

## **Using Activities to Teach Economics: Lessons from the Experimentalists**

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In his Harvard University classroom over a half-century ago, with Vernon Smith a graduate student participant, Edward Chamberlin (1948) conducted what were probably the first documented classroom laboratory experiments to investigate the efficiency of markets. Since that time, the use of experimental economics for research purposes has expanded greatly: Elizabeth Hoffman's 1991 bibliography listed over 1,500 articles related to this topic (Smith, 1994). In the late 1980s and early 1990s the movement of experimental pedagogy expanded into the college classroom, perhaps due to Vernon Smith and the Economic Science Laboratory (ESL) at the University of Arizona, directing their attention to using experimental methods for undergraduate instruction.<sup>1</sup>

In parallel manner, high school teachers (and university professors<sup>2</sup>) have been using active learning methods such as simulations, role plays, and group problem solving to teach economics for decades. These activities, promoted by the National Council on Economic Education (NCEE) and others, are widely used by

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<sup>1</sup>As an example of the strength of this movement, the *Journal of Economic Education* devoted the entire Fall 1993 issue to "Classroom Experimental Economics."

<sup>2</sup>Some recent publications designed for university students offer a mix of lessons based on both the experimental literature and the activity-based materials (see for example, Bergstrom and Miller [2000] and Brock [2000]).

economics teachers in the United States and are gaining popularity abroad.<sup>3</sup> Although there are obvious similarities between these two classroom methods, they are not the same and appear to have developed independently of each other. Initially at least, experimental methods were almost exclusively motivated by an interest in research, whereas activity-based economics was clearly introduced to enhance classroom instruction through the use of pedagogical methods designed to involve students in the learning process. At this juncture, soon after the award of the Nobel Memorial Prize in Economic Science to Vernon Smith “for having established laboratory experiments as a tool in empirical economic analysis,”<sup>4</sup> it seems particularly appropriate that we examine the possibility of applying the rigorous criteria used in experimental economics to activity-based economics. Through this examination, we find that the experimental economics literature offers valuable guidance for those writing, teaching, and conducting activity-based economics. This is important because improving widely-used classroom activities will improve the teaching and learning of economics in the US and abroad.

This paper proceeds as follows: We first provide a brief

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<sup>3</sup>The National Council on Economic Education is a premier organization for developing activity-based classroom economics materials and training teachers in the US. Their materials and training emphasize classroom activities. Since 1992, they have trained thousands of teachers in former communist countries, and have recently expanded their international programs in South Africa, Indonesia and Egypt. Other economic education organizations, such as the Foundation for Teaching Economics, also promote teaching economics using classroom activities.

<sup>4</sup>Nobel Laureate diploma, December 2002, Royal Swedish Academy of Sciences. Smith, however, is not the first Nobel Laureate to at least in part be honored for contributions to experimental economics. Kagel and Roth (1995: 90) point out that while “early experimenter—Maurice Allais—...won the 1988 Nobel Memorial Prize in Economics...for his work in general equilibrium theory ... the Royal Swedish Academy of Sciences referred to his experimental work” as well.

description of experimental economics, followed by a brief description of activity-based economics. We then consider the benefits of applying the conditions or criteria specified in the experimental literature to pedagogical activities conducted in high school and college classrooms.

### **Experimental Economics**

According to Smith (1982), experiments in economics are created by devising instructions that immerse human participants in a situation that represents some naturally occurring economic environment. The instructions generate incentives by offering to compensate with money (or other payment) at the conclusion of the experiment depending on the decisions of each participant. Experimentalists then observe the behavior of human subjects as they respond to the set of instructions. Given that human subjects are responding to actual incentives, “laboratory microeconomies are ... certainly richer, behaviorally, than the systems parameterized in our theories” (Smith, 1982: 923) because “real people pursue real profits within the context of real rules” (Plott, 1982: 1520).

In his classic piece, titled “Microeconomic Systems as an Experimental Science” (1982: 923-955), Smith articulated a theory of laboratory experiments in economics and reiterated Louis Wilde’s (1980) assertion that the principle objective of experiments in economics is “to create a manageable microeconomic environment in the laboratory where adequate control can be maintained and accurate measurement of relevant variables guaranteed” (1982: 930). In order to achieve the necessary control and measurement capability, Smith proposed a set of precepts that allows the study of laboratory environments where “real economic agents exchange real messages through real property right institutions that yield outcomes redeemable in real money” (Smith, 1982: 935). These precepts are listed and summarized in Table 1.

