Research on the Effectiveness of Non-Traditional Pedagogies

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The variety of pedagogical techniques available to economics instructors can be broadly classified as either 'passive' or 'active,' characterizing the role of the student in the learning process. The most prevalent method of passive learning is the traditional lecture, in which the instructor presents the material and students sit quietly, often making notes, and attempt to take in the material. This process generally leads only to 'surface' learning (i.e., rote memorization with no lasting impact) of the material, but seldom facilitates a deep understanding of the intricacies and nuances of the subject matter (Bransford et al., 2000). Active learning techniques can help students develop a deeper understanding of the material by requiring students to become engaged in the learning process.

A significant body of research examines the effectiveness of different pedagogical techniques in teaching economics. This research reveals that using active learning techniques, such as cooperative learning exercises, classroom experiments, and case studies, can improve student learning outcomes and increase student interest in economics.[1] Despite the demonstrated effectiveness of active learning strategies, lecture is still the dominant teaching strategy used by economics instructors.[2] In a 2005 survey of post-secondary institutions, Watts and Becker (2008) find that the median portion of class time spent lecturing in economics courses is 83 percent, the same percentage found in 1995 and 2000. Watts and Becker also report modest increases in the use of alternative teaching strategies such as classroom experiments and computer generated displays (e.g., powerpoint), each used in a median of six percent of courses in 2005, up from zero percent in 1995 and 2000. A post-graduation survey of over 2,000

students finds they are much more likely to report that their economics instructors utilized lectures more (relative to other disciplines) than they are to report that economics instructors utilized alternative teaching strategies (Allgood et al., 2004), suggesting instructors in other disciplines utilize non-lecture teaching strategies more often than do economics instructors.

This chapter reviews research on the effectiveness of several different teaching strategies available to economics instructors. Specifically, it reviews research studying the effectiveness of several non-lecture teaching strategies often recommended by advocates for use by economics instructors: cooperative learning, classroom experiments, case studies, experiential learning, and undergraduate student research. The reader should note that each of these strategies has an entire chapter in this volume dedicated to their description. However, this chapter provides an overview of the effectiveness and thus complements those chapters. We also address two issues arising with increasing frequency in economics courses: technology utilization and distance learning.[3] This chapter also briefly examines research on the training received by economics instructors when beginning their teaching careers in graduate school in order to provide some indication of the future of pedagogic practices in economics. Note that this is not intended to be a comprehensive review of all research on all possible nontraditional teaching strategies; rather, it is intended to provide a sense of the breadth of alternative strategies and the extent to which they have been studied.

Cooperative learning

Cooperative learning requires students to engage with their peers, teaching and learning from each other with guidance from the instructor and to cooperate to complete exercises and assignments.[4] Cooperative learning can take place inside or outside the classroom, and can range

from a brief in-class exercise to group research papers and presentations. The benefits associated with cooperative learning include increased motivation through peer accountability, increased opportunity for students to ask and resolve questions about the material, and increased student understanding and retention. The primary cost of cooperative learning is the opportunity cost of time that could otherwise be used to convey more material (although not necessarily more effectively) by lecturing. While instructors do spend time assisting individual students during cooperative learning exercises, most interaction will occur between students. Indeed, well-constructed cooperative learning exercises will actively engage all students in the learning process.

Yamarik (2007) compares student performance across several sections of intermediate macro taught with a cooperative learning component and a control section taught using a traditional lecture style. The cooperative learning component involved students working in permanent groups of three or four throughout the semester and collaborating on problem sets and cooperative assignments—both in and out of class. While Yamarik allows students to have some say in their group assignment, he attempts to ensure heterogeneity of aptitude and demographic characteristics within groups. Results indicate a statistically significant positive effect of cooperative student learning on student performance equal to a three to four percent improvement on exam scores, even when controlling for demographic and academic factors. Although students were unaware of the difference between sections during advance registration, some selection bias could have been created by students switching between the cooperative learning sections and the traditional lecture-style section at the beginning of the semester. Two additional sources of bias also may be present in Yarnik's results: first, instructor bias may be present if he were more excited about teaching the cooperative learning course and thus more

effective; second, student social attitudes about being in a group may have contributed to greater student effort. However, if cooperative learning did indeed contribute to greater effort, then cooperative learning exercises positively affect student performance, albeit indirectly, by increasing student motivation.

