Received: July 29, 2017
Revision received: May 2, 2018
Accepted: May 13, 2018

www.estp.com.tr
DOI 10.12738/estp.2018.5.117 ♦ October 2018 ♦ 18(5) ♦ 2176-2186

Research Article

Cooperative Learning Method in Physical Education Teaching Based on Multiple Intelligence Theory*

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Abstract

Group cooperative learning is a developing teaching strategy. In order to explore the feasibility, operation form and implementation effect of group cooperative learning strategy in physical education teaching, three track and field events of shot-put, 800-meter race and long jump were selected, and contrastive teaching between group cooperative learning and traditional PE teaching in 20 classes of eight universities were carried out. Through the teaching experiment, we have gradually established the university cooperative learning mode of physical education, and in the course of teaching experiments the feasibility of the teaching model was verified.

Keywords

Cooperative Learning • Teaching Model • Teaching Evaluation • Physical Education Teaching

* The Youth National Social Science Fund of China: Study on the intergenerational conflict of sports culture under the background of cultural power strategy (17CTY008); Project of "Thirteenth Five-Year Plan" of Education Science in Liaoning Province: Research on Linkage Mechanism of First-class Physical Education Discipline Construction in Liaoning Province (JG17DB499); Planned Project of Supporting Innovative Talents in Colleges and Universities of Liaoning Province in 2017 (WR2017015)

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Citation: Wang, X., & Liu, Y. L, Cooperative Learning Method in Physical Education Teaching Based on Multiple Intelligence Theory. *Educational Sciences: Theory & Practice, 18(5),* 2176-2186. http://dx.doi.org/10.12738/estp.2018.5.117

Cooperative learning is a creative and effective teaching theory and strategy that has arisen in the United States and has made substantial progress (Johnson and Johnson, 2009). Cooperative learning not only improves students' learning methods, but also changes their attitudes towards life. Nowadays, competition and cooperation coexist, and a positive spirit of cooperation and effective interpersonal skills are the basic qualities that modern people should possess (Johnson Johnson Roger and Smith., 2014). Therefore, teaching students how to cooperate with others is a problem that should be solved in PE teaching.

The theory of cooperative learning mainly includes five fields: (1) Cooperative learning is a kind of teaching activity with group activities. (2) Cooperative learning is a kind of cooperation and mutual assistance among students. (3) Cooperative learning is a goal-oriented activity, which is developed to achieve certain teaching objectives. (4) Cooperative learning depends on the overall achievement of each group in reaching the goal. (5) The allocation of learning tasks and the control of teaching process in cooperative learning are performed by teachers (Qun, 2007). Cooperative learning emphasizes the subjectivity of the students, and requires the students to participate actively in the teaching. In the process of interaction with the objective teaching environment, the students actively carry out knowledge construction. Constructivism thought that effective teaching should guide students to participate actively in learning, it should be the process of maintaining effective interaction between teachers and students, students and students (Bogner, 2009). According to constructivism theory, the process of teaching includes not only the interaction between teachers and students, but also the interaction between students and other students. So teachers should always act as promoters, conductors and collaborators in teaching.

Subject education theory pays attention to the essential value of education (Guang, 2015). The theory advocates human education and opposes material education. The subject education fully respects the main position of students. The purpose is to use the scientific and humanistic knowledge to inspire and promote the students to develop and improve actively and creatively. It is consistent with the purpose of cooperative learning.

The theory of multiple intelligences was first proposed by Dr. Gardiner, an American educationist (Bornstein, 1985). The theory holds that the thinking mode of human brain is pluralistic, that is, there are eight kinds of intelligences, such as speech expression, visual space, logical reasoning, body movement, self-cognition, music rhythm, natural observation and interpersonal communication. The theory of multiple intelligences tells us that every student has the potential to develop, but the field of performance is different. It requires teachers to treat every student from different perspectives, we must promote its superior quality in the intelligent field and migrate to other intelligent fields. For collaborative learning based on multiple intelligences theory, the theory of multiple intelligences should run through the whole process of learning mode construction.

