage improvement. Regarding the influence of the new teaching mode on the psychological quality of college P.E. students, it can significantly improve emotional-control ability, self-challenge ability, and adaptability to adversity. College sports students need more time to exercise to adapt to adversity, and gradually improve their ability to adapt to adversity. After the application of the learning model, the evaluation score of students' psychological quality improved compared with the previous teaching model. The H2 hypothesis is well-verified. Therefore, in the process of college P.E., the role of psychological education is becoming more and more important. The new learning mode can improve the emotional-control ability, self-challenge ability, and adaptability to adversity of P.E. students, and the comprehensive quality of students improved to a certain extent.

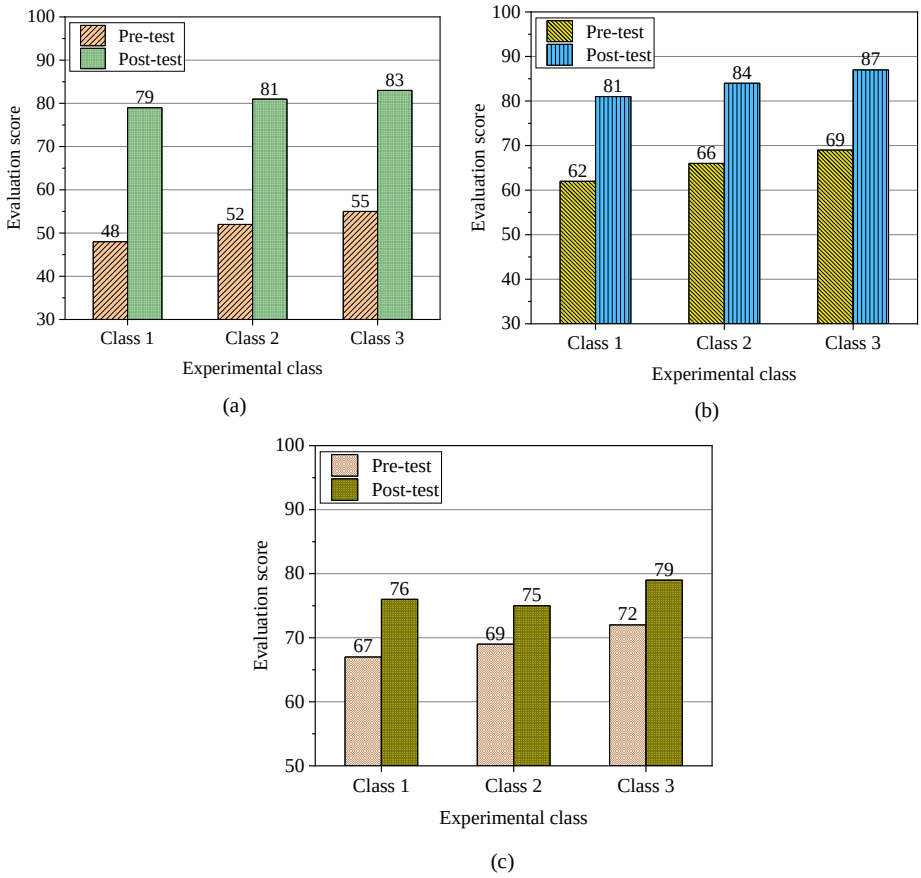

Figure 9. Psychological quality evaluation. (**a**) Emotional control; (**b**) Self-challenge; (**c**) Adversity adaptation. (Adapted from questionnaire data results).

3.2.3. Deep-Learning-Ability Evaluation Analysis

The evaluation of in-depth learning ability of college sports students is analyzed from three aspects: mastery of core subject knowledge, critical thinking, and complex problem-solving ability, and the results of pre-test and post-test are compared, as shown in Figure 10.

Figure 10 shows that in terms of deep-learning ability, the post-test scores of the three classes are all higher than the pre-test, indicating that the learning mode has a certain role in improving deep-learning ability. Firstly, in critical thinking, the score improvement is the most obvious, with a score improvement of 30 points or more. Secondly, in terms of solving complex problems, the overall score of the post-test score is higher than 80 points, and the score improvement is greater than or equal to 10 points. The improvement in the score of mastering core subject knowledge is less than 10 points. On the whole, the learning mode is the most significant for improving critical thinking, followed by complex problem-solving ability, and finally the mastery of core subject knowledge. Therefore, the learning mode proposed in this paper can promote students' deep-learning ability, effectively improve the deep-learning level of P.E. students, and improve their autonomous learning ability. The hypothesis H3 is demonstrated. In the teaching process, the teaching method of combining deep-learning technology and physical network technology is really helpful to improving the self-deep-learning ability of college P.E. students.

