Research Article

Construction of a College Physical Education Teaching Model Using Multiple Intelligences Theory

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In recent years, China has comprehensively carried out and implemented the “national fitness campaign.” Sports have been integrated into everyone’s daily life. As a place for cultivating talents, colleges and universities have also begun to reform the physical education teaching mode and cultivate a number of talents with strong competition ability, teaching ability, and adaptability to the society. With the deepening of the reform of physical education teaching mode in colleges and universities, some colleges and universities have introduced the theory of multiple intelligences. By analyzing the concept and content of the theory of multiple intelligences and comparing it with the traditional physical education teaching mode, it fully reflects the advantages of the theory of multiple intelligences in physical education teaching. This paper uses fuzzy mathematics and fuzzy set algorithm to build a teaching model based on the theory of multiple intelligences. Moreover, we study the innovative methods of college physical education teaching, take college physical basketball teaching as the research object, and analyze the students’ sports technology, students’ teaching practice ability, and students’ thinking ability based on the theory of multiple intelligences. Experimental outcomes show that the teaching method guided by the theory of multiple intelligences was designed for the intelligent characteristics of the students in the experimental group, and the teachers and students communicated with each other during the teaching period, which significantly improved the students’ thinking ability.

1. Introduction

Some western countries have formed a complete theoretical system by using the theory of multiple intelligences in educational reform [1]. At present, China is also further deepening education reform. The theory of multiple intelligences is a good interpretation of quality education, which is also an important theoretical basis for education reform and promotes China’s shell process reform. After the introduction of multiple intelligences theory in China, it has been valued by many experts and scholars and put into teaching practice. This paper uses the theory of multiple intelligences to construct the college physical education teaching model, which is of great significance to the development of college physical education in China. The theory of multiple intelligences explains intelligence well. Human intelligence belongs to diversity, not one or two, but a combination of multiple and independent. This theory is also recognized by experts in the field of education. This should be kept in mind that the multiple intelligences theory is a research achievement related to human intelligence. It has formed a mature and complete theoretical system and is now widely used in the fields of pedagogy and psychology.

A single presentation of theoretical knowledge in class will make students feel bored and uninterested. The application of multiple intelligences theory in college physical education can formulate corresponding teaching plans according to the individual differences of each student, which can greatly improve the teaching quality and achieve remarkable teaching results, which is of great value for cultivating high-quality talents. In this paper, we introduce the theory of multiple intelligences into college physical education and explain the main contents and characteristics of the theory in detail. We then compare and analyze the
differences between traditional teaching and multiple intelligences teaching so as to highlight the advantages of multiple intelligences teaching. Moreover, through combining fuzzy mathematics algorithm and fuzzy transformation method, this paper constructs an efficient physical education teaching mode based on multiple intelligences theory and analyzes the differences between multiple intelligences theory and traditional teaching mode from three aspects: (i) sports technology, (ii) teaching practice ability, and (iii) students’ thinking ability.

The setting of the control group and the experimental group shows that there is a significant difference (statistical) in students’ sports technology \( (P < 0.01) \). Based on the multiple teaching theory, teaching takes students’ learning style and personality characteristics as the core and formulates a suitable teaching mode according to students’ intelligence characteristics. There was a significant difference in the scores of teaching practice ability \( (P < 0.01) \). Because teachers carefully designed teaching methods, contents, and forms during teaching, students’ teaching practice ability was strengthened. There was a significant difference in the scores of students’ thinking ability \( (P < 0.05) \), which was due to the fact that the teaching method guided by the theory of multiple intelligences was designed for the intelligent characteristics of the students in the experimental group. Moreover, this means that the teachers and students communicated with each other during the teaching period, which significantly improved the students’ thinking ability. The main innovations and contributions of the research conducted in this paper are as follows:

(i) This paper introduces the theory of multiple intelligences into college physical education and explains the main contents and characteristics of the theory in detail

(ii) It compares and analyzes the differences between traditional teaching and multiple intelligences teaching so as to highlight the advantages of multiple intelligences teaching

