

The Relationship Between Children's "Run Ahead" Education and the Academic Achievement Gap

-- Game Theory Based Perspective

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Abstract

With the change of the times, "run ahead" education has been expanding its depth and breadth. Although quality education has been promoted for a long time, "run ahead" education is still favored by families. For the current stage of "run ahead" education, the impact on children's academic achievement gap should not be underestimated, which requires an in-depth discussion on the relationship between "run ahead" education and academic achievement gap. The "run ahead" in game theory is used to construct a payment matrix model for the "run ahead" education dilemma. Based on the analysis of other reasons, we conclude that families should start to change their mindset, regulatory system, and educational resources in order to make "run ahead" education more ecological.

Keywords

"Run ahead" education; Game theory; Academic achievement gap; Prisoner's dilemma.

1. Definition of "Run Ahead" Education

The so-called "run ahead" education, that is, to learn in advance in regular primary and secondary schools, has not yet taught the relevant knowledge and skills [1]. The "run ahead" is necessarily based on the "starting line" of education, and on December 11, 2014, the Ministry of Education held a meeting of the party group, and the proposition of "not letting children lose at the starting line" This proposition was first officially recognized and publicly proposed. The connotations of the proposition "the starting line" are: comparing the process of children's education to a race on a sports field, there is a realistic starting line; the starting line is particularly important, and early education plays an important role in children's development; the position on the starting line is crucial, implying that the earlier the time in educating children, the better; the starting line is the best. The earlier in time the better; Losing at the starting line will lose at the finish line, and losing in early education will also lose the future [2]. From the horizontal analysis, the types of "run ahead" education include: cram school for subjects such as language, mathematics and English, art classes such as piano, chess, calligraphy and painting, and classes for concentration and self-control training, while the vertical analysis includes fetal education classes, parent-child classes, early education classes and preschool classes and other early education training courses. Although quality education has been promoted for a long time, subject-based "run ahead" education still occupies the mainstream of the market, and although there are relevant policies to curb the occurrence of such behavior, it is still Although there are policies to curb such behaviors, it is still unavoidable that some families try every possible way to pull away from the "starting line", which is undoubtedly a serious challenge to China's educational environment [3]. This paper explores the relationship

between "run ahead" education and academic achievement gap from the perspective of game theory.

2. The Model Construction of "Run Ahead" Educational Dilemma

Game theory, also known as response theory, is a theory that analyzes the strategies that participants, in a perfectly rational situation, choose to maximize their own personal interests by comparison. It is based on the assumption that everyone is an "economic person" and aims to maximize their own interests. In "run ahead" education, each family is a player in the game, and both "participation" and "non-participation" are players of this game. In the "run ahead" game, families are the players, and "participation" or "non-participation" is the strategy of the "run ahead" game, and the benefit of the game is the academic achievement obtained by choosing "participation" or "non-participation" [4].

The "Prisoner's Dilemma" is the most famous paradox in game theory, which shows how difficult it is for people to cooperate for the common good, because they all pursue their own interests [3]. Nash equilibrium is an important term in game theory, and its main feature is that it is optimally selective, it is the best course of action given the behavior of the other players, and if one of them changes his strategy, his gain will be reduced. In short, each rational player in the equilibrium picks the best strategy to deal with the choices of the other players. However, at the Nash equilibrium, each rational participant does not have to change his strategy individually [5].

From the perspective of the beneficiaries, the counterpart is the Pareto optimum, i.e., a certain set of strategies that makes a whole achieve the highest benefit is called Pareto optimal. The essential difference with Nash equilibrium is that Pareto optimal takes the overall benefit as the starting point, while Nash equilibrium takes the individual benefit as the starting point.

2.1. "Run ahead" Educational Distress Payment Matrix Model

Based on the payment matrix model of the Prisoner's Dilemma and Table 1, we analyze the relationship between the gap in academic achievement when the economic and cultural conditions of families A and B and the intelligence level of their children are not equal.