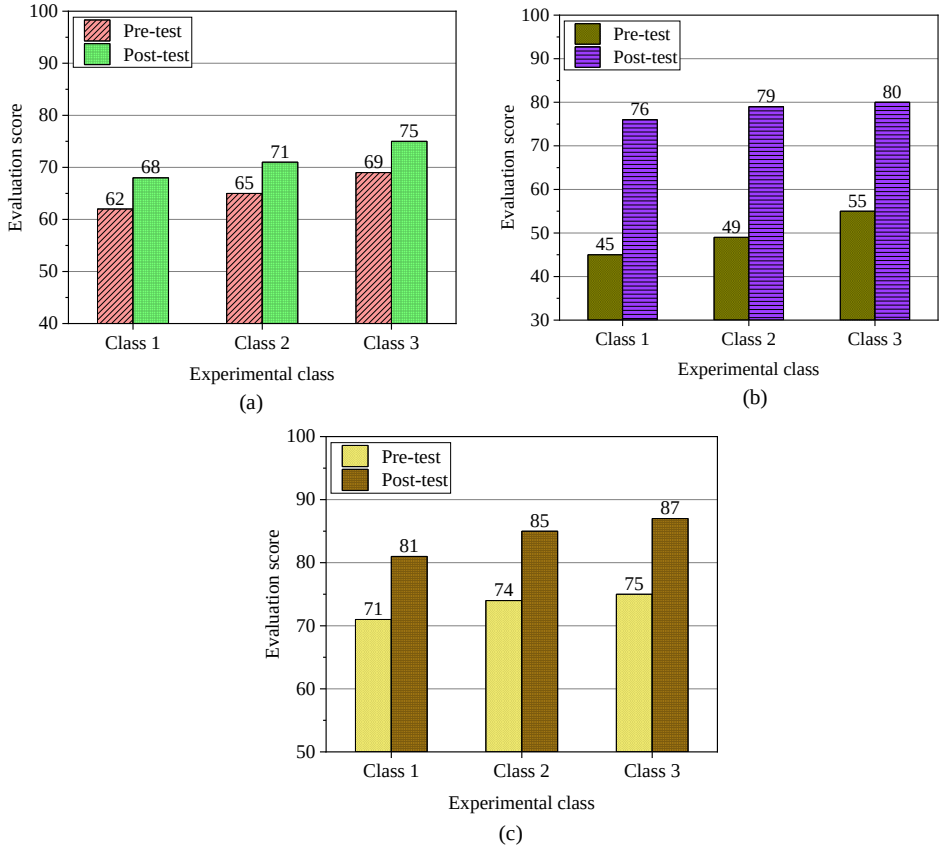

Figure 10. Deep-learning-ability evaluation. (**a**) Assessment of mastery of core subject knowledge; (**b**) Assessment of critical thinking; (**c**) Assessment of complex problem solving.

3.3. Comparison of Different Model Evaluation Algorithms

In order to evaluate the superiority of this design learning method, and other algorithms such as Particle Swarm Optimization (PSO), Brainstorm Optimization (BSO), and Multilearning Teaching-learning-Based Optimization (MLTLBO), these methods are compared through mean absolute error (MAE) and root mean square error (RMSE) analysis. The results are shown in Figure 11.

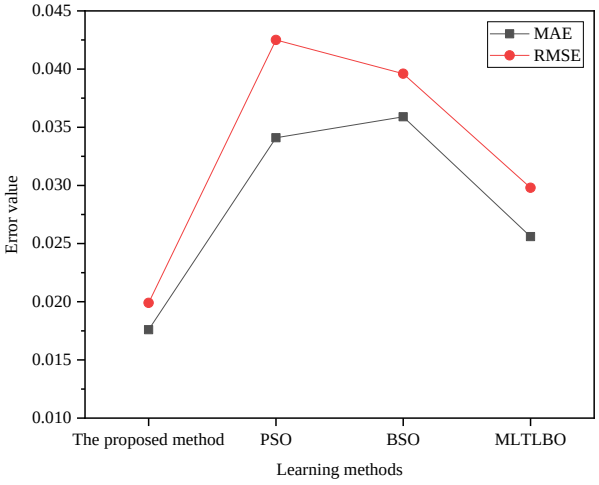

Figure 11. Comparison of evaluation indicators of different algorithms (Drawing according to model training data).

