

**Abstract Title Page**  
*Not included in page count.*

**Title:**

Effects of Problem Based Economics on high school economics instruction

**Author(s):**

Dr. Neal Finkelstein, WestEd

Dr. Thomas Hanson, WestEd

## **Abstract Body**

*Limit 5 pages single spaced.*

### **Background / Context:**

At the federal and state levels, economics has received increasing attention as a critical content area for K–12 education. In 1994 the Goals 2000 Educate America Act identified economics as one of nine core subject areas for developing content standards. Three years later, the National Council on Economic Education (NCEE) led a coalition of organizations (including the National Association of Economic Educators, the Foundation for Teaching Economics, and the American Economics Association’s Committee on Economic Education) to develop voluntary content standards to guide instruction. The standards describe the economics content for grades 1–12 and include 211 benchmarks detailing what students should know and be able to do (Siegfried and Meszaros 1998). According to the most recent NCEE survey of 2007, 48 states now include content standards in economics, with 40 requiring implementation of the standards, 23 requiring testing, and 17 requiring an economics course for graduation (NCEE 2007).

Even with the recent national attention on economics literacy in K–12 education (e.g. NAEP economics test in 2006; EEE grant program in 2004 and 2005), there is less agreement about where economics fits into the curriculum, effective ways of teaching it, and how much subject-area background should be required of classroom instructors (Watts 2006).

Watts (2006) reports that in states where economics is required for high school graduation, it is typically taught by following the state-adopted content standards, which are supported by a textbook. The format is generally one in which teachers provide direct instruction through a lecture format and encourage student discussion (see, for example, Mergendoller, Maxwell, and Bellissimo 2000). The teachers’ objective is to follow the text from beginning to end, covering concepts of theoretical and applied micro- and macroeconomics. In practice, there is variation from classroom to classroom (Walstad 2001). Teachers not only vary the sequencing of the course, but also add content through lessons and activities to augment the textbook (Schug, Dieterle, and Clark 2009). The variation is largely due to the fact that teachers and their districts remain ultimately responsible for designing the curriculum (Walstad 2001).

In contrast with the textbook-driven curriculum for high school economics, the method tested in this experimental trial (Problem Based Economics) uses a problem-based approach. Teachers use economic problems and follow a set of disciplined and strategic analytic steps. The intent is that students learn to contextualize, understand, reason, and solve what may at the outset have been a problem for which they had no analytic tools.

### **Purpose / Objective / Research Question / Focus of Study:**

The primary purpose of this study is to assess student-level impacts of a problem-based instructional approach to high school economics. The curriculum approach examined here was designed to increase class participation and content knowledge for high school students who are learning economics. This study tests the effectiveness of Problem Based Economics, developed by the Buck Institute for Education, on student learning of economics content and problem-solving skills. Student achievement outcomes are of primary importance and are hypothesized to be mediated by changes in teacher knowledge and pedagogical practice. This study targeted high

schools in both urban and rural areas and engaged teachers who committed to teach economics during the 2007/08 academic year.

The research questions asked whether Problem Based Economics changes:

- Students' content knowledge in economics.
- Students' problem-solving skills in economics.
- Teachers' content knowledge in economics.
- Teachers' instructional practices.
- Teachers' satisfaction with teaching materials and methods used to teach economics.

### **Setting:**

The field implementation for the study was high school classrooms in participating schools/districts. The intervention group teacher professional development took place in an office/conference environment in the summer preceding the 2007/2008 academic year.

### **Population / Participants / Subjects:**

The study was implemented from summer 2007 through spring 2008 in high schools in Arizona and California. For both of these states, high school economics has become a required course for graduation and relevant to schools and districts as a result. Arizona targeted the graduating class of 2009 as the first cohort of high school students that was required to complete a course in economics; California has had this requirement in place since 2005. Study participants included 128 economics teachers from 106 schools. Teachers were randomly assigned to the intervention or control condition (64 teachers each). The final analytic sample included 4,350 students. Some 39 percent of the students were eligible for free or reduced-price meals, 37 percent were Hispanic, and 40 percent were non-Hispanic White.

### **Intervention / Program / Practice:**

The intervention for this study was a specific set of Problem Based Economics curricular materials provided to intervention group teachers within a professional development and ongoing support program. The teachers used the Problem Based Economics materials as a major portion of their instructional program in their high school economics classes in the 2007/08 academic year.