Table 1. "Run ahead" Educational Distress Payment Matrix Model

The "run ahead" Education Dilemma Game		
Family A / Family B	Participation	Non-participation
Participation	$(a+a', b+b')$	$(a+a', b)$
Non-participation	$(a, b + b')$	(a, b)

Family A and family B are the insiders. Where "a" denotes the academic achievement points of the children of family A; "a'" denotes the academic achievement points of the children of family A that have been raised the points of academic achievement gained after "run ahead" education; where "b" denotes the academic achievement points of the children of family B; "b'" denotes the academic achievement point of the children of family B that have been raised the points of academic achievement gained after "run ahead" education.

1. When both family A and family B adopt the "participation" strategy, the academic achievement gap between the children of family A and family B due to "starting line education" is $|a+a'-(b+b')|$.
2. When family A adopts the "participation" strategy and family B adopts the "non-participation" strategy, family A gains a' units of academic achievement and family B gains 0

units of academic achievement. The achievement gap between the children of family A and family B due to "run ahead" education is $|a+a'-b|$.

3. When family A adopts the "non-participation" strategy and family B adopts the "participation" strategy, family A gains 0 units of academic achievement and family B gains b' units of academic achievement, and the academic achievement gap between family A and family B is $|a-(b+b')|$. The academic achievement gap between the children of family A and family B due to "run ahead" education is $|a-(b+b')|$.

When families A and B both adopt the "non-participation" strategy, the academic achievement gap between children in families A and B due to "run ahead" education is $|a-b|$, which is better than when families A and B both adopt the "participation" strategy. The advantage of this strategy is that the cost of this strategy is 0.

2.2. Ideal Model of "Run Ahead" Educational Dilemma Payment Matrix

For better analysis, an ideal model is constructed in this paper, i.e., when the economic and cultural conditions of families A and B and the intelligence level of children are equivalent, the payment matrix model is shown in the table2, and the following analysis is made.

Table 2. "Run ahead" Educational Distress Payment Matrix Model

The "run ahead" Education Dilemma Game		
Family A / Family B	Participation	Non-participation
Participation	$(x+y, x+y)$	$(x+y, x)$
Non-participation	$(x, x+y)$	(x, x)

Family A and family B are the insiders. When $a=b=x$ and $a'=b'=y$, where "x" denotes the academic achievement points of the children of family A and family B; "y" denotes the academic achievement points of the children of family A and family B due to the education of "run ahead" education.

1. When both family A and family B adopt the "involvement" strategy, both of them end up paying the same level of costs - time, money, energy, etc., when the children of family A and family B have the "A The gap in academic achievement between the children of family A and family B due to "run ahead" education is zero.

2. When family A adopts the strategy of "participation" and family B adopts the strategy of "non-participation", the children of family A are more likely to jump the gun than those of family B. Family A gains y units of academic achievement points, while family B gains 0 units of academic achievement points, and the academic achievement gap due to "run ahead" education is $|y|$.

3. When family A adopts the strategy of "non-participation" and family B adopts the strategy of "participation", the children of family B "jump ahead" of the children of family A. Family B gains the academic achievement gap due to "run ahead" education is $|y|$.

4. When both family A and family B adopt the "non-participation" strategy, the academic achievement gap between the children of family A and family B due to "run ahead" education is 0, which is better than the "participation" strategy adopted by both family A and family B. "The advantage of this strategy is that the cost of this strategy is zero.

2.3. Specific Analysis

When both family A and family B adopt the strategy of "participation", it constitutes a Nash equilibrium for both sides; while when both family A and family B adopt the strategy of "non-participation", it constitutes a Pareto optimum for both sides and achieves a win-win situation, which makes the two sides change from a "non-cooperative game" to a "cooperative game".

When both family A and family B adopt the strategy of "non-participation", it constitutes the Pareto optimum for both parties and achieves a win-win situation, which makes the transformation from "non-cooperative game" to "cooperative game"[8]. In the "run ahead of time" education dilemma payment matrix model, although both players choose to adopt the "participation" strategy or both adopt the "non-participation" strategy, the "run ahead" education dilemma payment matrix model is a Pareto optimum. "Run ahead" education results in a zero achievement gap for the children, but when both players choose to adopt the "participate" strategy, the players in the "run ahead" education game pay a significant price - a disincentive to participate. The cost to the players in the "run ahead" game is high, it inhibits the free development of children and the liberation of body and mind [22].