Marburger (2005) studies the effect on student performance of substantially replacing lecture with cooperative learning in principle of microeconomics. The author taught a control section using only lecture and an experimental section using cooperative exercises along with a five-minute debrief at the end of each class period. Marburger finds no significant difference in student performance on a multiple choice exam as a result of replacing lecture with cooperative learning; this result is particularly interesting in that student performance did not significantly decrease as a result of reduced lecture time. Further, Marburger finds that the cooperative learning class performed significantly better on a policy analysis project that required students to think critically and apply economic theory. These results suggest that the type and measurement of performance matter; multiple choice exams may target foundational knowledge, facts and rote memorization whereas cooperative learning may improve students' ability to understand and apply economic theories.

Duke and Awokuse (2009) examine the effects of a cooperative learning exercise designed to enhance critical thinking and writing performance by combining student understanding of agricultural and trade policies in developing nations with their respective economic and environmental impacts. The instructors evaluate student performance in one control section and four experimental groups (drawn from separate but related courses) using pre/post writing assignments graded by an outside professor using a standard rubric based on content and style. These one-page policy briefs require students to present an argument that

answers a question provided by the instructors and develop two points that support their thesis. Students in the cooperative learning groups complete three additional policy briefs and attend a three-hour colloquium, during which students give oral presentations to small groups and complete peer reviews. The authors find that the additional cooperative colloquium and policy briefs had a positive and statistically significant effect on student performance—an average of one point for each policy brief on a ten-point scale. These findings indicate that cooperative learning exercises can be used to improve student performance, particularly on written assignments that require critical analysis and application of economic theory.

Classroom experiments

Classroom experiments offer instructors the opportunity to demonstrate and reinforce economic concepts by allowing students to apply economic concepts and see the effects of their decisions in interactive situations. Classroom experiments can either supplement or replace traditional lecture presentations. The complexity of classroom experiments can vary widely, and the time needed can range from a few minutes to multiple class periods. Holt (1999) reviews and summarizes many of the issues pertinent to selecting and running classroom experiments. As with cooperative learning, the main opportunity cost of classroom experiments is foregone lecture time. The studies discussed below indicate that benefits to student learning make it worthwhile to incur this cost. Instructors who choose to create their own experiments will experience considerable development cost, but this cost can be avoided by taking advantage of the substantial set of existing experiments.[5]

Studies that examine the effect on student performance of replacing a portion of lectures with classroom experiments consistently find positive impacts, although the results are not

always statistically significant. Gremmen and Potters (1997) study this effect by randomly assigning 47 students across three sections of a course to either a control group, taught using only lectures, or an experimental group, taught using an introductory lecture followed by an experiment, using the same amount of time. The authors do not report the specific course studied. The impact on student learning is measured by administering the same multiple choice pre/post test to each group. The experimental group participated in an international relations experiment in which students play the role of government policy-makers and seek to make decisions that would raise their country's welfare above those of other, competing countries. The authors seek to eliminate bias in their results by switching the instructors of each section every class, altering the sequence of instructors, and not informing the instructors of specific content of the pre/post tests. Although the experimental and control groups have very similar average scores on the pre-test, the post-test scores of the experimental group improved much more than those of the control group, with the difference being statistically significant despite the small sample size. In addition, a third test a few weeks later showed that the experimental group retained a greater understanding of the material than did the control group, with the difference being statistically significant, indicating that teaching using classroom experiments can result in sustained, positive effects on student learning relative to the traditional lecture method.