(iii) Combining fuzzy mathematics algorithm and fuzzy transformation method, this paper constructs an efficient physical education teaching mode based on multiple intelligences theory

(iv) It analyzes the differences between multiple intelligences theory and traditional teaching mode from three aspects: (a) sports technology, (b) teaching practice ability, and (c) students’ thinking ability

The remaining of the paper is structured as follows. We discuss some of the recent state-of-the-art methods in Section 2. Section 3 is devoted to the theory of multiple intelligences. We discuss the convolution neural networks and proposed a model for text translation. In Section 4, we discuss the construction of the college physical education teaching model based on multiple intelligences theory. A teaching model is suggested. Section 5 illustrates the analysis of basketball teaching effect based on the multiple intelligences theory and the proposed teaching model. Finally, we conclude this discussion along with directions for future research in Section 6.

2. Related Work

In the last century, people have begun to realize the importance of intelligence and change the traditional cognition of intelligence [3]. Elkholy’s knowledge construction theory is used as the theoretical basis for studying the brain’s natural learning ability and generates intelligent psychological test tools, such as IQ test [4]. Al Qatawneh described the content of multiple intelligences and curriculum in detail. Moreover, the authors described the combination mode between curriculum and multiple intelligences in a very vivid way through figures and examples. In addition, they have also analyzed various intelligence training methods and students’ intelligence education so as to better apply this theory in the curriculum [5]. Dewi referred to the theory of multiple intelligences and learning style to have a more diversified understanding of the students’ learning characteristics and intelligence and used a variety of teaching styles and optimal teaching strategies to carry out targeted education [6]. China has also introduced the theory of multiple intelligences to improve China’s quality of education because the theory of multiple intelligences reflects the characteristics of modern science, meets the requirements of China’s educational reform, and is an important theoretical basis for China’s educational reform.

Wang put forward the theory of multiple intelligences as an important basis for evaluating physical education teaching, which reflects the evaluation process of physical education teaching from multiple perspectives [7]. Zhao proposed that the problems in the evaluation of physical education teaching in colleges and universities in China can be supplemented by the theory of multiple intelligences evaluation (MIEM). The application of the multiple intelligences evaluation model in physical education teaching evaluation can better meet the requirements of the concept of teaching quality [8]. Xu research pointed out that multiple intelligences theory is more conducive to physical education teaching in learning and research [9]. Hu believes that the use of multiple intelligences theory in cultivating college students’ physical ability is a new teaching model. However, there are still many problems in practical application, which need to be discussed later, especially the investigation of students’ physical exercise after graduation [10].

Wei explained, from eight various aspects, that the process of applying multiple intelligences theory in student work plays a guiding role in students’ entrepreneurship and scientific research [11]. Lu analyzed the use of multiple intelligences theory in English teaching from the perspective of teaching and pointed out that multiple intelligences theory should integrate teaching environment resources. Moreover, this should also integrate teaching resources by arranging classrooms, building campus culture and network environment, and paying attention to processing teaching contents and guiding students’ employment [12, 13]. By summarizing various problems in the ideological and political courses in colleges and universities, Zhang proposed and recommended applying the theory of multiple intelligences to the ideological and political courses in colleges and universities. The authors also suggest designing the
ideological and political teaching strategy based on the theory of multiple intelligences [14, 15].

Ding affirmed the positive role of using the theory of multiple intelligences in colleges and universities and proposed that students can better understand the structure of intelligence by using the theory of multiple intelligences. One of the main reasons to support this claim is that the multiple intelligence theory is convenient for the cultivation and expansion of students’ intelligence and conscious initiative [16, 17].

3. Based on the Theory of Multiple Intelligences

3.1. Content of Multiple Intelligences Theory. In the book “The Structure of Intelligence: The Theory of Multiple Intelligences” written by Gardner, it is proposed that a person has at least 8 kinds of intelligence [18]. These various kinds are shown in Figure 1.