Although according to the theory of strategic interaction in game theory, each player's choice of his own action must be based on the subject's judgment of how other players will react, and the source of external motivation for whether to participate in "run ahead" education is mostly other players [6]-[7]. However, when family A chooses the strategy of "participation" in order to achieve its own best interests, family B will also choose to "participate" in "run ahead" education under the influence of family A's strategy; and when family A chooses the "non-participation" strategy, family B will still choose the "participation" strategy in order to expand its advantage and enhance the competitiveness of children's education, no matter how one of them chooses. When a family has a higher preference for education and a more capable student is involved in "run ahead" education, other families will invest in "run ahead" education in order to narrow the gap, so that their children can have more educational opportunities to enhance their competitiveness in further education [4].

Since families choose whether or not to participate in "run ahead" education based on the principle of maximizing their own benefits, and the motivation for participating in "run ahead" education is to obtain longer-term benefits, most families are worried about "losing at the starting line" without considering the physical and mental development of their children. This leads most families to worry about "losing at the starting line" instead of considering the physical and mental development of their children, setting off the irrational side of the bad school culture of blindly participating in "run ahead" education, and leading to collective irrationality and excessive consumption of "run ahead" education. This leads to collective irrationality and excessive consumption of "run ahead" education, which reduces the benefit of society as a whole [9].

3. Measures to Cross the "Run Ahead" Education Dilemma

Facing the conflicts and games of many "stakeholders", in order to promote the ecology of "run ahead" education, it is necessary to start to change the concept, regulatory system, educational resources and other aspects of regulation, so as to protect the interests of all parties and restrain the behavior of all parties [10].

3.1. The Change of Traditional Concepts and Bad Social Culture

The core of the "run ahead" education bureau is to improve the level of human rationality, which essentially lies in the transformation of educational concepts, that is, the formation of the needs of today's social development, the formation of a correct concept of human development, talent, knowledge, etc. [23]

The fixation on the ideas of "learning is superior", "studying changes destiny", "expecting children to become dragons and phoenixes" and so on has led to parents' expectations of their children being greatly raised, which is the main reason for "run ahead" education is the main reason for the fire, individual families ignore the laws of physical and mental development of children, thus adding a series of unnecessary burdens to their children. As the "twin

experiment" has revealed, the most effective way to learn is to follow the laws of physical and mental development of children. Strictly control the direction of social opinion, reduce the spread of misleading educational concepts, society, schools and communities should take the responsibility of spreading the correct concept of parenting, and regularly hold public lectures and parent classes to correct misconceptions in a timely manner.

In order to change the status quo or maintain their own class advantage, all classes coincidentally participate in "run ahead" education. Those in lower classes want to make a stronger class leap through "run ahead" education, while those in higher classes want to achieve class replication [4]. through "run ahead" education. Parents are not only responsible for their children's success, but also for their own expectations, and many families have to grab the "run ahead" education as a "lifeline" to match their own expectations for their children. The family and society should be actively guided to change the concept of education and raise the rational level of participation in "run ahead" education. Change the "irrational" culture of "following the trend" and "comparing", and promote the creation of a rational education culture.

3.2. "Run Ahead" Education Is Included in the Management of "Load Reduction" and Improvement of System Policies

In game theory, even in the case of cooperative games formed after correcting misconceptions about parenting, it is not enough to rely on the mutual trust of the insiders as a guarantee for the long-term existence of cooperation; a set of commonly followed systems is the key to long-term cooperation among the insiders [22].

The relevant education departments should take up the relevant social responsibility to strengthen the supervision of "run ahead" education in the subject category to reduce the burden. Not only should they strengthen the supervision of various kindergartens and related training institutions, but they should also act as a good counselor for parents, guiding various kindergartens and families to choose different education methods according to the actual situation of their children, eliminating extreme practices such as pulling out the seedlings and helping them grow, and teaching children according to their psychological and physiological characteristics at different ages, so that they can learn happily [11]. The schools concerned must strictly follow the relevant national regulations and abolish entrance placement tests. Families and schools should form a joint effort in education and properly handle the relationship between children who participate in "run ahead" education and those who do not, so that the burden can be reduced from the "head" [12].