A five-day professional development workshop provided to the intervention group familiarized teachers with the curriculum modules, using pedagogical strategies consistent with problem-based instruction. The Buck Institute provided trainers who were current or former economics teachers with substantial experience using the Problem Based Economics curriculum materials. The trainers reviewed one curriculum module each day; pedagogical strategies that are consistently applied in the units were modeled, highlighted, reinforced, and discussed throughout the workshops.

Following the professional development program, teachers used the curriculum and associated methods to teach students in their classrooms for a one-semester course.

The counterfactual for the study was typical economics instruction using approved textbooks.

### **Research Design:**

The study was designed as a within-school randomized controlled trial.

The test of whether gains in economic literacy are seen between intervention and control students was accomplished by the administration of the Test of Economic Literacy (TEL), a 40-item closed-response economics exam (Walstad and Rebeck, 2001). The research team augmented this outcome measure with an opportunity to test students' abilities to reason with the concepts they had learned. Each TEL item was rated "correct" (1 point) or "incorrect" (0 points); the possible overall TEL score ranged from 0 to 40. A set of "performance tasks", developed by the University of California, Los Angeles's National Center for Research on Education, Standards, and Student Testing (UCLA CRESST), gave students the ability to demonstrate problem-solving skills as they answered open-ended essay questions. The five assessment tasks used in this study focused on monetary policy/federal funds, monetary policy/employment, fiscal policy, consumer demand, and opportunity costs. Each student was randomly assigned two tasks.

Both the TEL posttest and the performance task assessments were administered to the students by designated proctors (such as student counselors) at the end of the spring 2008 semester. See Table 1 for key study characteristics.

### **Data Collection and Analysis:**

Data collection for student measures (pre-test) were collected by the economics teachers at the start of the semester. Posttest data for student measures were not collected by the teachers but rather by proctors identified in each school. Consistent with standardized test administration, proctors received instructions from the research team, including information on how to return test materials by secure mail for follow-up scoring. Proctors were either student counselors or school-level administrators familiar with proctoring examinations. Therefore, data collection was not blinded to assignment condition. Teacher-level data were collected by participating teachers, who received the instruments by mail along with preaddressed, stamped envelopes for returning them.

Impacts of Problem Based Economics were estimated by comparing outcomes for students and teachers who were randomly assigned to the intervention and control groups. The impact analyses focused on the effect of the program on two primary student outcome domains (economics content knowledge and problem-solving skills) and three secondary teacher outcome domains (economics content knowledge, pedagogical practices, and satisfaction with teaching materials and methods). For student outcomes, the primary hypothesis-testing analyses involved fitting conditional multilevel regression models, with additional terms to account for the nesting of units within higher units of aggregation (Goldstein 1987; Raudenbush and Bryk 2002; Murray 1998). A random effect for teachers was included in the model to account for the nesting of student observations within teachers. All outcome variables were treated as continuous variables in the impact analyses (estimated using multilevel or single-level linear regression models). To

increase the precision of the estimates, a set of baseline characteristics of students and teachers was included in the models as covariates.

### **Findings / Results:**

The analysis at the primary (student) level supports the following:

- A statistically significant finding that students whose teachers had received professional development and support in Problem Based Economics (model-adjusted mean score = 22.61) outscored their control group peers (model-adjusted mean score = 20.01) on the TEL by an average of 2.6 test items (effect size = 0.32).
- The outcomes on student measures of problem-solving skills and application to real-world economic dilemmas also showed significant differences in favor of the intervention group (model-adjusted mean score for the intervention group was 6.72 versus 6.18 for the control group; the difference of 0.54 corresponded to an effect size of 0.27).

The study also confirmed the following at the secondary (teacher) level:

- No statistically significant difference between the intervention and control groups on teachers' knowledge of economics (model-adjusted means were 37.15 and 36.86 for the intervention and control group teachers, respectively). As discussed in the conclusions of the report, a ceiling effect on the Test of Economic Literacy instrument may have masked any true content gains for teachers.
- No statistically significant difference in teachers' pedagogical style with the survey measures used (model-adjusted means were 29.92 and 26.60 for the intervention and control group teachers, respectively).
- Statistically significant differences in favor of the intervention group teachers on a measure of satisfaction with the teaching materials and methods (model-adjusted means were 8.35 and 6.88 for the intervention and control group teachers, respectively; the difference of 1.47 corresponded to an effect size of 1.09).

