Promoting Experimental Economics in the Classroom

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Abstract: Economic experiments allow the K-12 teacher to promote active learning that is also rigorously grounded in economic theory. In an experiment students test for themselves the economics they hear in lectures and read in their textbooks. The authors have found that working through the existing teacher professional development system is a promising approach to infusing experimental methods into the school curriculum. This paper describes a short professional development course in experimental economics. The experience of conducting the course with two groups of teachers is discussed and survey results pertaining to teacher implementation of classroom experiments are presented.
A substantial literature exists describing the use of economic experiments for instructional purposes in college classrooms. Holt (2007) provides a good reference, and numerous articles describing experiments in college classrooms have been published recently, including experiments in price discrimination (Michael, et al 2005), public goods theory (Pickhardt, 2005), money demand and risk (Ewing, Kruse, Thompson, 2004) and rationing “free” goods (Alden, 2006).

The strength of the movement toward using classroom experiments is illustrated by the fact that since the Journal of Economic Education (JEE) devoted its entire Fall 1993 issue to “Classroom Experiments in Economics” over half of the issues of the JEE have included at least one article on experimental economics in the college classroom (Brock and Lopus, 2004).

While evidence regarding the effectiveness of classroom experiments in promoting student achievement is limited, Emerson and Taylor (2004) and Dickie (2006), found that college students in microeconomics course sections that relied heavily on classroom experiments experienced higher gains in achievement on the Test of Understanding College Economics (TUCE) than students in sections in which instructors used traditional lecture formats. Recently Ball, Eckel, and Rojas (2006) found that students who utilized an interactive teaching system to participate in experiments performed significantly better in exams than in control classes.

Little empirical research exists on using experiments to teach economics in the K-12 curriculum, although classroom experiments are a form of the kind of active learning that economic educators have been advocating for decades (Becker, 2000; Becker and Watts, 1995).

**Professional Development Course on Teaching with Experimental Economics**

In light of the evidence regarding the potential for experimental teaching techniques to improve economics instruction the Center for Economic Education at the University of Alaska Anchorage (UAA) developed a professional development course on “Teaching with
Experimental Economics” and presented it as a week-long college credit course during the summers of 2004 and 2005 to two separate groups of teachers.

Each day of each course was divided into morning and afternoon sessions. In each session teachers were randomly paired and worked together as subjects in an experiment conducted by the instructors under controlled conditions with monetary incentives. The incentives were not trivial – at the end of the week a teacher may have ‘earned’ as much as a hundred dollars, contingent on his or her experimental performance.

Following each experiment, teachers were led through a discussion of their experience. A major theme was the interaction between individual behavior and (sometimes surprising) macro outcomes. Teachers then worked on a group economics assignment (based on the economic concepts demonstrated by the experiment) and discussed their answers with the rest of the class. The final item was a discussion of classroom implementation, including appropriate teaching strategies, incorporation into the curriculum, and experiment materials.

Course Program

The first two days of the program focused on two classic experiments: the double oral auction, and public goods with alternative voluntary contribution mechanisms. The course included at least one game theory experiment, other microeconomic experiments and either an asset market experiment or a public finance experiment.

The participants learned alternative methods of conducting experiments: hand-run; single computer and projector; and networked laptop computers. Handouts with experiment instructions, and sample assignments, were provided. Computer software for the first two experiments was made available for the teachers to keep.

The last day of the course allowed the instructors more flexibility in presenting current research experiments – works in progress. These experiments took the participants beyond
standard ‘classic’ teaching experiments, involving them in the creative process by which they
designed and tested their own experiments. Table 1 summarizes the course by day, including the
experiment conducted, the economic concepts involved, the method by which the experiment
was conducted and the appropriate grade level application.¹

In addition, we have linked each experiment to the matching National Council on
Economic Education’s (NCEE) *Voluntary National Content Standards in Economics* (2000).²
The experiments support standards 3 through 9.

[INSERT TABLE 1]

From Table 1 it can be seen that microeconomic concepts were strongly represented,
whereas macroeconomics were not. This is partly a consequence of the development of
experimental research, which originated in microeconomics. As more macroeconomic research
experiments are published, we expect that this will gradually change.

**Experience of the 2004 and 2005 Cohorts**

A total of 42 teachers participated in the courses. Immediately following the courses,
participating teachers expressed great enthusiasm for teaching with the use of experiments. In
response to a question on the 2004 course evaluation survey asking “What was your impression
of the experimental approach to teaching economics?” most teachers answered with statements
like “Great! Super! The Best,” and “I think it’s way cool, mostly because, as a teaching tool,
students are more willing to learn when actively engaged.” Teachers in the 2005 group answered
this same question in much the same way with one teacher adding that “It helped me to better
understand concepts and will do the same for my students.”

Teachers in both groups said that what they liked best about the use of classroom
experiments was the fact that they actively engaged students, and that they utilized a technology
that students enjoy (computers). Some teachers did, however, express reservations. Several said
that they did not have necessary access to computers, one feared that they couldn’t afford to provide funds for incentive payments, and another thought that the systematic use of experiments would take “more time than a public high school teacher has to design, construct, and administer.”

