Research on Application of Game Theory in Sports Teaching

Hong-Mei WEN¹,a, Tie-Xiong ZHANG¹,b, Lu LU²,c, Zhen CAI²,d

¹Hunan University of Science and Technology, Xiangtan
²Hunan Urban Professional College, Changsha

a631759132@qq.com, b1620680233@qq.com, c952932588@qq.com, d522824589@qq.com

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Abstract. Physical education teaching is a kind of organized and discipline education teaching process, it is a significant vulgar to focus, formation law of slow, gradually evolved into a process of Nash equilibrium. The result is the formation of teachers and students are willing to form the best ideal result; Due to the game between teachers and students is a long-term repeated game, must set up the prestige in the process of teachers in the game, set a quota system in class, students can achieve transmutation effect, get the scouring under repeated game, the Nash equilibrium of pareto optimality

Game theory is to various events in people’s behavior strategy abstract, induction and summarizes the type and form of control theory, also the theory involves all aspects of people’s life, become a modern enterprise system, such as economy military strategy management of one of the theoretical basis. Sports as an important branch in education, is the key part of school sports work, pay more attention to the study of physical education teaching and discussion, is an important link in the school sports teaching. Through game analysis and discussion to the school sports teaching, the writers of the game between students and teachers is obtained as a result, to effectively promote the development of school sports teaching provides referential comments and Suggestions.

The Basic Concept of Game Theory

Game Theory can be also known as game Theory (Games going), is a competitive or competitive nature of the phenomenon of a kind of Theory and method, it is both a new branch of modern mathematics, is an important subject of operational research. Game theory is formally proposed in recent years of formal discipline, but the thought origin of game theory in our country has a long history. Sun Tzu’s the art as a famous ancient Chinese military theory, game theory contains the thoughts. 1994 three famous game theory researchers were awarded the Nobel Prize in economics, game theory marks the formal become an important part of research subjects. Game can divide the following main parts: the cooperative game and non-cooperative game, complete information game, static game and dynamic game with incomplete information. The main elements include: game players, strategies, gain and loss, the results of the game, game equilibrium. Of the elements of the game players ultimate goal is to obtain interest, interest with many different forms under the different situation. Teaching interests include, from the school’s reputation, economic benefits to the teachers’ earnings, to the cultivation of the students the results there are various forms of profit. From components ways, participants in the game, and the result of the game is closely related to life, does not exist in our life and the result of the game as the rules of the game change constantly. But in the teaching, teaching environment, that is, the teaching rules of the results of teaching to have serious change.
Institutional reform and innovation is the discipline of the environment and change, this concept was the public recognition. It not only can be supported by theory, from the aspects of game theory in the teaching environment can also be validated by the micro. In sports teaching, sports confrontational and competitive nature environment coincides with the game theory, weibo round of processing and analysis provides an efficient development environment. Due to the physical education mainly in outdoor, participate in the main body of teachers and students is a direct interaction, easily affected by many uncontrolled factors; Compared with other courses, nature of the game better, therefore, physical education teachers must have better knowledge of game theory.

**The Organization Teaching Mechanism**

Organization of each type of teaching is the must have a link, but the particularity of physical education curriculum, marked the organization of sports teaching, the course has a big difference. Physical education curriculum teaching mainly include the organization, the whole set of class, of all the team to adjust and relocate and practice the exercises of order, etc. Physical education teachers have to require certain ability to organize teaching, specific to each class teaching, teaching must be in the form of its organization form a mechanism, in reflect their own teaching style at the same time, also want to reflect their own habits, let the student focus, namely the students to know and understand you often organize teaching means, methods and organizational forms, to ask students to focus on this, finally formed a kind of practice. Formed in this way, students in the class when automatic orderly classroom habits, the students’ initiative, not only can reduce the elapsed time of sports classroom organization, more can form a good classroom teaching environment. If the teacher’s teaching organization form did not form practice, early will cause negative effect. Different organization teaching strategies, students have different coping strategies, the formation of the relationship between the two is a kind of game process. The game relation between teachers and students can use the benefit game result between matrix representations (figure 1).

![Figure 1. Game Relation of Gain Matrix.](image)

People on both sides the game, one party is refers to the teacher, the other is refers to the students, is A kind of game, two people in order to facilitate research analysis, research the students as A unified whole, the assumption is A teacher and A student of the game, between teachers use A said, students expressed in B. Teacher (A) the game of strategy set is the organization’s order and disorder, student’s policy set is order in and vacant (both policy set refers to the action plan and behavioral strategies), matrix number refers to the teachers and students to adopt different strategies after the game, which is the result of the game, the number 1 refers to the benefit of teachers, the number 2 is the students’ benefit.
Teachers mainly refers to the profit organization mediation team less time, reduce energy consumption, the organization effect is good, can smoothly complete the teaching mission; Students benefit is to point to improve the physical fitness, fitness effect is good, learned the technology, improved skills, etc. If teachers in teaching organization has certain personal characteristics of organization, organization effect is good, has formed a certain style of teaching, orderly organization of teaching strategies for the teachers, the students’ union to guide how to organize formation, how to form a contact order, strategy, and the result is organized gain both teachers and students is the game of the party, the teachers and students benefit for 3 ("3" has no special meaning, this kind of concrete numerical foot-and-mouth disease arbitrary assumption). If there is no fixed in the tissues of the teacher in the whole teaching organization form of teaching, not formed a practice, students feel puzzled, long-term down good teachers should organize team to complete the teaching mission large consumption of energy, time consuming, students are also more don’t understand the teacher’s teaching organization mode, bewildered, disoriented, poor students exercise effect, teachers and students both sides game in this case, the teacher who benefit for - 4, students for - 3; When the teacher organized, but this order is not fixed, not formed a kind of practice, students have no fixed strategy to deal with, must be to adapt to the organization of teachers are not fixed process, in this case, teachers and students both sides benefit, 1 on teachers, students - 1; If change the class itself is good class atmosphere, at the same time in the past in sports class, has formed a good form of teaching organization, or the athletics member of committee or class cadres capable, at this time of teachers organize teaching disorderly, namely without some form of organization of teaching, the teacher strategy disordered, students strategy in game mode, teacher’s benefit is 2, students - 1.

