

The Analysis of Game Equilibrium on the Monitoring of Improper Examination Behaviors in the Universities

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Abstract. With the development of modern technologies, a variety of improper examination behaviors have emerged in the universities. From the new perspective of monitoring the examination as a game behavior, this paper has identified the pure-strategy Nash equilibrium in the compromise strategy for monitoring students' improper examination behaviors after the transformation of monitoring game. Proposing to weaken the punishment of improper examination behaviors, this paper has also designed the relevant guarantee mechanism. Those measures can cooperate to effectively control the transformed game of improper examination behaviors and maintain the integrity in the examination.

Introduction

Various improper examination behaviors are rampant in many Chinese universities. If those improper examination behaviors of college students cannot be controlled effectively, it will lead to the lack of integrity, the deterioration of academic atmosphere as well as the professional knowledge and abilities of those graduates failing to live up to the standard of the society and companies. As a result, it will weaken the reputation, status and comprehensive competitiveness of the universities in the society. Moreover, a vicious cycle hindering the future development of the universities will take form. Therefore, many experts have offered suggestions to the universities and carried out the relevant researches from different angles. They also proposed the relevant measures for prevention and control in the hope of restraining the improper examination behaviors in those universities^[1].

Among those measures for prevention and control, some of them aim to intensify the punishment of improper examination behaviors and warn college students not to violate the examination discipline. Some of them are designed to enhance the education of integrity and also strengthen the self-discipline of college students. The logic of the former is that college students will be afraid to violate the examination discipline in the face of severe punishment^[2]. However, it has resulted in the ineffective monitoring system and rampant improper examination behaviors among those college students. The latter ones put their hope on the integrity mechanism which is an informal type of constraint. With the monitoring system failing to function effectively, some students have chosen to violate the examination discipline, which can be seen as a rational choice for their own benefits. The aim of this paper is to review the game between monitoring teacher and student. By focusing on the analysis of pure-strategy Nash equilibrium, this paper hopes to reveal the truth behind the improper examination behaviors and also propose the measures to prevent and control those improper examination behaviors of college students^[3].

What Lies Behind Improper Examination Behaviors

Hypothesis

The examination researched in this paper means the examination organized by those universities independently^[4]. Some necessary presumptions must be given before the research. Common improper examination behaviors can be summarized as follows. Firstly, some students hide small

paper containing the information about the examination in small font size in their clothes, pen bag, water bottle or tissue paper. Secondly, some students peep at others' test paper or hide something which is not allowed in the examination. Thirdly, some students pass on the answers to each other^[5]. Fourthly, some students take the examination for others. Fifthly, some students use modern technologies, such as invisible wireless phone, special eraser and electronic watch, in aid of their cheating in the examination^[6]. The fifth is mostly founded in the national educational examination, such as college entrance examination, entrance examination for postgraduate studies, qualification examination and civil service examination. It is not frequently found in the examination organized by the universities^[7]. The fourth does not occur in the university because it is quite likely to be noticed by the monitoring teacher or reported by other students. Hence, it can be assumed that the monitoring teacher is capable of identifying the first three types of conventional improper examination behaviors during the final examination^[8].

The elements of monitoring game

(1) The monitoring teacher will choose between two strategies, namely active monitoring (monitoring the examination carefully and reporting improper examination behaviors to fulfill their duties given by the university) and inactive monitoring (doing something not relevant to the monitoring, such as sleeping, reading and chatting, or responding to those improper examination behaviors negatively)^[9].

(2) Those students will choose between two strategies, namely violating the examination discipline and respecting the examination discipline^[10].

(3) Three main situations:

A. If those students respect the examination discipline, it means that the examination is maintained in good order and the score of the students is authentic. The additional gain of the students is zero. If the monitoring teacher chooses active monitoring in this case, it means the work of two hours and the gain being equal to net loss. It can be marked with (\times). If the monitoring teacher chooses inactive monitoring (such as playing with the mobile phone, sleeping and reading), it means the additional gain. Because none of those students violate the examination discipline and it can be seen as a game, the students or the university will have a minor negative evaluation on the misdeed of the teacher. It is negligible and the net gain can be marked as (\surd).

B. If some students violate the discipline and the monitoring teacher chooses active monitoring, the student will be seriously punished by the university and the gain is marked with (\times). The gain of the monitoring teacher is relatively complicated. First of all, the monitoring teacher makes some efforts to monitor the examination (\times). Secondly, the student who has violated the discipline may have a grudge against the teacher in the short term (\times) or take it unwillingly (none). But in the long term, the student may feel grateful to the teacher (\surd). Moreover, those students who have respected the discipline and the university will have a positive evaluation of the monitoring teacher (\surd). The gain is considerable and also highly important to the teacher. The total of three gains can be marked with (\surd).

C. If some students violate the discipline and the monitoring teacher chooses inactive monitoring, the student will not feel worried about it and receive the additional gain (high score) almost at no cost. It can be marked with \surd . As analyzed above, although the monitoring teacher has some additional gain, the gain of the teacher is still marked with \times because of the negative evaluation from the student or the university about the misdeed. To be more specific, those students who have violated the discipline will feel lucky about it but still evaluate the teacher as being irresponsible just like other students who have respected the examination discipline. The misdeed of the monitoring teacher may be reported to the university or the college. Even if the university or the college decides not to punish the teacher, it will still have a negative impression of the teacher.

