

How to Prevent College Students from Cheating in Exams? ——Based on Game Theory

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Abstract: As an effective method of evaluating teaching and strengthening students' learning, examination is still prevalent in many universities. But the equity and impartiality of the examination results is prone to be questionable due to students' cheating behaviors. Under the circumstance, this paper applies Game Theory to analyze students' cheating incidence in depth so as to find the real factors that affect their behaviors. And some corresponding solutions based on the analysis are also supplied as remedies.

Keyword: examination; cheating; Game Theory

1. THE CURRENT SITUATION OF STUDENTS CHEATING IN COLLEGES

College exam is a means of testing students 'academic level and strengthening students' learning. To guarantee the authenticity and validity of the test results and prevent cheating has always been an important part of Style Construction of University Teaching and Management in universities. China Youth Daily Social Investigation Center of China has conducted a survey to 2000 people with an internet questionnaire. Data shown that, 60.4% of the respondents admitted the cheating behavior of their own and that of their fellow students in college; 66.6% of respondents felt the current students cheating is widespread; 54.3% of respondents believed that university students who cheat in examinations are not honest; 50.6% of respondents suggested that strict examination measures should be taken to prevent college students from cheating. The survey data is inevitably something of a surprise, although the universities have repeatedly reaffirmed their commitment to improve their examination rules. In spite of some punishment, the proportion of college students involving cheating in examinations is high and goes beyond many people's expectation.

The researches some experts and scholars also show that, students cheating behaviors include cheating peek, notes, transmission, mobile phone cheating, and other types of volume change. And the cheating can be divided into two forms, single and multiple cooperative cheating. College Students cheating may not only corrupt the atmosphere of study, but also may foster a wrong attitude toward leaning. According to the major public opinion, college students being lack of education of integrity and self-discipline is the root cause of the rampant cheating.

In every season of final exams, promotion of integrity from levels of both schools and colleges during the exams can always be seen everywhere on campus. Community bulletin boards or classroom doors are posted with a variety of creative posters and propaganda slogans against exam cheating. For example, in the Institute of Chemical Technology laboratory building of our school such a banner hanging on the wall, "Hey, your friends said cheating on exams would not get red envelopes from them". With so much publicity efforts on stressing the integrity as well as the repeated reminding of the same kind from their class teachers before the exam, plus some precedent example of students who cheated and were severely punished according to the rules and regulations, why do students continue to risk cheating? Therefore, it is crucial to figure out how we can avoid or eliminate the cheating phenomena and truly achieve the integrity of education or ensure the fairness and justice in education. This article aims at finding some constructive ways to improve the situation from the perspective of Game Theory.

2. GAME MODEL ANALYSIS OF STUDENT CHEATING

Students cheating in exams is essentially a place in the game between students and invigilating teacher. That is student cheating depends not only on whether students cheat unilateral decision-making, but also closely related to the examiners whether the teachers wanted to punish cheating. Common strategic

behavior of students and teachers examiner determines the final cheating has occurred. Therefore, effective prevention of cheating cannot do without the analysis of mutual behavior between the two sides of the game. By constructing student exam cheating game model to analyze the factors affecting students take cheating and not cheating policy behavior, this paper want to proposed the construction of an effective system to prevent students from cheating in exams.

2.1. The Basic Elements of the Model

- (1) Participants: The game is a double game. Invigilator teachers and students are participants. The participants are rational people and seek to maximize their own interests. Both have full information and both the strategy and payment functions in different strategy is open and transparent.
- (2) Strategy space (The action space): Invigilator teachers can chose to not seriously invigilate and invigilate seriously, while students can chose to cheat and do not cheat.
- (3) Utility payoff function

Assumed, as long as the invigilator teachers invigilate seriously, student of cheating is bound to be found. Students losses (including cheating course grade recorded as zero, punished by a warning, demerits, dismissed and other penalties) referred to as -V, Invigilator teachers because of their invigilation duty must be carefully invigilate, so in this case teachers return is zero. If teachers are not strict invigilation, the students cheat successfully, students obtain excess returns (as well as other incentives to get high scores, etc.) referred to as B. If the teacher does not seriously invigilate and student cheating and found to be supervised, the invigilator teachers will be subject to certain penalties, losses recorded as -D. If teachers are not strict invigilation, students do not cheat, the invigilator will bring extra revenue lazy, denoted by S. If students do not cheat, then student achievement is real and income is zero. Utility payoff matrix shown in the following table:

 Table2.1. Utility payoff matrix

Students Invigilator teachers	invigilate seriously	not strict invigilation
Cheating	-V, 0	B, -D
Not cheating	0, 0	0, S

2.2. The Nash Equilibrium Analysis

According scribing method shown that there is no student and invigilator teachers game of pure strategy Nash equilibrium. Both participants must seek mixed strategy Nash equilibrium. The idea of seeking the probability distribution of mixed strategy Nash equilibrium isto make each of the participants randomly choose a pure probability distribution strategies, and make the other person using different strategies getting the same benefit, thus to calculate each participant randomly selected probability of each pure strategy.

