

Research on the "Four and Three Levels" Teaching Mode of University Public Physical Education Class under the CDIO Teaching Concept —— Take Football Class as an Example

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Abstract: In order to CDIO teaching concept of public physical education "four level three" teaching mode have more thorough understanding, this paper by adopting literature research, experimental analysis form of "four three" teaching mode in the application of public physical education in colleges and universities, and from football, special quality, learning motivation, self-confidence and so on four aspects of comparative analysis, found based on CDIO teaching concept of "four level 3" teaching mode in the application of football teaching has great advantage, can effectively improve students' interest, improve the efficiency of football teaching.

Keywords: CDIO teaching concept; Public physical education in universities; Four and three levels; Football

CDIO is an advanced concept for engineering education. Its core lies in the organic integration of four elements: conception (Conceive), design (Design), implementation (Implement) and operation (Operate). In accordance with the trend of thought of "learning by doing", it is committed to the close connection between theory and practice, actively guiding students to actively invest, pursue teamwork, stimulate innovative thinking and attach importance to application skills, and is known as the benchmark of modern engineering education. However, the teaching methods of public physical education in colleges and universities are updated slowly, and the problem of college students' physical decline is increasingly serious, which has become the focus of the sports science community. CDIO teaching concept can effectively solve this problem, because it also adheres to the concept of "learning from doing", emphasizing the two aspects of theory and practice, which is highly consistent with the quality needs of physical education, so that students can experience the course content through vivid sports activities and effectively improve their physical quality. This study aims to explore the application of CDIO concept in improving the teaching quality of public physical education in colleges and universities, through the in-depth analysis of football as an example, in order to enlighten the practitioners in the field of physical education.

1. Study subjects and methods

1.1 Study subjects

In 2022 annual football elective course in our school as experimental subject, experimental group sample size of 42 male subjects (experimental group), the control group sample size of 45 male subjects (control group), the experimental period covers the overall period from September 2022 to June 2023, the control group follow the conventional education way (teacher demonstration and guidance, students practice, correct errors after further field), while the experimental group follow the "four level 3" teaching method of CDIO scientific concept^[1].

1.2 Research method and content

1.2.1 Literature and data method

By studying relevant academic materials, we analyze the actual application of CDIO education concepts at home and abroad.

1.2.2 Educational experiment method

The final examination adopts the mode of "separation of teaching and examination", and the scope of the examination paper

includes two parts: theoretical knowledge and skill application. Among them, the skill test includes the number of bouncing the ball, quick passing, positioning shot (calculate the number of goals) and the accuracy of heading. The skills assessment is conducted by the three teachers, and all grades are based on the average of the three. The special football test includes: (1) professional teachers perform the average performance of the standing long jump for three consecutive times in the same field; (2) a 30-meter sprint test behind the heat to obtain a single running score; (3) a 12-minute run, also conduct a test after the heat and record the data; (4) in this project, we will accurately measure the range of the six-meter equilateral triangle field with the soft ruler. In order to ensure the fairness and accuracy of the race, we will strictly fix the starting point and the finish point. Finally, we will record the time spent in each race in detail; (5) According to the "Physical Health Assessment Standard for College Students", fully use the high precision measurement facilities, and record the corresponding results^[2].

1.2.3 Mathematical and statistical method

The research team used Excel to organize the data and conduct in-depth statistical analysis with Spss20.0 software. The paired sample T-test was used for comparing the groups, while the independent sample T-test was used for the analysis of internal individual differences. If the difference between the test results is as small as 0.05, the difference is significant and statistically significant.

2. Construction of the "four levels and three levels" teaching mode

The first-level index of the "four-level and three-level" teaching mode covers the assumption, planning, execution and operation. In this framework, the preset stage covers many secondary indicators such as course objective formulation, content organization and planning, cultivating students' talents and application in practice; the planning stage includes the high-level planning of the project and the secondary and tertiary project customization, the main focus is on classroom teaching and extracurricular learning. In other words, the classroom teaching stage should focus on selecting the content of teaching, making the flexible use of teaching means, and strengthening the effectiveness of tacit cooperation between teachers and students; while in the extracurricular learning stage, we should make full use of micro-video teaching resources, carefully plan the review strategy, and comprehensively promote the independent learning mode to enhance the enthusiasm of participation.

3. Application analysis of "four-level" teaching mode of university public physical education under the CDIO teaching concept

3.1 Comparison of football class scores

In the public sports football course of our school, the examination adopts theory and skills in two ways. After comparison, the average theoretical score of the students in the experimental group was 80.74 ± 7.60 , which was about 5% higher than the 75.74 ± 8.06 students in the comparison group. Further using the paired sample T-test, the difference was significant ($T = -2.937$, $P = 0.005$). On the technical level, the four aspects of heading, accurate shooting, dribbling around and bouncing the ball mainly consider the accuracy and stability of the players^[3]. By comparison, it is found that the cutting-edge technology of the experimental group is stronger, which is embodied as follows:

(1) Heading: The average test score of students in the experimental group reached 8.39 ± 1.24 m, far exceeding the 7.16 ± 1.30 m of students in the comparison group, and the data difference was significant ($T = -3.532$, $P = 0.001$).