Moreover, the content of multiple intelligences theory involves eight aspects that can be grouped by the intelligent species, content, and cultivating way, which are described in detail as illustrated in Table 1.

3.2. Characteristics of Multiple Intelligences Theory

3.2.1. Individual Intelligence Difference. In the theory of multiple intelligences, it is pointed out that all people have eight kinds of intelligence. The intelligence of each person does not appear independently. It is flexibly combined in various ways to form an intelligent individual, and there are great differences among individuals. Based on this difference, all people have different intelligence. Even if the same intelligence is different in everyone, it is impossible to judge the individual IQ by an accurate standard [19]. Each student should be treated differently during teaching, and it is not allowed to evaluate the quality of students from a certain intelligence. During the period of teaching reform, we should fully integrate the core content of multiple intelligences theory and cultivate a large number of talents with strong comprehensive ability for the country [20].

3.2.2. Intelligence Emphasizes Individual Development. Based on Gardner’s theory of multiple intelligences, modern multiple society does not simply judge talents from mathematical logic ability and language ability but pays more attention to the ability to deal with practical problems [21]. It is also the main trend of modern education reform. It is not only the traditional cultivation of students’ mathematical logic ability and language ability but also students’ individuality that guide students to improve their ability to deal with practical problems and innovate product effects [22].

3.2.3. Diversified View of Intelligence. Each individual intelligence is not judged from the aspects of mathematical logic ability and speech intelligence. It is a differentiation of individual manifestations integrating a variety of different abilities. Gardner pointed out that intelligence is multidimensional and its expression is independent. The intelligence of each individual will change with the accumulation of growth and experience and will also be affected by the environment. There are abilities other than eight kinds of intelligence [23, 24]. Therefore, we should analyze intelligence with multidimensional thinking. During the teaching period, it is necessary for modern teachers to analyze the intelligence of students for each student’s characteristics, analyze the intelligence characteristics of each individual, and study students’ intelligence from a multidimensional perspective.

3.3. Differences between Multiple Intelligences Teaching and Traditional Teaching. The purpose of formulating teaching methods is to complete teaching tasks and the means used in the activities participated by teachers and students. In fact, the teaching activities of both parties, that is, teacher and student, include teachers’ teaching methods and students’ learning methods [25]. During the teaching period, adopt scientific teaching methods to strengthen the teaching effect and complete multiple teaching objectives. Through comparing the theory of multiple intelligences with traditional teaching, the differences between the two teaching modes against certain aspects of the intelligence are studied and listed in Table 2.

4. The Construction of a Teaching Model for College Physical Education Based on the Theory of Multiple Intelligences

4.1. Fuzzy Mathematics Algorithm of College Physical Education Teaching Mode. In reality, the concepts of incompleteness, uncertainty, and inconsistency belong to fuzzy characteristics. Different fuzzy characteristics can be studied by corresponding fuzzy theories and methods. Their theories
Definition 1. Let $u$ represent the universe; then the mapping $\mu: U \rightarrow [0, 1]$ from $u$ to $[0, 1]$ can define a fuzzy subset $A$ of universe $U$. Formulas (1) and (2) represent a fuzzy set on universe $U$:

\begin{align*}
A &= \{\mu_A(\mu_1)/\mu_1, \mu_A(\mu_2)/\mu_2, \mu_A(\mu_3)/\mu_3, \ldots\}, \quad (1) \\
A &= \{\mu_A(\mu_1)/\mu_1 + \mu_A(\mu_2)/\mu_2 + \mu_A(\mu_3)/\mu_3, \ldots\}. \quad (2)
\end{align*}

For some finite domains, a fuzzy set $A$ is represented by the following ways:

\begin{align*}
A &= \{\mu_A(\mu_1), \mu_A(\mu_2), \mu_A(\mu_3), \ldots, \mu_A(\mu_n)\}. \quad (3)
\end{align*}

Fuzzy set is used when it is difficult to accurately define classification and element attributes. Refer to the degree of belonging of this element to any set, and its standard is the value of 0–1. If $\mu$ a ($\mu$) is close to 1, it indicates that this element has high membership in the set; otherwise, it indicates that this element has low membership in the set. The following basic concepts are extended.