It can be seen that monitoring game is a type of Matching Pennies without pure-strategy Nash equilibrium (see Fig 1). However, the fact that improper examination behaviors have occurred over and over again just suggests that there may be a transformed type of monitoring game in real life.

	Cheating	Not Cheating
Active Monitoring	✓	×
Inactive Monitoring	×	0

Figure 1. monitoring game without pure-strategy Nash equilibrium

Transformed Monitoring Game

According to the existing system, the university will deprive the student who is involved in the improper examination behaviors of the degree's diploma (light punishment) or expel the student from the school (severe punishment). The logic is that those students will be afraid to violate the examination discipline in the face of severe punishment. However, the following cases have been neglected.

Compromise

Because of the overly severe punishment, the inclination and strategy of the monitoring teacher will change. The gain of the students violating the discipline is still minus. Being deprived of degree's diploma or expelled from the school means that they lose the right of education. It can be marked with (\times). During the game with the students, the monitoring teacher is hesitant about whether to report the improper examination behaviors of the students to the school. On one hand, the monitoring teacher realizes the negative consequence of the improper examination behaviors and agrees that the school should punish those students accordingly so as to maintain the order of examination. On the other hand, the teacher believes that the school is a place of education and should give those students another chance to correct their mistake rather than deprive them of the right of education just because of one wrong deed. As a result, the monitoring teacher will have compassionate feelings towards those students (changed inclination) and expect them to correct their mistake next time. The monitoring teacher will choose the third strategy, which is called compromise, to improve their own benefits. It can be marked with ($\sqrt{\sqrt{\quad}}$), which is better than active monitoring marked with ($\sqrt{\quad}$) and inactive monitoring marked with (\times). In other words, the teacher will monitor the examination carefully. When identifying the cheating of some students, the teacher will give a serious warning to them or expel them from the examination room. But the teacher will not report it to the school.

Take advantage of the compassionate feelings of the monitoring teacher

The compromise strategy of the monitoring teacher leads to the pure-strategy Nash equilibrium (see figure 2), namely improper examination behaviors. In theory, each participant in the pure-strategy Nash equilibrium believes that he has chosen the optimal strategy to deal with others' strategy which has been determined. As seen in the figure, in the case of the monitoring teacher choosing a compromise strategy to deal with the improper examination behaviors of some students, those students, especially those wanting to get away with it, will receive no additional gain (fail in the examination) for handing in the test paper or have the additional gain of + (change from fail to pass) for cheating in the examination successfully despite the warning from the monitoring teacher. Compared with those students without cheating in the examination (fail for sure), violating the examination discipline is the best response of those students to the compromise strategy of the monitoring teacher.

	Cheating	Not Cheating
Active Monitoring	X X	0
Eclectic Monitoring	0 or ✓	0
Inactive Monitoring	✓	0

Figure 2. The pure-strategy Nash equilibrium

Avoid the extreme countermeasures to punish the improper examination behaviors

Appropriate punishment

The strategy of severe punishment has neglected the relevant rules about punishing the students, namely proper procedure, sufficient evidence, clear basis, accurate definition and appropriate punishment. As a matter of fact, given the presumption that the monitoring teacher is completely capable of identifying the improper examination behaviors, it is not necessary for the university to deprive those students who have violated the examination discipline moderately of the right of education. As long as the punishment can ensure that the gain is lower than that of respecting the examination discipline, those students will choose not to cheat as a rational person with an inclination to pursue personal interest. Therefore, any extreme strategy must be avoided. Appropriate punishment should be given to those students who have violated the examination discipline.

Reward & punishment strategy

Salary incentive

The teacher should be respected for their work. The service fee which is not lower than the class fee must be paid to the teacher on a regular basis. Considering that examination is indispensable to the teaching work, the school can convert the monitoring time into the class hour accordingly. It will be included in the total working time of the teacher every semester so as to enhance their work initiative for monitoring.

The diversification of monitoring teachers

The examination department should set up a monitoring team made up of the personnel such as retired cadres and old professors. Those teachers who choose inactive monitoring will be supervised and reported. Some suggestions will be given to them. The mutual supervision should be also carried out. The corresponding punishment and warning will be given to those teachers failing to fulfill their duties. Some administrative teachers and the teachers from other schools can be involved in monitoring the examination. They will receive the additional reward after identifying the improper examination behaviors. It will put a constraint on inactive monitoring. As to those teachers responsible for teaching the students, they have to deal with the constraint from students' evaluation. If they maintain the order and discipline in the examination classroom strictly, it will cause some students to lose their right of education. Those teachers will have compassionate feelings about it and also worry about the grudge from those students. Therefore, the diversification of monitoring teachers can isolate the monitoring from other stakeholders. Combined with additional rewards, it will solve the problem naturally.

Conclusion

From the angle of monitoring game, this paper has made an analysis of game equilibrium and revealed the truth of improper examination behaviors. It can be seen as a transformed type of game equilibrium in which the monitoring teacher chooses a compromise strategy and the students take advantage of the compassionate feelings of the teacher. Weakening the extreme punishment is the

precondition measure. On the premise of effective and appropriate punishment, the balance between the school's right to give a punishment and students' right of education can be realized. The diversification of monitoring personnel is the core measure. The reward and punishment mechanism is the guarantee measures. Those measures can cooperate to effectively control the transformed game of improper examination behaviors and maintain the integrity in the examination.

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