Dickie (2006) reports similar findings in a study of 108 microeconomics principles students divided into two experimental sections, each incorporating seven experiments, and a control section taught using only the lecture method. In one of the experimental sections, Dickie employs additional grade incentives for student performance on experiments. In his analysis of student performance, Dickie controls for indicators of student aptitude and other factors, including cumulative GPA, standardized test scores, age, race, gender, and semester hours

completed. In order to ensure that academic expectations were consistent across sections, Dickie uses the same textbook and study guide for each section and assigns homework assignments of equal length. Results indicate a significant positive effect of classroom experiments on student test score improvement relative to the impact of plain lecture. In addition, he finds no statistically significant effect of grade incentives on student performance, suggesting instructors could incorporate classroom experiments into their courses without offering additional incentives to encourage participation.[6]

Emerson and Taylor (2004) study the effect of classroom experiments on student performance using a sample of 300 students in nine different sections of microeconomic principles, two of which are experimental and seven of which are controls. The authors take numerous steps to ensure statistically robust results including: homogeneity of students across classroom sections; use of the Test for Understanding of College Economics (TUCE) for testing on the first and last days of class; controlling for a host of factors regarding student ability (using data on GPA, gender, major, previous semester hours completed, average weekly hours of employment, SAT scores, and whether or not students had taken a high school economics course); and using a set of eleven standard experiments drawn from a principles textbook designed to incorporate classroom experiments (Bergstrom and Miller 2000).[7] Students in experimental sections improved their TUCE scores (post-pre) by an average of 2.42-2.99 points more than students in control sections, an improvement equivalent to 11.1-12.3 percent of the possible improvement in scores; however, they find few statistically significant differences between experimental and control students in performance on a departmental final exam, student evaluations, or class attrition rates. One characteristic of this study worth noting is that in end-of-course student evaluations, students in experimental sections ranked the most important

course components as: experiments, lectures, readings, and homework, while students in control sections ranked the most important components as: homework, readings, lectures, and quizzes. While both groups recognize the need to use economic understanding to enhance their learning, those presented with experiments find them far more effective than homework assignments.

In addition to quantifiable improvements in student performance, classroom experiments have the potential to increase student interest in and engagement with the course material. Yandell (1999) tests the hypothesis that teaching a microeconomics course that incorporates classroom experiments will yield improved student learning. He compares outcomes for 31 students in two sections taught with a traditional lecture format with 35 students in two sections that incorporated classroom experiments. In all sections, Yandell taught the same concepts, used the same book and chapter sequence, and administered an identical final exam. The author analyzes differences in student grades and evaluations, controlling for common aptitude indicators such as high school GPA, gender, and SAT scores. Yandell finds that the impact of experiments on student performance was positive, although statistically insignificant. Also interesting are differences in student evaluations, which reveal that the experimental section had statistically significant higher ratings for teaching effectiveness of the instructor, instructor enhancement of student interest, and interest level of class sessions. That is, while students may not have performed better on exams as a result of introducing experiments, students in the experimental sections found their course more interesting than did students in the traditional sections.

Case studies

Two forms of case studies are used to teach economics. Case studies in textbooks are typically one- or two-page examples illustrating economic concepts in the real world. Although they can help students recognize the ways in which economic decisions are made, this form of case study seldom requires students to critically examine the material and make their own decisions. In contrast, traditional case studies do not provide students with analysis, but present them with information and charge them with performing their own analysis. Carlson and Schodt (1995) define case studies as "narrative accounts of actual, or realistic, situations in which policymakers are confronted with the need to make a decision (p. 18). Marks and Rukstad (1996) similarly define case studies not as simple examples that illustrate an application of economic theory, but rather as complex, real-world scenarios in which students must interpret and think critically about a substantial amount of information and apply economic concepts as they read about a situation in which an important economic decision was made.[8]

Carlson and Schodt (1995) analyze student evaluations (as opposed to student performance) from economics courses at different institutions to evaluate the efficacy of case studies when used in combination with lectures, problem sets, and exams.[9] In response to a question about how much case studies contributed to what students learned, 39 out of 55 students indicated "substantially" (the highest choice), 14 indicated "somewhat," only 2 indicated "little," and none indicated that the case studies should have been replaced with lecture. In addition, 39 out of 55 students indicated that case studies were the most useful course component for "learning how to use economics to solve real problems" (p. 22). Carlson and Schodt consider written assignments to be an important component of effective case-method teaching, but cite increased instructor effort and grading time associated with written assignments as a significant cost of implementing case studies.