Figure 11 indicates that, in the comparison of MAE values of different algorithms, the most obvious advantage is the design learning method, with an error value of 0.176, followed by the MLTLBO algorithm, then the PSO algorithm, and finally the BSO algorithm. In the evaluation of different models, the design method has the smallest error value, and the learning model has certain advantages.

4. Discussion

At present, the problems existing in college students' psychological quality are mainly the lack of evaluation mechanism, the infiltration of psychological education-related content in ideological and political education, and the lack of psychological guidance and self-reflection ability of college students. The psychological education of college P.E. students plays an important role in their academic performance and personal growth, but the current theoretical classes of P.E. students tend to ignore the content of psychological education. For college P.E. teaching, there is a lack of related evaluation research on the application of IoT technology and machine learning methods into psychological education. The research is more about the influence of psychological quality education on students, and it lacks systematic empirical analysis [28]. Therefore, it is very important to integrate psychological-education thought into the theoretical course teaching of college P.E. students.

Through the evaluation system to analyze the teaching effects of different teaching modes and evaluate the learning ideas of P.E. students from different angles, it is shown that the learning mode based on the IoT and machine learning can improve the learning enthusiasm of college P.E. students, and to a certain extent, and it can improve academic performance. Although the improvement in theoretical performance is not as obvious as that of training courses, compared with the previous teaching mode, the satisfaction degree increased from below 70% to over 79%, with the highest satisfaction reaching 86%. The teaching method of integrating psychological education can really improve students' academic performance and learning enthusiasm. The comprehensive ability of students' psychological quality improved compared with the previous ability. In particular, the improvement in emotional control is the most obvious. For example, the grade of Class 1 increased from 48 to 79, and the effect is very obvious. Students' personal deep-learning ability can be exercised, and especially their ability to solve complex problems significantly improved. Therefore, in the IoT and machine learning environment, combining psychological education can really improve students' psychological quality, and the evaluation results have obvious advantages. It is suggested that colleges and universities should constantly reform the teaching methods of P.E. students, innovate teaching methods, pay attention to the comprehensive penetration of psychology in P.E. students' curriculum teaching, and promote the development of college students' comprehensive quality and the improvement in their learning ability. Therefore, the new teaching mode can not only improve students' academic performance, but also improve students' psychological quality and self-learning ability.

5. Conclusions

In order to improve the psychological quality and comprehensive academic performance of college P.E. students and solve the problem of improving the theoretical course performance of college P.E. students, this paper first infiltrates psychological-education content in the teaching-design process of college P.E. students, introduces the IoT technology and CNN deep-learning algorithm, reforms the traditional teaching methods, forms a P.E. teaching mode based on the IoT and machine learning, and builds a teaching evaluation index system for college P.E. students. Through the questionnaire survey, this paper comprehensively analyzes the teaching evaluation index system, compares students' deep-learning ability, and demonstrates the proposed assumptions. The results are: (1) There are many problems in college P.E. students' psychological quality, such as the lack of a psychological feedback evaluation system, the lack of integration of psychological-education concepts, and lack of a psychological guidance mechanism in theoretical courses, which

show that psychological education plays an important role in P.E. students. (2) After the application of the new teaching mode, through the analysis of the evaluation index system, it is found that the students' performance in the training class improved remarkably, with the lowest overall satisfaction of 89% and the highest of 95%. The results of theoretical courses have also been improved to a certain extent. Therefore, the new teaching mode plays a certain role in promoting learning enthusiasm and theoretical course achievement. (3) Students' emotional control ability is improved most obviously, and the average score is increased from below 60 to above 79. The designed teaching mode can significantly improve emotional-control ability, followed by self-challenge ability and adaptability to adversity. This shows that a college P.E. teaching mode based on the IoT and machine learning can effectively improve students' psychological quality and ability. (4) The new teaching mode can significantly improve students' critical thinking ability, complex problem-solving ability, and the ability to master core disciplines. In a word, the designed learning mode can really promote the learning concept of college P.E. students, and the effect is obvious. The deficiency of this design lies in the fact that the scope of investigation is three P.E. classes in three colleges and universities, and the scope of popularization is relatively narrow. In the follow-up, it is necessary to investigate and study the applicability of other majors, optimize the learning plan and evaluation system, and evaluate the teaching effect from various angles. This paper is an innovation and breakthrough for traditional P.E. teaching mode, and an innovation and promotion for P.E. teaching methods and teaching evaluation.

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