The Random Lottery Mechanism as an Academic Incentive

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ABSTRACT

The author shows the benefits of using the random lottery mechanism as a pedagogical tool. The mechanism's primary advantage is to provide students an incentive to work additional problems without increasing the amount of homework the teacher must grade. In addition, this mechanism encourages in-class participation and can generate discussion of mechanism design.

Teachers battle constantly with their students over workload. We worry that our students fail to study long and often enough. Assigning homework is one simple and effective solution to this problem. Forced practice increases students' understanding. However, grading takes time away from other activities, e.g. research, and so the amount of homework that the teacher is willing to grade is probably less than the amount that maximizes student learning. In this paper I outline a system, the random lottery mechanism, designed to increase students' time spent studying without increasing the professor's workload.

One clever innovation produced by experimental economists is the random lottery mechanism (RLM). With this type of design, subjects perform multiple tasks, each with a particular payoff structure. Instead of being paid for his or her performance on each task, the subject is typically paid for only one particular task. So as to maintain proper incentives for all the tasks, the reward task is determined randomly at the end of the experiment.1 This mechanism maintains the incentives in each particular task, and provides some advantages to the researcher. In experiments, this incentive mechanism is generally used for one of two reasons. The first reason is to avoid endowment effects in the experiment. When a subject performs multiple tasks, and is paid for performance on those tasks, prior earnings in the experiment may bias a subject's subsequent choices. The second reason is more practical; often an experimenter wants subjects to perform multiple tasks, but cannot afford to pay the costs of recruiting separate groups of subjects for each particular task. The same cost-benefit logic for using the RLM can be applied to grading homework problems, and this application provides the harried professor with a teaching tool.

Many economics classes are problem based. Becker and Watts (2001) report on survey data indicating 83% of teachers at Research and Doctoral level universities use problem sets when teaching Intermediate Theory and Statistics and Econometrics classes. When I teach intermediate microeconomics or introductory econometrics, my main goal for the class is to have students learn to effectively analyze problems. The best way to improve problem-solving skills is through practice. However, it is often difficult to motivate students to practice enough to be competent problem solvers. Merely asking students to work additional problems, or suggesting students should work additional problems to study for the exam, often does not provide a strong enough incentive for many students to work those extra problems. Many students fail to grasp the fact that doing homework is a necessary but not sufficient condition for learning the material. If long enough, a graded homework assignment can provide sufficient practice and the correct incentive to the student; however, this length of assignment typically is too long for me to effectively grade given other time constraints. Unfortunately, it often appears that the more the students practice, the more the teacher grades! The RLM provides a solution to this problem. The lottery mechanism allows a professor to assign a

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1 See Cubitt, Starmer and Sugden (1998) for a more detailed explanation of the random lottery mechanism.
large block of problems to a class, but only grade a smaller subset, and have the comfort of knowing most of the students worked most of the problems.

Let me provide an example of this system in action. In a course like intermediate microeconomics, I believe that to adequately understand a typical chapter, a student should work approximately 10-20 problems based on the material in that chapter. No teacher has time to grade that many problems. Instead, prior to using the RLM, I would assign 3 or 4 graded problems per chapter, and rely on the students to practice the remaining problems on their own. Now, the directions to my homework assignments look like figure 1. With the RLM, I give the students incentive to work 7 problems per chapter, while I only grade 4 randomly selected problems. It is the possibility that I might grade any of the seven problems that provides the incentive for students to work all seven problems. I always provide answer keys with the answers to all the problems, not just the ones to be graded. This system gives most risk averse students the incentive to work all the problems. I have not increased my own workload, but have caused the students to increase theirs.

The RLM can be used to spark classroom discussion. Students tend to be curious as to why I use this particular system. Especially in an intermediate microeconomics class, where I cover game theory, students’ questions about the RLM can lead to discussing the application of economic principles in mechanism design. I use students’ questions to launch a discussion of the use of lotteries as an incentive mechanism in the real world. I also use this discussion to show how the RLM provides an incentive compatible mechanism to eliminate the principle-agent problem. I show the students how my situation is an example of the principle-agent problem, where they are the agents, and I am the principle. My goal is to have them maximize their effort, while their goal is to minimize their effort. The RLM, by increasing student effort, solves the principle-agent problem (for me!) By explaining my motivation for using the RLM, and explaining how its use provides the proper incentive to students to complete their homework, I provide a real world application of economic theory.

This system encourages class participation and volunteerism as well. Students’ interest in class peaks when I randomly select the problems to be graded. Questions are usually selected with the roll of a die or the drawing of cards, preferably performed by one of my students. If some questions were particularly difficult, this selection process can be very exciting for the students! In addition to the attention generated by the novelty of the RLM, students observe activities associated with grading intently, and this heightened attention tends to spill over and energize the classroom for the rest of the class period.

Economists claim to have a special understanding of incentives. Yet too often, I hear fellow teachers complain of a lack of motivation among their students. If economists truly have a special knowledge of incentives, shouldn’t we apply that knowledge to our teaching in order to help motivate students? The RLM is an attempt to use economic principles in the teaching of economics that I have found effective in encouraging students to practice problem solving – I hope my readers will see equally effective results with their own students.

References


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2 You can use any other ratio if that makes you more comfortable. However, I suspect ratios below ½ might cause less risk averse students to avoid harder problems, and so don’t recommend ratios in this range.

3 I strongly recommend this policy. Student learning, as well as motivation to work all the problems suffer if students do not have the opportunity to check their work.