Related Works

From the development stage, cooperative learning can be roughly divided into three stages. At the initial stage (from the end of 1960s to the middle of 70s), some cooperative learning strategies were initially formed. For example, the "group-game-competition" method was proposed in this period. At the substantive progress stage (from the middle of 1970s to the middle of 80s), the theory of cooperative learning is becoming mature,

and putting forward the cooperation strategies, such as "division of work of groups", "group assisting individuals", "group investigation method" and so on. At the stage integrated with other related theories (from the middle of 1980s to now), there is a trend of convergence between cooperative learning and other related teaching theories. The emergence of cooperative learning method based on multiple intelligence theory is a good example.

In PE teaching, many scholars have done a lot of research on cooperative learning. Shi et al.'s research on developmental teaching and students' subjective development holds that students' active participation, cooperative learning relationship between students, differences between students and the success of students' experience can promote the development of students' subjectivity (Shi & Huang, 2015). Jin *et al*., analyzed some basic theories of cooperative learning, and put forward some feasible cooperative learning models for PE teaching (Jin and Guo, 2006). Tao *et al.*, carried out experimental research on cooperative learning mode in Wushu teaching (Tao, 2009). Bayraktar *et al*., set up cooperative teaching mode in gymnastics general course teaching (Bayraktar, 2011).

Methods

Experimental method and observation method

The purpose of the experiment is to make a thorough investigation and study on the situation and process of physical education in class, and variable control was carried out to get some stable and regular knowledge. The research subjects are divided into experimental and control classes, and they were tested on the sports ability, basic body parameters acquisition (UOSIM test instrument) and teaching experiment items. Teaching experiment items include teaching achievement test before experiment teaching and testing results after experiment teaching.

Questionnaire

The purpose of questionnaire in this paper is to investigate the cooperation and interaction of students in the current physical education class. In order to ensure the reliability of the questionnaire, 674 students from 20 classes in sophomore and junior grade were sampled, and two questionnaires were conducted every week on the survey subjects, and the conclusions were drawn from two questionnaires. The purpose of the questionnaire survey is not only to draw a few simple data, but also to carry out the objective observation and interview on this basis, and it is the important value of the survey.

Interviews

The impression directly obtained through ordinary observation is only an external surface phenomenon, and the interpretation of the phenomenon is inevitably influenced by its own subjective factors (Hong-yin, 2007). In order to make the research as objective as possible, we have also adopted the interview method in the process

of research. Through mastering the information that the observation and the questionnaire can't obtain, the research will be more detailed and deeper. In the interview process, we try to use individual interviews. The content of the interview mainly includes the existing problems of interaction among teachers and students in current PE teaching.

Literature analysis

Literature analysis is the basic method used in this study. One of the early works of the research process is to consult the literature related to this research. Understanding the relevant research results will help us better understand the current situation of research and make the research process more effective (Shao, 2006).

Mathematical statistical methods

In this study, the SPSS statistical software was used to test the difference between the basic body index of the experimental class and the control class, as well as the difference between the two tests of the experimental class and the control class before and after the experiment by T test.

Teaching Research Results

Comparison of traditional physical education and cooperative learning in physical education

Traditional PE classroom interaction is usually limited to the mutual influence between teachers and students, and it denies the interaction between students. The process of teaching and learning is acted only as a bilateral activity between teachers and students in traditional PE teaching.

Cooperative learning should pay attention to the interaction between teachers and students, students and students, teachers and teachers. It breaks through the limitations and singleness of existing contacts, and advocates the multi direction communication mode between teachers and students.

Nowadays, there are four kinds of interaction modes in classroom teaching. Mode 1 is shown in Figure 1. This mode is one of the most traditional one-way communication modes, which is characterized by teachers' teaching, instead of requiring students to respond immediately. The model has a poor effect.

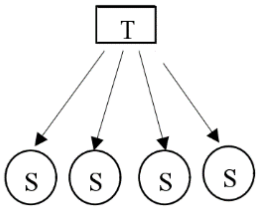

Figure 1. Interaction mode 1

The second mode shown in Figure 2 is better than the first one. It is a two-way communication mode. In this model, the teacher has noticed the search for feedback to determine whether the students understand what the teacher is talking about, it makes the teachers to have the opportunity to correct the mistakes in physical education and the misunderstanding of the students. This model has a good effect.