Precept 1, Nonsatiation, requires that participants not become satiated in the reward medium, usually dollars of currency in

**Table 1. Precepts for a Controlled Laboratory Experiments in Economics**

| <u>Precept</u>  | <u>Description</u>   |
|-----------------|--|
| 1. Nonsatiation | Participants should not become satiated in the reward medium.  |
| 2. Saliency     | Participants should understand that their actions are directly related to a change in the reward, and that they have a property right to the reward. |
| 3. Dominance    | The reward is sufficient to dominate any subjective costs associated with completing activities included in the experiment.                          |
| 4. Privacy      | Each participant should only be informed about his or her own payoff alternatives.   |
| 5. Parallelism  | Conclusions drawn from the behavior of individuals in an experiment should be transferable to naturally occurring economic environments.             |

experimental contexts, because participants' utility is expected to rise monotonically in receiving the reward. Of course, Smith recognized that experimental subjects might attach "game value" to the outcomes of an experiment, motivated by the mere joy of winning. But since "gaming utilities reinforce rather than distort the effect of any explicit reward structure" (Smith, 1982: 935), this poses no difficulty for the first precept. Precept 2, Saliency, guarantees "motivational relevance" because the agent making choices realizes that the outcome (reward) received is due to the action taken. Precept 3, Dominance, requires that

the reward is sufficient to cover the subjective cost of the participants' time and effort expended in the process of completing the decisions and transactions of the experiment itself. In experimental economics, the condition is often met by insuring that the reward levels are set sufficiently high for the relevant population and for the complexity of the task. Precept 4, Privacy, controls for potential interdependence of preferences among participants by insuring that each participant is only informed about his or her own payoff alternatives. In this way, a subject chooses an action, not because he has enough information to determine that his friend is at a disadvantage and wants to help her, but because his own preference for reward maximization leads to the choice.

Although Precepts 1 through 4 are sufficient conditions for a controlled experiment, Smith adds a fifth condition, Parallelism, for experimental validity. This precept addresses the transferability of the results of the experiment to other naturally occurring economic environments, essentially requiring that the created environment parallel a naturally occurring situation.

### **Activity-Based Economics**

The development and use of methodology to actively involve K-12 students in learning economics was largely coincidental with the development of experimental research methods and its movement into college classroom teaching techniques. For the past several decades, leaders in social science education have promoted using activities to engage and interest students in what they are learning. The NCEE, a frontrunner in training teachers to employ active learning methods, was founded in 1949 just one year after Chamberlin's seminal article. The development and widespread use of this methodology in secondary level economics can be documented in part by viewing materials published over the years by NCEE. NCEE's publication *Economics in Action: 14 Greatest Hits for Teaching High School Economics* (2003) compiles fourteen most popular lessons into one volume. The introduction to this collection uses the phrase "activity-based economics" to describe

lessons that actively engage students in learning through activities such as “simulations, group decision-making, problem solving, classroom demonstrations, role-plays, and group presentations.” The rationale for using this methodology is that it helps students remember and apply abstract concepts; it is successful with students of different ability levels; it promotes social growth as well as economic understanding; and because it is fun, students are more interested in the subject matter (Lopus, Morton, and Willis, 2003: 85).

### **Applying Experimental Precepts to Activities**

Because of the obvious overlap between the methodologies of experimental economics and activity-based economics, it is relevant to consider whether activities satisfy the key elements of an economic experiment, and if they do not, whether it makes any significant difference. The wide variety of activity-based lessons can be classified into one of three broad categories:

- (a) group work—presentations, decision-making, or problem-solving,
- (b) simulations—participants follow prescribed behaviors or role-plays, and
- (c) activities encouraging individual choice influenced by rewards.

A lesson falling into category (c) is most appropriate for our analysis because it would most resemble an experiment by giving students incentives to make choices and provide opportunities for the teacher to award prizes. Consider a typical market game where a teacher or college instructor divides the class into buyers and sellers (for example, NCEE 2003, Lesson 7). Sellers are given cards with a minimum price for which they are willing to sell a product and buyers are given cards with a maximum price for which they are willing to pay for the product. The reservation prices on the cards are such that an equilibrium price will

emerge through a series of trading sessions, assuming buyers and sellers strive to maximize profits.

If the activity works as intended, the teacher is able to show that equilibrium prices occur through forces of supply and demand. The lesson also becomes a nice application of how economic theory is based on human behavior through responding to incentives. We now investigate how applying or not applying the five experimental precepts may affect the outcome of this activity.

1. *Nonsatiation*: With respect to a market game or other category (c) activity, this precept implies that a teacher needs to reward buyers and sellers with something sufficient to motivate them to want to keep trying to sell at the highest price or buy at the lowest price possible. This may present a dilemma for a secondary teacher because it is probably unethical to pay students money or valuable items when earning higher profits is based in part on the chance of getting a “good” card. In the same manner, it is probably not appropriate to reward students with classroom points that could significantly affect grades, enabling a lucky student to end up with a higher course grade than an unlucky student. Hopefully the joy of participating and doing one’s best in the activity, receiving a small item such as candy or a “free homework pass,” or public acknowledgment of success would be sufficient to motivate students to participate and satisfy this precept. If students are not sufficiently motivated to act in a way to maximize profit in the game and this precept is not met, the price will likely not converge to equilibrium and the point of the lesson may be lost.