This hypothesis was tested using multinomial logistic regression based on data from the 2008 China General Social Survey. The results show that educational inequality is most serious in the early stage. Therefore, educational inequality should receive more government intervention at an early stage [24].

It is necessary for the government to improve the corresponding regulatory measures, improve the relevant laws and regulations, require clarification of the subject of supervision, and raise the threshold of access to relevant institutions. The government should set up a monitoring group led by the education department, in conjunction with the fire department, industry and commerce, and the civil affairs department, to be responsible for the registration, application, registration, supervision and inspection of "run ahead" education institutions, so as to bring the relevant education institutions under the supervision of the state [13]. It is necessary for the government to strengthen the appropriate control over "run ahead" education in order to curb the social reproduction of the gap opened by "run ahead" education and to promote the effective functioning of the intergenerational effect of education [14].

Improve the evaluation system of college entrance examination and the single evaluation method of schools. In the traditional concept, most people believe that academic universities are the mainstream of education today, so much so that after the promulgation of the policy on

quality education, subject education is still placed at the center of supremacy, and further education is in fact a talent selection process, and currently the state is making greater efforts in the education of professional and technical personnel, which means that the proportion of entering academic universities is being cut, coupled with the subject class The "run ahead" education has a "threshold effect", which makes the "run ahead" education as the main tool for further education[15]. The so-called winning and losing criteria are naturally knowledge and skills, scores and promotion rates, and key and non-key schools [16]. Obviously, the "primary schooling" of kindergarten education and other "run ahead" education is a manifestation of the downward extension of examination-based education [17].

The state should clarify the objectives of the college entrance examination evaluation and evaluate students in a diversified way. Improve the form and content of examinations in order to promote students' all-round development. Give full play to the autonomy of colleges and universities in enrollment, and promote the efficiency, science and fairness of enrollment [18]. At the same time, it is especially important to improve the "score-only" talent selection mechanism and increase the ratio of various achievements in the talent selection mechanism. Schools should change the evaluation method mainly based on final results of examinations, which is too single and overemphasizes the function of "screening and selection" and neglects the motivational function of students, and should be supplemented by diagnostic evaluation and process evaluation to improve the evaluation system [19].

3.3. Improve the Quality of Teachers' Teaching

From the perspective of families' intrinsic motivation to participate in "run ahead" education, the lack of quality educational resources is key to families' choice to participate in "run ahead" education, and the delayed nature of educational benefits and the effectiveness of quality teachers for short-term gains lead to quality teachers as a key motivator. resources as a key driver of this. In the absence of quality teachers, the lack of mobility and the difficulty of replenishing quality teachers has led to a decline in the overall quality of teaching and learning, and has even led to a shortage of educational resources, adding to the already anxious situation. The state's institutional safeguards and its related policies, rules, laws, regulations, and provisions are important institutional environments in the professional development of teachers [20]. For example, good pre-service and in-service teacher education, teacher training policies and mobility systems for quality teachers can help improve the overall professionalism of teachers. The school, as the direct management of teachers, should select academic leaders with cohesive and professional knowledge to form teaching teams within the teacher community to strengthen teachers' sense of self-development, thus motivating learning and better serving professional development [21]. In fact, improving the quality of teaching is the core content of all proposals to improve the quality of schooling, and by raising the threshold of teaching is not a key policy to improve the quality of teaching [22].

To sum up, looking at the issue of "run ahead" education from the perspective of game theory can help us better understand the nature of the problem and use it as a basis to carry out relevant measures, so that the culture of irrational participation in "run ahead" education can be effectively reduced. Although "run ahead" education in accordance with the laws of children's physical and mental development can help build up long-term motivation for children, further research is needed on the level of education that children can receive at a specific stage, so that education can be scientific and effective.

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