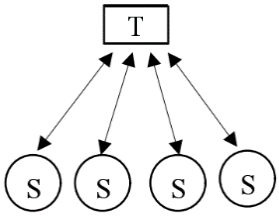

Figure 2. Interaction mode 2

The third mode is better than the second. On the one hand, teachers and students maintain two-way communication. On the other hand, it allows students to learn and communicate with each other.

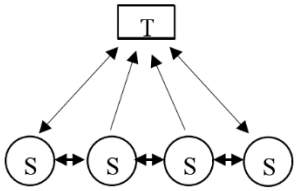

Figure 3. Interaction mode 3

The communication channel of the fourth mode is more than the third. The teacher has become a member of the group and has been working together to encourage two-way communication among students in the group. This model has the best effect.

The interaction modes and strategies adopted in cooperative learning are mainly third or fourth mode. It is quite different from the one-way and two-way communication mode adopted in our current physical education teaching system.

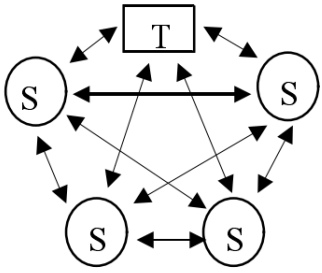

Figure 4. Interaction mode 4

The establishment of cooperative learning group in physical education

The cooperative learning group is generally suitable for 4 to 6 students, and everyone should have specific own role. Group cooperative learning members must understand the roles they should undertake and understand what they should do for the group, but the roles should be changed regularly so that the members of the group have the opportunity to take different roles. The implementation of cooperative learning should take into account the personality traits, learning ability and cooperation consciousness of team members. In order to achieve effective cooperative learning, the students in the class should be combined into a number of heterogeneous learning groups according to their academic level, ability tendency, personality characteristics, gender and so on.

On the one hand, the combination of overall cooperation and moderate competition is beneficial to the establishment of the group cooperative learning community. On the other hand, it can stimulate the enthusiasm of the group. The promotion of moderate competition in group cooperative learning can link the learning environment with the social environment, and let the students realize that the social reality environment is full of competition, which can enhance the students' adaptability to the social environment.

Under the current educational system, the organization of class teaching puts teachers in an absolute dominant position, so that the teachers are invisible to the authority of the students. In the group cooperative learning, the role of the teacher is transformed into a promoter and a participant, so that the psychological distance between the students and the teachers will be closer, and the relationship between teachers and students is equal and harmonious. Under the teacher-student relationship, the students in the PE classroom group will realize that they are the masters of the cooperative study of the group, and the teachers are the promoters of their cooperative learning.

The process of group cooperative learning is a integrating cognitive activities and emotional activities based on psychological activities of the whole group. In group cooperative learning, emotional goal is to cultivate cooperative learning interest through group cooperative learning and stimulate the motivation of cooperative learning. In the group cooperative learning, the students' cooperation and participation consciousness is cultivated, the students can understand the methods and skills of cooperation, understand the concept of cooperation and the concept of equality between teachers and students. It is the basis of students' group cooperative learning in PE classes.

Evaluation system of cooperative learning model in physical education

The evaluation of traditional physical education focuses on the examination, and the new evaluation system of cooperative learning model focuses on the developmental evaluation. Our proposed evaluation system pays attention to the process of students' development, the students' nonacademic content, the diversification of the evaluation subject, the cooperative learning of the students, the incentive function of the evaluation, and inspires the students' creative ability.

The contents of PE classroom teaching are divided into three parts: Teachers' PE teaching behavior, students' learning performance and teachers' basic quality.

For teachers' PE teaching behavior, it can be evaluated from the following four aspects: the formulation and implementation of the physical education object; the processing and transformation of the physical education content; the construction and management of the physical education design; the guidance and training of the learning methods.

