

Gaming the System

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Inside Higher Ed had a fascinating article a couple days ago about some college students who unanimously boycotted their final exam and all got A's under a grading curve loophole. It's a great example of game theory at work.

In several computer science courses at Johns Hopkins University, the grading curve was set by giving the highest score on the final an A, and then adjusting all lower scores accordingly. The students determined that if they collectively boycotted, then the highest score would be a zero, and so everyone would get an A. Amazingly, the students pulled it off:

The students refused to come into the room and take the exam, so we sat there for a while: me on the inside, they on the outside," [Peter Fröhlich, the professor,] said. "After about 20-30 minutes I would give up.... Then we all left." The students waited outside the rooms to make sure that others honored the boycott, and were poised to go in if someone had. No one did, though.

Andrew Kelly, a student in Fröhlich's Introduction to Programming class who was one of the boycott's key organizers, explained the logic of the students' decision via e-mail: "Handing out 0's to your classmates will not improve your performance in this course," Kelly said.

"So if you can walk in with 100 percent confidence of answering every question correctly, then your payoff would be the same for either decision. Just consider the impact on your other exam performances if you studied for [the final] at the level required to guarantee yourself 100. Otherwise, it's best to work with your colleagues to ensure a 100 for all and a very pleasant start to the holidays."

This is an amazing game theory outcome, and not one that economists would likely predict.

In this one-off final exam, there are at least two Bayesian Nash equilibria (a stable outcome, where no student has an incentive to change his strategy after considering the other students' strategies). Equilibrium #1 is that no one takes the test, and equilibrium #2 is that everyone takes the test. Both equilibria depend on what all the students believe their peers will do.

If all students believe that everyone will boycott with 100 percent certainty, then everyone should boycott (#1). But if anyone suspects that even one person will break the boycott, then at least someone will break the boycott, and everyone else will update their choices and decide to take the exam (#2).

The problem is that Nash equilibrium theory alone doesn't tell us what the students are more likely to do. Economists would say that the first equilibrium, where no one takes the

exam, is unlikely to result because it is not “trembling hand perfect,” an idea that helped win Reinhard Selten win the Nobel Memorial Prize in Economics.

The idea is to think about what would happen if one of the players believes that there’s a small probability that a mistake will occur and someone’s hand will “tremble” and play a different strategy.

The second equilibrium — the one where everyone takes the test — is trembling-hand perfect, in that if someone makes a mistake and doesn’t take the test when she means to (she sleeps through the exam, for example), everyone else continues with their strategy to keep taking the exam.

If someone makes a mistake under equilibrium #1 — in which no one takes the test — and takes the test even though he doesn’t believe others will (and knowing that it won’t improve his grade), then that equilibrium unravels and everyone decides to take the test after all.

Even more impressive to me than the students’ cooperation is the professor’s decision to honor the original grading system and give everyone an A. I guess he knew, though, that he’d made a poorly designed grading system and that the students had outsmarted it. According to Inside Higher Ed, the professor is modifying the grading scheme going forward.

“I have changed my grading scheme to include ‘everybody has 0 points means that everybody gets 0 percent,’” Professor Fröhlich told Inside Higher Ed, “and I also added a clause stating that I reserve the right to give everybody 0 percent if I get the impression that the students are trying to ‘game’ the system again.”