### **Conclusions:**

Educators may be looking for ways to strengthen their economics education programs. The findings of this study confirm that students benefited from the combination of the professional development program, ongoing support for teachers, and the Problem Based Economics curriculum. At the same time, teachers reported satisfaction with the Problem Based Economics materials. Teachers in the sample had, on average, fewer than three college-level economics courses; the opportunity to engage in a five-day workshop in economics instruction offers support to teachers who are interested in advancing their own professional development and increasing content knowledge..

During recruitment, the majority of teachers who agreed to participate in the study expressed enthusiasm for the material they taught, its relevance to students' lives, and the idea that a research study would benefit the profession broadly. Recruitment for the study was not easy, however. Hundreds of economics teachers declined to participate. The original 128 who agreed to participate were interested in finding better ways to reach their students. They included both

new and seasoned teachers, with some variation in content expertise. What they had in common was their willingness to participate in the experiment—a selection bias that could not be quantified, but must be acknowledged. This has implications for the generalizability of the study. The results of this study are likely to apply mainly to teachers and schools where the economics program and the associated professional development are a priority. From the perspective of the students, we also note that their participation in the study was voluntary; we cannot quantify whether students unwilling to participate in the economics tests would have performed differently than the study sample described in this report.

## Appendices

Not included in page count.

### Appendix A. References

- Achilles, C.M., and Hoover, S.P. (1996). *Exploring problem-based learning (PBL) in grades 6–12*. Retrieved September 10, 2009, from <http://www.eric.ed.gov/ERICWebPortal/contentdelivery/servlet/ERICServlet?accno=ED406406>
- Allison, P.D. (2002). *Missing data*. Thousand Oaks, CA: Sage Publications.
- Artino, A. (2008). *A brief analysis of research on problem-based learning*. Retrieved September 10, 2009, from <http://www.eric.ed.gov/ERICWebPortal/contentdelivery/servlet/ERICServlet?accno=ED501593>
- Baker, E.L. (1997). Model-based performance assessment. *Theory into Practice*, 36, 247–54.
- Baker, E. L., Aschbacher, P. R., Niemi, D., and Sato, E. (1992). *CRESST performance assessment models: assessing content area explanations*. Retrieved April 21, 2010, from <http://www.cse.ucla.edu/products/guidebooks/cmodels.pdf>
- Baker, E.L., Freeman, M., and Clayton, S. (1991). Cognitive assessment of history for large-scale testing. In M.C. Wittrock and E.L. Baker (Eds.), *Testing and cognition*. Englewood Cliffs, NJ: Prentice-Hall.
- Baker, E.L., Linn, R.L., Abedi, J., and Niemi, D. (1996). Dimensionality and generalizability of domain-independent performance assessments. *Journal of Educational Research*, 89(4), 197–205.
- Baker, E.L., and Mayer, R.E. (1999). Computer-based assessment of problem solving. *Computers in Human Behavior*, 15(3), 269–282.
- Benjamini, Y., and Hochberg, Y. (1995). Controlling the false discovery rate: a new and powerful approach to multiple testing. *Journal of the Royal Statistical Society, Series B*, 57(1), 1289–1300.
- Bernanke, B.S. (2006). Testimony of Chairman Ben S. Bernanke on Financial Literacy before the Committee on Banking, Housing, and Urban Affairs of the United States Senate. Washington, DC: Federal Reserve Board. Retrieved September 10, 2009, from <http://www.federalreserve.gov/boarddocs/testimony/2006/20060523/default.htm>
- Bridges, E. (1992). *Problem based learning for administrators*. ERIC Clearinghouse on Educational Management, University of Oregon (ED 347617). Retrieved September 10,

2009, from

[http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content\\_storage\\_01/0000019b/80/24/31/a6.pdf](http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/24/31/a6.pdf)

Buck Institute for Education. (2008). *Problem Based Economics* (curriculum). Retrieved September 10, 2009, from [http://www.bie.org/index.php/site/PBE/pbe\\_overview/](http://www.bie.org/index.php/site/PBE/pbe_overview/)

California Department of Education. (2008). API data files 2006. Retrieved May 15, 2008, from <http://www.cde.ca.gov/ta/ac/ap/apidatafiles.asp>

California Department of Education. (2009). Questions and Answers: Standardized Testing and Reporting (STAR). Retrieved January 26, 2010, from <http://www.cde.ca.gov/ta/tg/sr/gsefaq.asp>