Marks and Rukstad (1996) build a compelling argument for the use of case studies to teach students to read and evaluate economic data, understand tradeoffs and constraints, deal with ambiguities in data and theories, and ultimately make informed policy decisions. The authors argue that in-depth traditional case studies give relevance to economic principles and teach students information about qualitative tradeoffs within a complex environment that cannot be acquired from a simple knowledge of basic economic principles alone. In particular, they point out that instructors of terminal economics courses may best serve their students by teaching them how to use economic principles to make informed economic decisions in real-world scenarios rather than teaching them how to build advanced economic models.

Experiential learning

Many students can benefit from hands-on pedagogies such as experiential learning.[10] By requiring students to engage directly with the material, these teaching strategies are more likely to lead to deep learning. One form of experiential learning is service-learning, a pedagogy that can take many forms, can be utilized at all levels of the curriculum, in small or large courses. Service-learning deepens student understanding of concepts taught in the classroom by having students integrate these concepts with work outside the classroom. Ziegert and McGoldrick (2008) observe that "One of the strengths of service-learning is that the embedded learning process promotes student engagement with the material and student ownership over learning is strengthened" (p. 43). Instructors in other disciplines have known about the benefits of service-learning for some time, but use of the technique is somewhat newer to economics. Economics instructors can, however, learn from others' experience.

Markus *et al.* (1993), in a study of 89 students in an undergraduate political science course at a large research university, find that an assortment of benefits accrue to students

engaging in service-learning activities. For example, they find that classroom learning and course grades increased by a statistically significant amount and that students are more likely to report they "learned to apply principles from [the] course to new situations" (p. 414). The authors conclude that "experiential learning counters the abstractness of much classroom instruction and motivates lasting learning by providing concrete examples of facts and theories" (p. 416-7). Further, they find non-academic benefits to service-learning, such as "greater awareness of societal problems" and "significant effects [on] students' personal values and orientations" (p. 410).

Studying a sample of 3,450 undergraduates at 42 institutions, Astin and Sax (1998) seek to gauge the effects of community service participation on undergraduate development. Students engage in a variety of community service activities including tutoring at-risk elementary or secondary school students and volunteering at churches, hospitals or clinics, social or welfare organizations, community centers, etc. The authors find that participating in community service "substantially enhances the student's academic development, life skill development, and sense of civic responsibility." (p. 251)

Undergraduate student research

Undergraduate student research can also have benefits beyond those available to students from traditional teaching methods. It can be one part of a single course or can span multiple semesters, as might a senior thesis. In a study of 139 undergraduate students, approximately 55 percent of whom participated in an undergraduate research experience and 45 percent did not, Seymour, et al. (2004) find that participation in research increases undergraduates' self-confidence (both in general and with regard to the specific discipline), increases their ability to think and work like a scientist, and deepens student understanding of their discipline.[11] These

conclusions are based on data collected during interviews of the students and their faculty sponsors. Seymour, et al. also include several quotes from students that describe additional gains in areas such as communication skills, relationship with research faculty, and clarification of career objectives.

Hathaway, et al. (2002) survey 288 undergraduates at the University of Michigan. Sixty-three percent of students in the sample participated in a research experience and thirty-seven percent did not. They conclude that undergraduate research participation leads to statistically significant increases in student likelihood of pursuing post-graduate education.[12]

Distance learning and technology utilization[13]

The increased use of computers and the internet in the classroom motivates research evaluating the impact of technology and distance learning on student performance. Online courses in economics have a variety of distinct advantages and disadvantages compared to traditional, face-to-face economics courses. Online courses allow students who live in remote locations to take classes without incurring significant travel costs and provide flexibility to working students who might not be able to attend day classes. Depending on the nature of coursework, online classes may allow instructors to teach larger classes, especially if the majority of coursework can be graded automatically or with minimal instructor time (for example, online problem sets or discussion posts). Potential costs associated with distance learning include startup costs for instructors, less personal interaction between students and instructors, fewer opportunities for real-time discussion and active learning, and an increased potential for cheating on exams. While many online instructors give the equivalent of take-home exams to their students, some instructors require students to take exams in a brick and mortar setting.