(2) Shooting: the average score of the single shot of the students in the experimental group was 7.05 ± 1.93 m, which was better than the 5.83 ± 1.81 m of the students in the comparison group, and also showed significant differences ($T = -2.683$, $P = 0.011$).

(3) Shab over: the average test score of students in the experimental group was only 9.72 ± 1.89 s, while students in the comparison group was 11.31 ± 1.71 s, and the gap between the data was very significant ($T = 5.144$, $P = 0.000$).

(4) Bouncing the ball: the average value of the total number of students bouncing the ball in the experimental group reached 35.17 ± 7.85 m, far exceeding the 30.33 ± 6.67 m of the students in the comparison group. The data difference between the two was also very significant ($T = -3.105$, $P = 0.004$).

This paper reveals that compared with the traditional teaching mode, it has obvious advantages. This mode advocates the comprehensive planning and careful design of each course and implementation links in the whole process of teaching and learning, such as clearly setting course objectives, formulating teaching contents, formulating strategic strategies to train students, and how to apply knowledge scientifically and effectively. In this way, it is helpful for students to have a clearer and in-depth understanding of the curriculum composition and system. Through the three-level project design of the course, students are guided to gradually deeply and study from theory to practice, so as to form accurate football response ability and improve football skills. In the process of course implementation and student acquisition, further improve their learning effectiveness. CDIO teaching method emphasizes content selection, method rationality and teamwork, diversified teaching methods, such as the application of various teaching methods can

effectively help students learn action skills.

3.2 Comparison of special quality situation

The results showed that the standing long jump performance of the experimental group (distance: 2.15 ± 0.37 m) was superior to the control group (distance: 1.89 ± 0.32 m), and the difference was extremely significant ($T = -4.275$, $P = 0.000$). The performance of the experimental group in the 30-meter sprint was also more prominent (time: 1.13 ± 0.32 seconds), with a significant advantage over the control group (time: 1.29 ± 0.30 seconds), and the difference was also significant ($T = 3.630$, $P = 0.001$). The gap between the 12-minute runs was also small (time: experimental, 2818.18 ± 424.96 seconds, control, 2672.73 ± 400.79 seconds), but still statistically significant ($T = -2.054$, $P = 0.046$). In addition, the time of the test class in the triangle return run (time: 12.36 ± 1.67 seconds) exceeded the control group (time: 13.11 ± 1.56 seconds), showing a significant difference ($T = 3.107$, $P = 0.003$). For the last indicator —— sitting forward flexion, the experimental group was also higher than the control group (distance: 64.48 ± 7.61 cm vs 56.64 ± 8.26 cm), and the difference was very significant ($T = -5.880$, $P = 0.000$). The above five items reflect the strength, speed, endurance, agility and flexibility of football.

The conclusion points out that this new model not only focuses on the absorption of course content, but also pays more attention to the cultivation of relevant skills and qualities, such as special physical quality. At the same time, this model advocates comprehensive development, which requires students to master the basic knowledge, but also effectively improve their practical operation ability and comprehensive quality^[4].

3.3 Comparison of learning motivation

This paper uses the rigorous scientific method and the motivation measurement tool recognized by the industry to accurately evaluate the learning motivation of the case group members and the control group members before and after the experimental intervention. The results revealed that the average value of student learning motivation in the control group was 24.12 ± 2.89 , but after the trial intervention, the average value rose to 25.49 ± 4.54 . However, these changes did not reach significant statistical significance, ($T = -1.577$, $P = 0.119$). In contrast, the average learning motivation of students before the experimental group was 24.90 ± 3.15 , which increased significantly to 31.46 ± 4.27 after the implementation of the trial intervention. This stark change significantly exceeded expectations ($T = -7.728$, $P = 0.000$). Before the implementation of the intervention ($T = -1.433$, $P = 0.060$); however, the gap widened after the intervention ($T = -6.127$, $P = 0.000$). According to the scoring criteria of this scale, the 12-21 equal grades represent the students' weak learning motivation, the 22-27 grades represent the middle level, and the 28-36 grades represent the strong composition potential. It can be seen that the advantages of this teaching mode are significantly higher than those of the traditional teaching mode^[5].

4. Conclusion

In conclusion, the "four-point and three-level" football elective course teaching model guided by the teaching concept of CDIO was successfully established. The model divides the teaching into four steps: —— conception, design, implementation, and operation. Each step contains eleven small steps, which are refined into a total of 16 specific measures. By using such a teaching model, we have significantly improved the students' mastery of football theoretical knowledge and skills, and at the same time, it has also played a positive role in promoting their special physical quality in this field. It is worth mentioning that under this model, students scored better in academic motivation than when they used traditional teaching methods, and their confidence scores also showed obvious superiority. In general, the application of the "four-level and three-level" football elective course teaching mode based on the CDIO teaching concept in the higher education system is feasible and very effective, and meets the needs and interests of the majority of students.

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