Assumed that the probability of students cheating at random case is p, the probability of not cheating is 1-p, the probability of invigilating ineffective is q and the probability of serious invigilation is 1-q. U_{T1} represents invigilator teachers utility under the condition of serious invigilation, U_{T2} refers invigilator teachers utility under the condition of ineffective invigilation.

$$U_{T1}=q^*0+(1-q)^*0$$
$$U_{T2}=-D^*q+S^*(1-q)$$
Assumed $U_{T1}=U_{T2}$, then $q=\frac{S}{D+S}$ (1)
In the same way, $p=\frac{V}{V+B}$ (2)

At this time, the probability of students cheating and the probability of teachers invigilating ineffective are the the probability of mixed strategy Nash equilibrium.

Xiaohong Li & Yaxin Meng

From Equation (1), the impact of student cheating factors are D and S. When invigilator teachers are not strict invigilation, students cheat and be supervised found, invigilator teachers will be subjected to certain penalties. We write for this "D". Teacher invigilators is not strict and students do not cheat, then the invigilator extra revenue brought lazy. We write for this "S". Poor invigilation is not advocated by universities, so the study does not S. According to the equation showing, D increases, q will reduce. On the contrary, D reduces, q will increase. So in order to reduce the probability of students cheating, invigilating ineffective must be vigorously punished, which we are accustomed to think that increased penalties for cheating students will be able to reduce the phenomenon of cheating contrary. In practice, how colleges and universities to increase penalties? If the loss is greater than the benefits obtained by teachers undertaken the invigilation, it will lead to teachers do not want to invigilate, invigilating work cannot be carried out. And the punishment is too small will lead to students cheat probability increases. So universities should fully weigh the benefits and penalties, must ensure that gains more than punishment, so as to ensure the invigilator teachers to participate actively in the work of the invigilation.

From Equation (2), the impact of teachers invigilating ineffective factors are V and B. Practice for students who cheat successfully obtained the additional benefits colleges and universities do not promote, so to reducing the probability of teachers invigilating ineffective need to start from the V factor. According the equation (2), V increases, p will increase, and V reduces, p will reduce, V reduced. So colleges and universities must be developed in practice of cheating in a reasonable penalties. The maximum punishment is not better. When the punishment is too heavy, teachers will turn the invigilators a blind eye. That lead to the invigilation invalidity and increase the number of students cheating.

3. SPECIFIC MEASURES TO PREVENT COLLEGE STUDENTS FROM CHEATING IN EXAMS

3.1. For College Invigilators

The probability of student cheating depends on the punishment of invigilator teachers. To strengthen supervision and management of teachers is an effective way to reduce student cheating.

(1) Increase the punishment for ineffective invigilation

The rules and regulations for invigilation should be perfected in universities. Teachers of examiners violations will not be tolerated and strictly play by the rules. Tolerate cheating must be severely punished. So that the probability of ineffective invigilator decreases, and the probability of serious invigilator increases. The number of students cheating on exams declines. For example, once poor invigilation be found supervisors, universities can impose certain fines on invigilator teachers, or the teacher's behavior will be connect with end-of-year evaluation of teachers, academic title evaluation. Universities can also conduct college or department which teachers belong to penalties.

(2) To reward invigilators who catch cheating

All invigilator teachers have understood that invigilation work is abnormal tedious work. And even some teachers said that "Invigilation is more than a long lecture." So, how to motivate teachers invigilators invigilate in accordance with regulations seriously deal with cheating is a problem that many universities must be faced. Specific measures may be adopted, such as, once students be found cheating, teachers will be get a certain amount of reward. End-of-year evaluation will take into account the performance of invigilators usually like.

(3) Improve the reward of invigilation work

Invigilator teachers enthusiasm is not high. That is a common problem present in the majority of colleges and universities. How to improve invigilator enthusiasm is placed in front of major colleges and universities. In practice, we can raise the pay of teachers to improve the working enthusiasm of teachers proctored to a certain extent.

3.2. Aiming At College Students

The probability of invigilation ineffective depends on college students cheating punishment, therefore, to improve the students' punishment system is an effective way to reduce the probability of poor invigilation.

(1) Students cheating will be recorded in students electronic credit file

Compared with found cheating will be canceled degree qualification, students cheat in school recognized student records electronic credit file, may be more easily accepted by invigilator teachers. The heart burden of invigilator teachers because catching students cheating will be reduced a lot. Now the students cheating on exams student records included electronic credit file may impact on students is not as large a degree qualification was canceled, but with the gradual improvement of electronic credit files, students cheating in school recognized student records electronic credit file will be accompanied by the student's life, affecting every aspect of their lives. This measure has also been adopted in many developed countries.

(2) Make other reasonable and appropriate rules for the punishment of cheating

In addition to (1), colleges and universities can also use the following measures. Once student cheats, grade his test course zero and do not offer the opportunity for a make-up. The student must work on the curriculum again with a high course fee.

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