Define that fuzzy sets are equal: if $A$ and $B$ are different, for universe $u$, then $\mu \in U$ has two functions $\mu_A(\mu) = \mu_B(\mu)$, indicating that $A$ fuzzy set is equal to $B$ fuzzy set; that is, $A = B$.

The relationship between fuzzy sets is inclusion. Assuming that both $A$ and $B$ belong to $F(U)$, if all have $\mu_A(x) \leq \mu_B(x)$, it can be concluded that if fuzzy set $B$ is included in fuzzy set $A$; that is, $A \subseteq B$. If there are special cases, $B \subseteq A$ is also true, and finally, $A$ and $B$ are equal.

### 4.2 Fuzzy Transformation Method of College Physical Education Teaching Mode

The fuzzy transformation method is a method of fuzzy comprehensive evaluation based on the matrix change mode [27]. $R$ represents the fuzzy judgment matrix, $A$ represents the weighting vector, and the comprehensive value of all elements in the weighting vector $A$ is 1; that is, $\sum a_i = 1$. The calculation formula is shown by the following:

\begin{align*}
   b_j = \vee (a_i \wedge r_{ij}) \quad (j = 1, 2, 3, \ldots, m).
\end{align*} \quad (4)

Regardless of the value of $r_{ij}$ in the above formula, the result of $a_i \wedge r_{ij}$ is smaller than that of $a_i$. According to this analysis, $a_i$ cannot weight the results but only limits some results and filtering. During the later calculation, the principle of taking the larger one is applied, and the highest one among the various $a_i \wedge r_{ij}$ results is always selected so as
to better exhaust gas factors and completely retain important factors [28]. Based on the above settings, the multiplication method will take the small instead, and its calculation formula is as follows:

\[ b_j = \bigvee (a_i r_{ij}) (j = 1, 2, 3, ..., m). \]  

(5)

The \( a_i \) function here is different from the above. It has no partial suppression or filtering function and only has weighting function. The following calculation formula also follows the principle of taking the larger one, and \( a_i \) is difficult to enter \( b_j \). It is fully proved that the main factor is still the core part. Then the following is the calculation formula of the algorithm that will take the larger one instead of the larger one:

\[ b_j = \sum_{i=1}^{n} (a_i r_{ij}) (j = 1, 2, 3, ..., m). \]  

(6)

There is also a certain difference between \( a_i \) and multiplication instead of the minimization method. Its basic function is partial limit and filtering. All three factors in this method can obtain corresponding participation opportunities; that is, the role of the main factor is not significant [29]. The following is the weighted average formula:

\[ b_j = \sum_{i=1}^{n} (a_i r_{ij}) (j = 1, 2, 3, ..., m). \]  

(7)

4.3. Innovation of College Physical Education Based on the Theory of Multiple Intelligences. Physical education is related to the all-round development of students. The use of physical education can improve students’ physical quality, develop students’ potential intelligence, and realize the all-round development of personal ability. However, China’s colleges and universities do not pay attention to the teaching of physical education, and the opening time is relatively short, which has not formed a complete teaching mode. Most colleges and universities’ hardware facilities cannot meet the requirements, such as tennis courts, equipment, and teachers. In terms of software facilities, physical education teaching methods, teaching innovation, teaching content, and teaching evaluation also form a systematic theoretical system. The innovation of physical education teaching in colleges and universities involves many contents. This paper innovates physical education teaching based on the theory of multiple intelligences, which is shown in Figure 2.

4.4. Construction of Teaching Model Based on Multiple Intelligences Theory. The theory of multiple intelligences is used in college teaching practice, in which “observation” is to comprehensively collect students’ learning data in the task situation environment. In addition, the evaluation task should aim at students’ mastering and learning more knowledge and ability. The explanation includes the reasoning and analysis of observed phenomena and data, as well as the content of classroom evaluation to promote students’ skill learning and students’ knowledge. The three elements can be regarded as a closed cycle and interrelated process.