Duch, B. (1995). What is problem-based learning? *About teaching* 47. A newsletter of the Center for Teaching Effectiveness. Retrieved September 10, 2009, from <http://www.udel.edu/pbl/cte/jan95-what.html>

Duvall, R.F. (2009). *Federal government's role in empowering Americans to make informed financial decisions*. Testimony before the Senate Subcommittee on Oversight of Government Management, the Federal Workforce, and the District of Columbia, April 29, 2009. Retrieved September 10, 2009, from [http://www.councilforeconed.org/news/story.php?story\\_id=157](http://www.councilforeconed.org/news/story.php?story_id=157)

Educational Testing Service. (2010). *The Praxis Series: Teacher Licensure and Certification*. Retrieved January 8, 2010, from <http://www.ets.org/portal/site/ets/menuitem.fab2360b1645a1de9b3a0779f1751509/?vgnnextoid=48c05ee3d74f4010VgnVCM10000022f95190RCRD>

Expeditionary Learning Outward Bound. (1999). *Early indicators from schools implementing New American Schools designs*. Cambridge, MA: Expeditionary Learning Outward Bound.

Gijselaers, W.H. (1996). Connecting problem-based practices with educational theory. *New Directions for Teaching and Learning*, (68), 13–21.

Goldstein, H. (1987). *Multilevel models in educational and social research*. London: Oxford University Press.

Hendrie, C. (2003). Small schools hard to start, report finds. *Education Week*, 22(32). Retrieved September 10, 2009, from <http://www.edweek.org/ew/articles/2003/04/23/32gates.h22.html>

Hill, C.J., Bloom, H.S., Black, A.R., and Lipsey, M.W. (2008). Empirical benchmarks for interpreting effect sizes in research. *Child Development Perspectives*, 2(3), 172–77.

Hmelo-Silver, C.E., Duncan, R.G., and Chinn, C.A. (2007). Scaffolding and achievement in problem-based and inquiry learning: a response to Kirschner, Sweller, and Clark (2006). *Educational Psychologist*, 42(2), 99–107.



- Honey, M., and Henríquez, A. (1996). *Union City interactive multimedia education trial: 1993–95 summary report* (CCT Reports, 3). Retrieved September 10, 2009, from [http://www.edc.org/CCT/ccthome/tech\\_rept/CCTR3/](http://www.edc.org/CCT/ccthome/tech_rept/CCTR3/)
- Judge, G. G., Griffiths, W. E., Hill, R. C., Lutkepohl, H. and Lee, T.-C. (1985). *The Theory and Practice of Econometrics*. (2nd ed.) New York: Wiley.
- Kirschner, P.A., Sweller, J., and Clark, R.E. (2006). Why minimal guidance during instruction does not work: an analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist*, 41(2), 75–86.
- Landis, J.R., and Koch, G.G. (1977). The measurement of observer agreement for categorical data. *Biometrics* 33(1), 159–74.
- Lopus, J., and Placone, D. (2002). Online stock market games for high schools. *Journal of Economic Education*, 33(2), 192.
- Massa, N.M. (2008). Problem-based learning (PBL): a real-world antidote to the standards and testing regime. *New England Journal of Higher Education*, 22(4), 19–20.
- Maxwell, N., Mergendoller, J., and Bellisimo, Y. (2005). Problem-based learning and high school macroeconomics: a comparative study of instructional methods. *The Journal of Economic Education*, 36(4), 315–31. Retrieved September 10, 2009, from [http://www.bie.org/files/PBE%20JEE%20paper\\_1.pdf](http://www.bie.org/files/PBE%20JEE%20paper_1.pdf)
- Memory, D.M., Yoder, C.Y., Bolinger, K.B., and Wilson, W.J. (2004). Creating thinking and inquiry tasks that reflect the concerns and interests of adolescents. *Social Studies*, 95(4), 147.
- Mergendoller, J., Maxwell, N., and Bellisimo, Y. (2000). Comparing problem-based learning and traditional instruction in high school economics. *The Journal of Educational Research*, 93(6), 374–82.
- Mergendoller, J., Maxwell, N., and Bellisimo, Y. (2006). The effectiveness of problem-based instruction: a comparative study of instructional methods and student characteristics. *Interdisciplinary Journal of Problem-based Learning*, 5(2), 5. Retrieved September 10, 2009, from <http://docs.lib.purdue.edu/ijpbl/vol1/iss2/5/>
- Mo, K., and Choi, Y. (2003). Comparing problem-based learning with traditional instruction: focus on high school economics. *Theory and Research in Citizenship Education*, 35(1), 89–113. Published by the Association of Social Education in Korea (ISSN: 1598-7280). English abstract is available at <http://www.bie.org/index.php/site/resource/item150> (retrieved September 10, 2009).
- Moeller, B. (2005). Understanding the implementation of problem-based learning in New York City high school economics classrooms. In J. Ravitz (Chair), *Assessing implementation and impacts of PBL in diverse K–12 classrooms*. Paper presented at the annual meeting of the