2. *Saliency*: With respect to a market game or similar lesson, saliency is met if concrete rewards are given for performance and students are told in advance what the awards will be. A possible problem with saliency occurs if there is a “winner-take-all” award scheme, for example, with only one buyer and one seller recognized as winners. If students realize during the activity that they are not likely to

be the winner, they may not be motivated to participate according to the incentives in the activity. In order to boost saliency, we recommend providing continuous reward scales to motivate all participants to strive for more profit, even if the probability of finishing in first place is believed to be near zero. Not only does such a motivation promote saliency, but in most cases it more closely matches the actual economy and thus strengthens the likelihood of satisfying parallelism as well.

3. *Dominance*: To satisfy dominance, the reward for performance in the activity must cover the students' subjective opportunity "cost of thinking, calculating, and acting...in the process of making individual decisions" (Smith, 1982: 933). For most high school students, attending class and doing class assignments is not a matter of choice if the student wants to acquire the units to graduate, so the added cost of participating in a classroom activity is probably low and a small-item reward, such as candy along with recognition and the enjoyment of participating may be sufficient to satisfy the dominance precept. However, if some activities are perceived as being more complex or less rewarding for students in terms of the "game value," the teacher may need to increase the reward levels to compensate students for the added cost and to motivate them to meaningfully participate.<sup>5</sup>

4. *Privacy*: Privacy is met in a market game activity if students do not have sufficient information to conclude much about others' preferences. This could be met if students do not show each other their cards indicating their reservation buy and sell prices. However, given the

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<sup>5</sup>As Smith reports, research in experimental economics has shown that participants' decisions are more consistent with reward-maximizing strategies when the reward level is increased (1982: 934).

social goals existing among high school students, if they seek to help friends instead of maximizing their own profit during the activity, nonsatiation is effectively violated and the price may not converge to equilibrium. The teacher may instruct students to not reveal the prices on their cards, but this violates the precept of parallelism.

5. *Parallelism*. This precept is met if the market game activity demonstrates realistic economic concepts. But if lesson instructions tell students how to behave, this likely violates this precept because such direct instructions are seldom given in naturally occurring economic environments. If instructions to a market game tell students that they should try to maximize their profits, this would violate parallelism because in the real world people try to maximize profits because of the incentives occurring from doing so and not because someone tells them this is what they should do. Because the activities are supposed to demonstrate that human behavior leads to predictable outcomes that demonstrate economic theory, this lesson is lost if this precept is violated.

### **Summary and Recommendations**

We believe that it is important that activity-based lessons used in high schools (and colleges) at least to some extent satisfy the set of conditions for a meaningful experiment. If this does not occur, students and perhaps teachers may fail to correctly grasp the underlying economic theory and the significance of the observed behavior. However, perhaps understandable, teachers may be hesitant to follow some of the precepts precisely. For example, in order to achieve parallelism, a teacher needs to give up the inclination to state the goal of the activity or to direct student behavior. While removing specific directions for behavior during an activity may seem “risky” to teachers because of the resulting uncertainty about what students will choose to do and a desire to observe behavior consistent with theory, doing so not

only satisfies the parallelism precept, but the activity becomes much more robust in demonstrating the economic way of thinking. Further, if the reward media chosen satisfies nonsatiation and dominance, and is motivationally relevant as required by saliency, then the risk of behavior that is inconsistent with the underlying theory is substantially reduced.

We believe that the most likely potential barrier to satisfying the precepts in a high school environment is the actual reward media options available to the teacher. Monetary payments used most widely in experimental research are generally precluded for legal, ethical, or financial resource reasons in high schools. As well, although experimentalists have found that grades (e.g., bonus points) elicit high levels of motivation among students (Friedman and Sunder, 1997: 43), giving higher grades for winning may not be viewed as ethical in a high school if there are elements of luck involved in who wins. This means that teachers must often be creative with small items, thus risking violation of the nonsatiation and dominance precepts since not all students will like candy or whatever the reward may be. However, skilled teachers may be able to motivate students with the fun and competition of earning small prizes. If it is difficult to motivate students to meaningfully participate in activities, teachers might remind the class that active participation often enhances learning and course grades.

Academic economists who write and review lessons for use in high schools might use the six precepts in Table 1 as a guide to designing more robust activities. Instruction should be carefully written to insure that teachers recognize the importance of sufficiently motivating students to participate "on the margin." While it is probably not necessary that high school teachers know the names and definitions of each precept, professors involved in conducting workshops for high school economics teachers should carefully demonstrate activities and explain the importance of adhering to the ideas behind the precepts. A better understanding of the structure of the activity will allow teachers

to have more informed post-activity discussions and will provide insights about how to deal with anomalies that might arise. In this way, activities used to teach economics will effectively demonstrate the economic way of thinking while engaging students in the process of learning economics.

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