Cognition corresponds to learning objectives. Observation is the search for evidence related to students’ development, and interpretation is the effective feedback of students’ evidence. As shown in Figure 3, the teaching model based on multiple intelligences theory is shown.

5. Analysis of Basketball Teaching Effect Based on Multiple Intelligences Theory

5.1. Analysis of Students’ Sports Technology. This paper studies the construction of the college physical education teaching model based on multiple intelligences theory and takes college basketball teaching as the research object. Among them, ‘sports technology’ refers to the way in which athletes’ physical ability can effectively play and complete each action. Moreover, the sports skill refers to the ability to complete the specified action with a certain technology. During basketball teaching in colleges and universities, sports technology is not only the key to basketball teaching but also an important teaching mode. Therefore, based on the teaching mode guided by multiple intelligences theory, this paper analyzes sports technology and grasps the important role of multiple intelligences theory in basketball teaching composition. To do so, we set up a control group and an experimental group to compare the students’ technical test scores. Figure 4 shows the learning technology scores of the two groups of students in the teaching experiment. Similarly, Table 3 shows the technical examination results of the two groups of students after the test teaching experiment. According to the above Figure 4, the technical test scores of the students in the experimental group are mainly 83–73 and 94–84, respectively, and \( P < 0.01 \) can be obtained from the data in Table 3. The \( P \) value shows that the students in the control group and the experimental group have great differences in technical scores, which proves that the technical level of colleges and universities using multiple intelligences theory in basketball teaching is high. This is due to the fact that basketball teaching using multiple intelligences teaching theory can highlight students’ personality characteristics and learning style. Starting from a variety of intelligent characteristics, corresponding teaching modes are adopted for different students. After observation, it is convenient for students to master the action structure, have a deeper understanding of the key parts of the technology, and experience the key points of technology through combining with their own characteristics. This essentially helps in making students more confident and interested in learning basketball.

5.2. Analysis of Students’ Teaching Practice Ability. Teachers teach by organizing students to carry out interactive activities. Practice is not only the main channel of people’s innovation but also the test of the results and level of innovative activities. Teaching activities are embodied in a certain form of teaching organization during teaching practice. As the main carrier and medium of teaching activities, teaching organization can ensure teachers carry out classroom teaching smoothly. In order to explore the influence of multiple intelligences theory on the effect of
college basketball teaching, the index of students is assessed in the teaching experiment, and the experimental group and the control group are set to compare the students’ scores. The teaching practice ability is assessed from three aspects: 30 demonstration skills, 40 explanation skills, and 30 organization teaching. The distribution results of the two groups of students’ teaching practice ability after the teaching experiment are shown in Figure 5. Table 4 shows the comparison of the two groups of students’ teaching practice ability after the teaching experiment.

Analysis of the data in Figure 5 shows that, during the teaching process, most of the students’ practical ability scores of the experimental group are in the 95–90 division, and the students’ practical ability scores of the control group are in the 77–72 division. According to the data in Table 4, the value of $P < 0.01$ fully shows that there is a great difference in practical ability between the control group and the experimental group. In terms of teaching practice ability, the students in the experimental group were significantly higher than those in the control group. This is because, based on the system control theory, teaching itself belongs to a controllable closed-loop system. The components of the system have multiple subsystems and a large number of teaching-related factors. Through the effective control of the teaching subfactors, the teaching tasks and objectives are realized and used during the basketball teaching. Teachers should design teaching methods, teaching contents, and teaching forms based on the characteristics of students so as to realize combination and optimization. Their manifestations should focus on physical activities and cultivate students’ action technology. The designed teaching activities should be implemented in conjunction with various intelligent teaching methods. Because some technical actions cannot be explained in the actual teaching process, therefore they can
only be demonstrated by teachers for many times. Students master the skills through observation and practice for many times. Students can quickly grasp the feedback information in a short period of time and realize the technical action of innovation and improvement.