American Educational Research Association, Montreal, Canada. Retrieved February 2, 2010, from [http://www.bie.org/research/study/understanding\\_the\\_implementation\\_of\\_problem-based\\_learning\\_in\\_new\\_york\\_city](http://www.bie.org/research/study/understanding_the_implementation_of_problem-based_learning_in_new_york_city)

Murray, D.M. (1998). *Design and analysis of group randomized trials*. New York: Oxford University Press.

National Assessment of Educational Progress. (2007). *The nation's report card: economics 2006*. Retrieved September 10, 2009, from <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2007475>

National Council on Economic Education. (1997). *Voluntary national content standards in economics*. New York: National Council on Economic Education.

National Council on Economic Education. (1999). *Standards in economics: survey of students and the public*. New York: National Council on Economic Education. Retrieved September 10, 2009, from <http://www.councilforeconed.org/cel/results.php>

National Council on Economic Education. (2007). *Economic, personal finance & entrepreneurship education in our nation's schools in 2007. A report card: survey of the states*. New York: National Council on Economic Education. Retrieved September 10, 2009, from <http://www.councilforeconed.org/about/survey2007/NCEESurvey2007.pdf>

Newmann, F., and Wehlage, G. (1995). *Successful school restructuring: a report to the public and educators by the Center on Organization and Restructuring of Schools*. Madison, WI: Wisconsin Center for Education Research. Distributed jointly by the American Federation of Teachers, Association for Supervision and Curriculum Development, National Association of Elementary School Principals, and the National Association of Secondary School Principals.

Niemi, D. (1996). Assessing conceptual understanding in mathematics: representation, problem solutions, justifications, and explanations. *Journal of Educational Research*, 89(6), 351–63.

O'Neil, H.F., Jr. (1999). Perspectives on computer-based performance assessment of problem solving: editor's introduction. *Computers in Human Behavior*, 15(3–4), 255–68.

Pearson Education, Inc. (2006). *California Subject Examinations for Teachers® Test Guide*. Amherst, MA: Pearson Education, Inc. Retrieved January 11, 2010, from [http://www.cset.nesinc.com/PDFs/CS\\_testguide\\_geninfo.pdf](http://www.cset.nesinc.com/PDFs/CS_testguide_geninfo.pdf)

Raudenbush, S.W., and Bryk, A.S. (2002). *Hierarchical linear models: applications and data analysis methods* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Raudenbush, S. W., Martinez, A., Spybrook, J. (2005). *Strategies for improving precision in group-randomized experiments*. New York: William T. Grant Foundation.