Gratton-Lavoie, et al. (2009) study learning outcome differences across online and traditional principles of microeconomics classes at California State University, Fullerton. The instructors teach both an online version, in which all course material, including lectures, are delivered online, and a traditional version, in which students have access to a basic course website (containing the same course material as the online course) and lectures are delivered face-to-face. The instructors seek to eliminate any bias they might introduce by alternating which course they teach every semester and adhering to previously agreed-upon course materials, assignments, and exams. Students freely select whether they take an online or traditional version of the course and comparisons across these two formats reveal significantly different student characteristics. Notably, students in the online course are, on average, older, more likely to be married and have children, and more likely to be female. After controlling for these differences, Gratton-Lavoie, et al. find no statistically significant effect on student performance of teaching online economics courses versus traditional classroom economics courses. The lack of performance differences provides justification for developing online courses, particularly for students who face barriers to attending traditional brick and mortar college courses.

Agarwal and Day (1998) evaluate the degree to which using the internet as a tool for economic education has an effect on student learning and retention of concepts, student perception of instructor effectiveness, and student perceptions of and attitudes towards economics. Based on a sample of 210 students (130 in undergraduate macroeconomics, 80 in graduate microeconomics), and defining internet tools as email, a class discussion list, and resources for internet research, Agarwal and Day find that introducing the internet as a learning tool had a positive and statistically significant effect on TUCE scores and student grades in both undergraduate and graduate classes. Their results also indicate that internet use as a component

of economic education improves student perception of instructor effectiveness. Lastly, they find that internet tools had a positive effect on graduate student attitudes toward economics but no significant effect on undergraduate attitudes toward economics.

Sosin, et al. (2004) study the effect of technology utilization on student performance using a sample of 67 introductory economics courses with a total of 30 instructors and 3,986 students. The authors measure student performance across courses by comparing pre- and post-course scores on the TUCE. The authors find that extensive electronic technology use had an overall, positive and significant effect on student performance in both microeconomics and macroeconomics courses; however, they find that instructor use of PowerPoint had a significant negative effect on performance. Additionally, they find that while emailing materials to students had a significant negative effect on macroeconomics student performance and courseware like Blackboard and WebCT had a significant positive effect, these effects were reversed for microeconomics students. These results suggest that differences in the type of material may impact the efficacy of technology utilization.

Teacher preparation

Most economics instructors get their first teaching experience while in graduate school. Economics departments often employ graduate students as teaching assistants (to grade papers, etc.), as recitation leaders, and as independent instructors of undergraduate courses. Walstad and Becker (2010) summarize survey data collected from 81 PhD-granting economics departments in 2008. Their results indicate that 89 percent of economics graduate students have some form of teaching responsibilities. The survey also inquires about the type of training given to graduate students before putting them in front of a class. Of the departments that use graduate students as instructors, Walstad and Becker report that less than half require the students to attend a

noncredit program on teaching and less than one third require students to attend a for-credit graduate course on teaching. Some departments offer training for graduate instructors themselves, while others rely on University resources such as staff from a teaching and learning center. Walstad and Becker report that graduate instructors are much more likely to attend internal department programs than they are to attend external programs (87 percent vs. 17 percent for for-credit courses and 86 percent vs. 70 percent for noncredit programs, p. 205-6). The authors express surprise that PhD-granting economics departments invest so little in training their graduate instructors, particularly since "most graduate students who earn a PhD are likely to assume significant teaching responsibilities when they secure an academic position." (Walstad and Becker, 2010, p. 208).