Spring 2006 Survey

In order to obtain feedback regarding adoption of experiments in the classroom, the teachers were mailed a survey in Spring 2006 asking them about their adoption of experiments, and their perception of the barriers to adoption. All 42 completed and returned it. Only 13 (31%) had done one or more experiments. Of the 73 experimental sessions reported, 53 of those were accounted for by just three teachers, two of whom were at the same school. Forty-one of the 73 experiments were some version of a demand and supply/double oral auction experiment. The experimental “adopters” had more years of teaching economics, on average, than the total sample (9.1 years for adopters vs. 5.2 years for non-adopters).

That 13 participants had gone on to adopt experiments was encouraging. But for the group as a whole we had underestimated the barriers to the adoption of experiments. What were the barriers to adoption? The survey included questions soliciting a ranking of ten potential barriers to using experiments as: “major barrier”; “minor barrier”, or “not a barrier.” The results (rank ordered according to “major barrier”) are presented in Table 2.

[INSERT TABLE 2]

The largest barrier to adoption reported by teachers was item number 1, “No money for incentive payments.” Although alternative forms of incentives to monetary payment might plausibly be used (candy, extra credit points, etc.) teachers were of the opinion that this was a major barrier. Our own use of monetary incentives during the courses may have affected teachers’ views on this issue. Identifying experiments that fit teachers’ curricula was the second
biggest barrier, followed by technology issues, including access to projectors to display experimental results and access to computers. These problems may be overcome in subsequent in-service courses by posting results by hand and by utilizing more hand-run (pencil and paper) experiments.

Conclusions

This experimental economics course for teachers was successful in terms of exciting and preparing them for teaching experiments. The teachers were persuaded that experiments were an effective way to teach economic concepts. However they did have concerns about computer resources, and monetary incentives. They also were concerned about having the right experiments for their particular class needs.

Looking to the future, we conclude that for the majority of teachers a single short course will not suffice to facilitate adoption of experiments. In order to bring a higher proportion of teachers to the adoption stage will probably require at least one mentoring and application course beyond an introductory level experimental course.

NOTE

1. Information describing each experiment and instructions for conducting them are available upon request from the authors.

2. The Voluntary National Content Standards in Economics published by the National Council on Economic Education lists twenty instructional standards that are intended to promote sound economic education curricula.
REFERENCES


<table>
<thead>
<tr>
<th>Day</th>
<th>Experiment</th>
<th>Concepts</th>
<th>Method</th>
<th>Recommended Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday (two sessions)</td>
<td>Double oral auction</td>
<td>Exchange, equilibrium, efficiency, markets</td>
<td>Hand-run and computer double auction</td>
<td>Middle school and high school social studies and economics courses NCEE Standards: 4; 5; 7; 8; 9</td>
</tr>
<tr>
<td>Tuesday (two sessions)</td>
<td>Public goods and the voluntary contribution mechanism</td>
<td>Public goods, rivalry and excludability, mitigation of the public goods provision problem</td>
<td>Computer experiment</td>
<td>Middle school and high school social studies and economics courses NCEE Standards: 5; 7</td>
</tr>
<tr>
<td>Wednesday</td>
<td>Normal form game theory</td>
<td>Strategic behavior</td>
<td>Hand-run experiment</td>
<td>AP economics NCEE Standards: 7</td>
</tr>
<tr>
<td>Wednesday</td>
<td>Extensive form game theory</td>
<td>Strategic behavior</td>
<td>Hand-run experiment</td>
<td>AP economics NCEE Standards: 7</td>
</tr>
<tr>
<td>Thursday</td>
<td>Ultimatum Bargaining Game</td>
<td>Personal exchange, concepts of fairness</td>
<td>Hand-run experiment</td>
<td>Middle school and high school social studies and economics courses NCEE Standards: 4</td>
</tr>
<tr>
<td>Thursday</td>
<td>Financial Asset market experiment</td>
<td>Financial markets, assets, expectations, bubbles, Public choice, voting</td>
<td>Computer experiment</td>
<td>High school social studies and economics courses NCEE Standards: 8 (financial asset experiment), 3 (public finance experiment)</td>
</tr>
<tr>
<td>Friday</td>
<td>Instructors’ current academic research</td>
<td>Examples: retail gasoline marketing computer experiment (standards: 9); endogenous trade and specialization computer experiment (standards: 5; 6)</td>
<td>Course review and evaluation survey</td>
<td>Course review and evaluation survey</td>
</tr>
</tbody>
</table>

Table 1 – Daily Course Schedule
<table>
<thead>
<tr>
<th></th>
<th>Major Barrier</th>
<th>Minor Barrier</th>
<th>Not a Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>No money for incentive payments.</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>2.</td>
<td>Not aware of experiments that match exactly the needs of my course(s).</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>3.</td>
<td>No access to projector.</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>4.</td>
<td>No access to computer lab.</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>5.</td>
<td>No access to suitable computer.</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>6.</td>
<td>Experiments are too complicated.</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>7.</td>
<td>I don’t feel technically able.</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>8.</td>
<td>Insufficient room in the curriculum to add experiments.</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>9.</td>
<td>Class periods are too short.</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>10.</td>
<td>I can teach economic concepts better using other teaching techniques.</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
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