5.3. **Analysis of Students’ Thinking Ability.** Thinking is the source of human invention and creation. Students’ learning activities should also use thinking flexibly. The key to improving students’ learning ability is to strengthen their thinking ability [30]. Therefore, during the traditional physical education teaching in colleges and universities, teachers take students’ sports technology as the core and do not pay attention to students’ ability to observe, study, analyze, raise, and deal with problems. Therefore, under the guidance of multiple intelligences teaching theory, colleges and universities choose to observe, analyze, raise, and deal with problems as the test content. Teachers explain to all students and evaluate students. Figure 6 shows the results of the analysis of the thinking ability of the two groups of students in the teaching experiment. Moreover, Table 5 shows the results of the examination of the thinking ability of the two groups of students after the teaching experiment.

According to the results of students’ thinking ability shown in Figure 6, most of the students in the experimental group scored 89–84 points, while the students in the control group scored 77–72 points. The information in Table 5 shows that the value of \(P < 0.05\), which indicates that the thinking ability of the students in the control group and the
experimental group is different. Subsequently, this also fully proves that colleges and universities can greatly improve students’ thinking ability by using the theory of multiple intelligences in basketball teaching. The factor leading to this result is that the multiple intelligences theory designs the teaching scheme based on the intelligent characteristics of the students in the experimental group (control and experiment groups) and pays attention to improving the students’ intelligence so as to supplement the lack of students’ intelligence and double the students’ self-confidence during learning.

6. Conclusions and Future Work

This paper adopts the theory of multiple intelligences in the study of college physical education teaching mode, which fully reflects the characteristics of multiple intelligences structure in teaching. The traditional teaching mode pays attention to theory. A single presentation of theoretical knowledge in class will make students feel bored and uninterested. The application of multiple intelligences theory in college physical education can formulate corresponding teaching plans according to the individual differences of each student, which can greatly improve the teaching quality and achieve remarkable teaching results, which is of great value for cultivating high-quality talents. This paper chooses college basketball teaching as the main research object and uses the multiple teaching theory to analyze the influence of college basketball teaching on students’ sports technology, practical ability, and thinking ability, which can effectively strengthen students’ initiative and enthusiasm for learning basketball. Experimental outcomes show that the teaching method guided by the theory of multiple intelligences was designed for the intelligent characteristics of the students in the experimental group, and the teachers and students communicated with each other during the teaching period, which significantly improved the students’ thinking ability.

We will build a more powerful teaching model based on state-of-the-art algorithms in the future, which will result in improved accuracy. Deep learning approaches, therefore, are time expensive, and model training might take a long period. As a result, techniques such as aggregation can be utilized to increase the algorithm’s performance in terms of training and prediction time. Other approaches, such as graph convolutional network (GCN), LSTM, ResNet, and attention networks, can be researched in the near future in addition to CNN. The ReLU function was used to get the results in this paper; however, other functions would produce different results. As a result, we will look into

Table 4: After the teaching experiment, the test results of the comparison of the scores of the two groups of students’ teaching practice ability.

| Group                   | \( \bar{x} \) | \( S \) | \( T \) | Sig  | \( P \) |
|-------------------------|--------------|--------|--------|------|--------|
| Experience group (N = 33) | 86.94        | 5.98   | 5.51   | 0.00 | <0.05  |
| Control group (N = 34)  | 79.02        | 6.24   | 2.36   | 0.041| <0.05  |

Table 5: After the teaching experiment, the two groups of students’ thinking ability scores were compared and tested.

| Group                   | \( \bar{x} \) | \( S \) | \( T \) | Sig | \( P \) |
|-------------------------|--------------|--------|--------|-----|--------|
| Experience group (N = 33) | 87.53        | 6.46   | 2.36   | 0.041| <0.05  |
| Control group (N = 34)  | 84.22        | 6.46   | 2.36   | 0.041| <0.05  |
several functions. The network depth, kernel size, and filter number study restrictions might also be a viable alternative for further enhancement of the proposed teaching model.

Data Availability

Data are available upon request from the corresponding author.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding the publication of this work.

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