In a similar study, McCoy and Milkman (2010) survey 124 recent economics PhDs about the pedagogical training they received in graduate school and how well-prepared they were to teach upon graduation. About 38 percent of respondents reported attending a noncredit teacher training program while in graduate school and less than 12 percent of respondents reported taking a for-credit graduate teaching course.[14] Respondents who had participated in the different programs report similar perceptions of their preparedness for teaching upon graduation. When asked to evaluate student perceptions of their teaching, respondents who had taken a for-credit training course reported receiving higher student evaluations than did respondents who had not received any teacher training in graduate school, a difference that is statistically significant.

Conclusion

Active learning strategies are generally found to produce greater student learning, as evidenced by higher test scores and longer retention, with generally modest costs to the instructor. Further, while the strategies have been discussed independently here, Pollock (2006) finds that learning

outcomes are highest when instructors use a combination of active learning strategies in lectures and associated recitation sections.[15]

While the research on the effects of replacing or supplementing lectures with cooperative learning exercises, classroom experiments, case studies and other active-learning pedagogies provides substantial evidence of their efficacy, there is room for additional work. Future research should examine larger samples of students, instructors, and courses, more-carefully control for non-pedagogical factors, focus on identifying specific benefits associated with individual teaching strategies (or combinations of strategies), and attempt to quantify the learning gains that come with the use of different strategies. In addition, researchers could further explore exactly *why* active learning techniques promote deep learning. Finally, as technology evolves, so will the economics classroom; future research should evaluate the benefits of new technologies that might enhance student learning.

Endnotes

[1] Siriopoulos and Pomonis (2006) review 40 papers that study the effectiveness of different pedagogies in economics and finance and reports that 35 of the 40 strongly recommend significant use of non-lecture techniques to improve student learning.

[2] Explanations for this remain an open question. Watts and Becker (2008) suggest there are strong "inertial forces leading most economists to use chalk and talk teaching methods." (p. 285)

[3] For more information about distance learning, see that chapter in this volume.

[4] Both Hoxby (2000) and Sacerdote (2001) find positive and statistically significant peer group effects on student performance.

[5] Greg Delemeester and Jurgen Brauer maintain a list of over 170 non-computerized classroom games currently available for use in college economics courses at http://www.marietta.edu/~delemeeg/games/. The games are organized by topic and are available for introductory macro- and micro-economics, money and banking, labor economics, and other post-principles courses. Charles Holt maintains a similar list of computerized classroom games at http://veconlab.econ.virginia.edu/admin.php.

[6] The findings of Bastian, et al. (1997) support the conclusion that students do not require special incentives (monetary incentives in their experiment) to learn from classroom experiments.

[7] See the Measurement Techniques of Student Performance and Literacy chapter in this volume, for more information about the TUCE.

[8] Carlson and Velenchik (2006) provide a set of guidelines for instructors to follow when utilizing the case method in the classroom. These strategies include allowing for silence to let students think, encouraging students to respond directly to other students, and giving serious thought to what one is trying to teach with a case before using it.

[9] One course was an upper-level Development Economics taught at a selective liberal arts college and the other was an upper-level International Monetary Issues taught at a large public research institution.

[10] Ziegert (2000) finds that a majority of students have a personality that leads them to prefer experience-based learning opportunities; Ziegert and McGoldrick (2008) observe that service learning better serves such students.

[11] Seymour, et al. (2004) also lists 53 articles that describe the potential benefits of undergraduate research.

[12] The student sample is drawn from students who applied to participate in an undergraduate research program. Selection to the program was randomly determined by lottery so as to any eliminate possible bias due to more-qualified students participating in the research program.

[13] See the chapters "Distance Learning" and "In Class Use," in this volume, for additional information on these topics.

[14] It is unclear whether there is any overlap between these two groups.

[15] Pollock (2006) studies three sections of Physics I at a large public research institution, with each section taught using a different mix of traditional and non-traditional teaching strategies.

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