Through to the teachers and students (A) (B) under the organization adopt different strategies in teaching of benefit analysis found that the two sides (3, 3) is the most ideal benefit, namely the teachers in teaching organization always adopt the strategic behavior of orderly, students responded with A group in the way. As the reason of teachers and students which is a common pursuit of results between the two sides are willing to, reached a Nash equilibrium (Nash equilibrium, named after the deep first put forward by American mathematician Nash). This equilibrium, teachers and students both sides won’t appear deviation, because of the deviation is not good for both sides, for teaching strategies with other organizations in matrix form of benefit is less than the equilibrium profit. So, orderly organization of teaching is an ideal behavior should be used.

**Repeated Game and Transmutation Effect**

The same teaching class time is an academic year, in this school year, teachers and students is a long-term interactive, repeated game dynamic process. The formation of class atmosphere, the formation of teaching style is a long-term process of the change in gradually appear. For example, a class most of the students and active (or lazy), is the enthusiasm of whole class exercise high (or mar), when teachers accustomed to no roll call, late for class, the number of class does not count the number of people have left early. This lazy, late, leave early, or to a variety of reasons to escape the bad behavior of physical education, teachers should adopt different strategies, different strategies can show different results (profit), these strategies and benefit can use game theory of repeated game, with the method of game tree diagram analysis (figure 2).
Can be seen from the figure 2 game party A for teachers, said game party B students, the number of the figure, the first representative teachers’ benefit, the benefit is mainly refers to the teachers’ consumption, time consuming, the completion of tasks of teaching quality and teaching, etc.; Second number refers to the benefit of students, the benefit on behalf of the student benefits to satisfy his bad behavior, does not refer to the student of other benefits (such as technology, exercise the effect, etc.). Teachers’ policy set have bad behavior of students to stop and don’t stop, stop in A trusted and untrusted two, if the confidence of the benefit from A and B? If not credible, then stop the teacher, the student the benefit of what? Below in stages to analyze teachers’ (A) and (B) the process of repeated game between students, this process can be divided into three main stages.

First stage: the teacher to student’s bad behavior (bad behavior refers to the above mentioned) don’t stop, stop it. This situation teachers did not lose anything (such as energy and time), benefit is 0, and students can you do what you want to do, to benefit from 3.

The second stage: the teacher to stop. Again in this stage, if the student to the teacher to stop is approved, have a certain threat, for example, miss how many times the current PE score zero points, 1 points late arrival, did not perform well in class button how many classification, in this way, students can’t break, continue for a long time, can form good class atmosphere, exercise actively, achieve transmutation effect; This case class teachers can smoothly, complete the teaching mission, reduce energy, don’t worry, benefit for 3; While a student is not because we can not achieve their bad behavior, to benefit from 0 (student wrongdoing zero profit, which in turn means he disciplined, earnestly study and exercise). If teachers stop no credibility, do not have the effectiveness of the threat, though, the student cannot achieve the expectation effect of their bad behavior at the time, but after his operation, from time to time there will be a bad behavior in benefit to 1, it indicates that cannot be fully satisfy their bad behavior, only partially met, teachers who benefit to 1, shows that the teacher to stop, but the effect is not ideal, students could not reach the requirements of teachers.

The third stage: under this stop not credible strategy if the game again, the third stage game. Because the student fully believe that the teacher to stop does not have credibility, there will be no threat, students will often appear threat behavior, just do not stop the benefit to almost than, because the students all have scruples, benefit to 2, students and teachers in recognition of your stop don’t stop, the concept of trusted teachers spend more time, energy, benefit for 2, and if the teacher does not stop at this time, let matters slide, long-term, to say the teachers’
teaching difficult, students lazy, organizational discipline is poor, can’t complete the teaching task, teachers’ benefit for - 4, while students completed realized his own bad behavior, to benefit from 3.

Therefore, the repetition of the game by game theory analysis, teachers and students of long-term repeated game requests the teacher to stop must have credibility and threats, strict requirements for the class, which must have certain rules and regulations and disciplinary punishment system, and strictly adhere to the implementation, like this can form good class atmosphere class. To achieve high teaching effect, achieve the equilibrium (3, 0), that is satisfactory for both the teachers and students the refining Nash equilibrium of a dynamic game of for a long time, as a rational both sides to pursue this kind of equilibrium solution, don’t want to deviate from.

**Conclusion**

(1) Due to the particularity of physical education, as a PE teacher should have more sense of game.

(2) The organization of teaching, the teacher should always adopt the strategy of orderly, focus from shows common to students, and form practice, as students rational application of orderly organization, the two sides reach Nash equilibrium to those games.

(3) The long-term teaching process, teachers and students is a process of repeated game, the teacher to the student to stop bad behavior must be credible and threat, so, make necessary regulations and rules and discipline and consistent implementation is necessary.

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**References**