For students' learning performance, we think that we should evaluate from three aspects: the exertion of students' subjectivity; the change of students' learning styles; and the process of students' personal experience.

According to the survey, we think that the teachers' basic quality in the teaching of PE cooperative learning is embodied in three aspects: the concept of physical education, the attitude of physical education and the basic skills of physical education.

According to evaluation system of cooperative learning model, we designed the "sports classroom teaching evaluation table" to quantify the physical education teaching in class. In this table, students' developmental evaluation mainly includes: daily learning evaluation, monthly comprehensive evaluation, examination evaluation and term comprehensive evaluation.

Teaching experiment analysis

Long jump is the basic content of college physical education curriculum. We analyze that the basic physical factors which affect long jump performance are gender, height, weight, waist and abdominal muscle strength, and fast running ability under the same conditions.

Table 1
Comparison of Sports Ability and Physical Condition Between Experimental Class and Control Class Before Experiment

Index	Experimental class (n=132) M±SD	Control class (n=128) M±SD	Difference	p
Height(cm)	175.96±10.72	175.78±9.98	+0.18	>0.05
Weight(kg)	65.52±10.31	65.21±12.18	+0.31	>0.05
Sit-up	55.18±5.67	55.27±4.98	-0.09	>0.05
Push-up	18.23±2.21	19.07±1.98	-0.84	>0.05
50-meter race	7.42±2.12	7.35±1.99	+0.07	>0.05

In order to enhance the reliability of the experiment, we used two universities to verify the same grade. There are 132 students and 128 students in experimental class and control class, respectively. The sports ability and physical condition of students before the teaching experiment are shown in Table 1.

From Table 1 we can see that there was no significant difference in all indicators ($p>0.05$). That is, there was a certain comparability between the experimental class and the control class in the basic indicators.

However, before and after the teaching experiment, the scores of the experimental class and the control class have changed a lot, and the specific changes are shown in Table 2.

Table 2
Comparison of Long Jump Score Between Experimental Class and Control Class After Experiment

	Experimental class (n=132) M±SD	Control class (n=128) M±SD	Difference (cm)	p
Before experiment	427.96±77.96	441.52±80.11	-13.56	>0.05
After experiment	492.78±66.31	456.12±79.18	+36.66	<0.05

From Table 1 we can see that before experiment teaching the average score of long jump of the control class was better than that of the experimental class, but there was no significant difference between the two classes ($p>0.05$). After experiment teaching, the average score of the students in the experimental class was exceeded 36.66 cm to the control class. After T test, there were significant differences between the two classes after the experiment.

Table 3
Comparison of Sports Ability and Physical Condition Between Experimental Class and Control Class Before Experiment

Index	Experimental class (n=137) M±SD	Control class (n=135) M±SD	Difference	p
Height(cm)	173.56±11.72	174.15±8.76	-0.59	>0.05
Weight(kg)	66.72±9.21	66.63±11.77	+0.09	>0.05
Vital capacity	2521.17±660.31	2576.56±655.33	-55.39	>0.05
Hemoglobin content	141.68±6.32	141.97±5.98	-0.29	>0.05

Through the analysis of Table 1 and Table 2, we can see that the cooperative learning teaching method which is easier to arouse the students' active participation is compared with the traditional PE teaching method. The PE Teaching under the guidance of the cooperative learning teaching method can improve the students' achievement, and the average score is obviously higher.

800-meter race is the basic content of college physical education curriculum. We analyze that the basic physical factors which affect long jump performance are gender, height, weight, vital capacity and hemoglobin content under the same conditions.

In order to enhance the reliability of the experiment, we used two universities to verify the same grade. There are 137 students and 135 students in experimental class and control class, respectively. The sports ability and physical condition of students before the teaching experiment are shown in Table 3.

From Table 3 we can see that there was no significant difference in all indicators ($p>0.05$). That is, there was a certain comparability between the experimental class and the control class in the basic indicators.

After the teaching experiment, the student's 800-meter race results have changed as shown in Table 4.