- Ravitz, J., and Mergendoller, J. (2005). *Evaluating implementation and impacts of problem based economics in U.S. high schools*. In J. Ravitz (Chair), *Assessing implementation and impacts of PBL in diverse K–12 classrooms*. Paper presented at the annual meeting of the American Educational Research Association, Montreal, Canada. Retrieved September 10, 2009, from [http://www.bie.org/AERA2005/Ravitz\\_Mergendoller.pdf](http://www.bie.org/AERA2005/Ravitz_Mergendoller.pdf)
- Ravitz, J., Becker, H., & Wong, Y. (2000). Constructivist compatible beliefs and practices among U.S. teachers: Teaching, Learning & Computing, 1998 National Survey, Report #4. UC, Irvine. Retrieved September 10, 2009, from <http://www.crito.uci.edu/tlc/findings/report4/report4.pdf>
- Schochet, P.Z. (2008). *Guidelines for multiple testing in impact evaluations of educational interventions* (MPR Reference No. 6300-080). Princeton, NJ: Mathematical Policy Research, Inc.
- Schug, M.C., Dieterle, D.A., and Clark, J.R. (2009). Are high school economics teachers the same as other social studies teachers? The results of a national survey. *Social Education* 72(2) 71–75. Retrieved October 10, 2009, from <http://markschug.com/pdf/AreHighSchoolEconTeachersTheSame.pdf>
- Siegfried, J.J., and Meszaros, B.T. (1998). Voluntary economics content standards for America's schools, *Journal of Economic Education*, 29(2), 139–49.
- StataCorp. (2007). *Stata statistical software: release 10*. College Station, TX: StataCorp LP.
- Stigler, G.J. (1970). The case, if any, for economic literacy. *Journal of Economic Education*, 1(2), 77–84.
- Tobin, J. (1986). Economic literacy isn't a marginal investment. *Wall Street Journal* New York: July 9, 1986
- U.S. Department of Education. (2010). Excellence in Economics Education Awards. Retrieved January 11, 2010, from <http://www.ed.gov/programs/econeducation/awards.html>
- U.S. Department of Education. (2001). Excellence in Economics Education Act of 2001. Retrieved September 10, 2009, from <http://www.ed.gov/policy/elsec/leg/esea02/pg78.html>
- University of California, Los Angeles, National Center for Research on Education, Standards, and Student Testing (UCLA CRESST). (2005). *High School Economics Performance Assessments*. Los Angeles, CA: UCLA.
- von Hippel, P.T. (2007). Regression with missing Y's: an improved strategy for analyzing multiply imputed data. *Sociological Methodology*, 37(1), 83–117.
- Walstad, W.B. (2001). Economic education in U.S. high schools. *Journal of Economic Perspectives*, 15(3), 195–210.

- Walstad, W.B. (2007). *Five developments advancing economic education in the United States: the role of the National Council on Economic Education*. Comments for a panel session at the annual meeting of the National Council on Economic Education, National Association of Economic Educators, and Global Association of Teachers of Economics, Denver. Retrieved September 10, 2009, from [http://www.councilforeconed.org/news/story.php?story\\_id=116](http://www.councilforeconed.org/news/story.php?story_id=116)
- Walstad, W.B., and Rebeck, K. (2001). *Examiners Manual, Test of Economic Literacy, Third Edition*. New York: National Council on Economic Education.
- Watts, M. (2006). *What works: a review of research on outcomes and effective program delivery in precollege economic education*. New York: National Council on Economic Education.
- What Works Clearinghouse. (2008). *Procedures and standards handbook (version 2.0)*. Retrieved September 13, 2009, from [http://ies.ed.gov/ncee/wwc/pdf/wwc\\_procedures\\_v2\\_standards\\_handbook.pdf](http://ies.ed.gov/ncee/wwc/pdf/wwc_procedures_v2_standards_handbook.pdf)
- White, I.R., and Thompson, S.G. (2005). Adjusting for partially missing baseline measurements in randomized trials. *Statistics in Medicine*, 24(77), 993–1007.
- Winick, D.M. (2007). Statement on results from *The nation's report card: Economics 2006*. Washington, DC: National Assessment Governing Board, August 8, 2007. Retrieved January 11, 2010, from <http://www.nagb.org/newsroom/PressReleasePDFs/Economics%202006%20-%20Winick%20statement.pdf>

## Appendix B. Tables and Figures

*Not included in page count.*

**Table 1. Study characteristics and data collection schedule for high school instruction with Problem Based Economics**

<b>Study design</b>	<b>Cluster-randomized trial</b>
<b>Unit of assignment</b>	Teachers
<b>Statistical power estimates</b>	For Type 1 error = .05, 80 percent or higher power to detect minimum detectable effect size of 0.18-0.21 at student level and 0.55 at teacher level <sup>a</sup>
<b>Implementation began</b>	Summer 2007
<b><i>Student measures</i></b>	
Test of Economic Literacy (pre/post)	Administered January 2008, June 2008
Student surveys (pre/post)	Administered January 2008, June 2008
Performance task assessments	Administered June 2008
<b><i>Teacher measures</i></b>	
Test of Economic Literacy (pre/post)	Administered June–August 2007, June 2008
Teacher surveys (pre/post)	Administered June–August 2007, June 2008

*Note: a.* The estimates were based on 83 teachers, with an average of 40 students per teacher. The study team closely worked with these teachers to collect data throughout the study period. The detailed flow of the teacher sample is presented later in this chapter (figure 2.1). The intraclass correlation was assumed to be either 0.15 or 0.20. Appendix A provides the power estimates based on the final analytic samples.