Table 4
Comparison of 800-Meter Race Score Between Experimental Class and Control Class After Experiment

	Experimental class (n=137) M±SD	Control class (n=135) M±SD	Difference (second)	p
Before experiment	203.31±26.33	202.52±26.11	+0.79	>0.05
After experiment	172.38±37.51	196.65±38.26	-24.27	<0.05

According to the analysis of data in Table 4, the average scores of the students in the control class before the experiment are basically the same as those in the experimental class ($p>0.05$). After the experimental teaching, the average score of the students in the experimental class improved greatly. After T test, there were

significant differences between the two classes after the experiment. It shows that the performance of cooperative teaching experiment class is significantly better than that of the control class.

The reason for selecting shot-put is mainly because the teaching of shot-put is boring and difficult to teach. So, students are not active enough to apply general teaching methods. We analyze that the basic physical factors which affect shot-put performance are gender, height, weight, psoas and abdominal muscles, and lower limb explosive power under the same conditions.

In order to enhance the reliability of the experiment, we used two universities to verify the same grade. There are 103 students and 105 students in experimental class and control class, respectively. The sports ability and physical condition of students before the teaching experiment are shown in Table 5.

Table 5
Comparison of Sports Ability and Physical Condition Between Experimental Class and Control Class Before Experiment

Index	Experimental class (n=103) M±SD	Control class (n=105) M±SD	Difference	p
Height(cm)	172.86±12.33	173.05±10.56	-0.19	>0.05
Weight(kg)	68.02±8.33	67.83±9.17	+0.19	>0.05
Sit-up	53.27±6.71	53.56±5.76	-0.29	>0.05
Standing long jump	1.73±0.57	1.72±0.58	+0.01	>0.05

From Table 5 we can see that there was no significant difference in all indicators ($p>0.05$). That is, there was a certain comparability between the experimental class and the control class in the basic indicators.

After adopting the cooperative teaching experiment and comparing the teaching results, the shot-put results of the experimental class and the control class is shown in Table 6.

Table 6
Comparison of Shot-Put Score Between Experimental Class and Control Class After Experiment

	Experimental class (n=103) M±SD	Control class (n=105) M±SD	Difference(cm)	p
Before experiment	688.62±216.52	690.12±213.78	-1.50	>0.05
After experiment	780.18±307.21	716.25±280.16	+63.93	<0.05

According to the analysis of data in Table 4, the average scores of the students in the control class before the experiment are basically the same as those in the experimental class ($p>0.05$). After the experimental teaching, the average score of the students in the experimental class improved more than 92cm, at the same time, the score of the students in the control class only improved about 26cm. It means that the performance of cooperative teaching experiment class is significantly better than that of the control class.

The results and analysis of the questionnaire

Table 7
Investigation and Statistics of Students for Cooperative Learning in Physical Education

Index	Like	Dislike	Indifferent	1-2 students/ group	3-5 students/ group	6-9 students/ group	More than 10 students/ group
Sophomore	75.38%	8.39%	16.23%	18.12%	78.23%	1.25%	2.4%
Junior	82.75%	3.64%	13.61%	46.92%	43.12%	6.93%	3.03%

Table 8
Investigation and Statistics of Parents for Cooperative Learning in Physical Education

Index	Important	A little important	Indifferent	Unimportance
Number	301	261	12	33
Percentage	49.59%	42.99%	1.98%	5.44%

Cooperative learning mainly improves students' learning initiative and improves their learning quality through students' mutual help and mutual learning in physical education. From the student cooperative learning questionnaire (shown in Table 7), we can see that the number of sophomore students who prefer cooperative learning is slightly less than that of junior students.

According to the parents' questionnaire (shown in Table 8), it is considered that the cooperative learning plays a good role in the development of students' PE learning habits.

Conclusion

In this paper, a cooperative learning sports teaching system is constructed initially, and a cooperative learning method in physical education teaching based on multiple intelligence theory is proposed. The method aims at achieving the full play of students' subjectivity and creativity and realizing the students to become the subject of learning. The cooperative learning mode of physical education has proved its good teaching effect and excellent adaptability through the experiments in several universities' physical education courses. The research results have certain guiding significance for college physical education in the future.

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