What Works Clearinghouse

ies INSTITUTE OF EDUCATION SCIENCES

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# WWC Review of the Report "Effects of Problem Based Economics on High School Economics Instruction"[1,2]

**The findings from this review do not reflect the full body of research evidence on *Problem Based Economics Instruction*.**

## What is this study about?

The study included 128 high school economics teachers from 106 schools in Arizona and California, half of whom were randomly assigned to the *Problem Based Economics Instruction* condition and half of whom were randomly assigned to the comparison condition. High levels of teacher attrition occurred after randomization and before implementation. The analysis sample included 64 teachers, with 35 in the treatment condition and 29 in the comparison condition.[3] Student attrition was low, and the student analytic sample was shown to be equivalent in economic literacy at baseline.[4]

Intervention teachers used *Problem Based Economics Instruction* materials as a major portion of their curriculum content and instructional program during the 2007–08 academic year, whereas comparison teachers used their schools' standard instructional materials.

The study assessed the effectiveness of *Problem Based Economics Instruction* by comparing the economics knowledge of students in the treatment and comparison groups at the end of their implementation semester.

### WWC Rating

***The research described in this report meets WWC evidence standards with reservations***

***Strengths:*** This study is a well-implemented randomized controlled trial.

***Cautions:*** This study experienced high levels of teacher attrition.

### Features of *Problem Based Economics Instruction*

Building on the more general techniques of problem-based learning, the *Problem Based Economics Instruction* curriculum was designed by the Buck Institute for Education, with input from university economists and expert teachers. The intervention is intended to help students actively learn critical thinking and problem-solving skills using real-world examples.

Each economics unit took place over four to 15 instructional days. Teachers were asked to provide core course content and use a set of strategies to help students contextualize, comprehend, and solve real economic problems; work in a group; communicate effectively using multiple methods and technologies; gather information and analyze data; understand interrelationships across economics systems; and make inferences.

The curriculum was designed to include nine modules. Five of the nine available modules were selected for use in this study and were provided to the intervention group teachers; these modules were chosen because they included fundamental components of the curriculum standards in Arizona and California.

## What did the study find?[5]

The study found no statistically significant difference on the economics knowledge of students in grades 11 and 12 in the classes that used *Problem Based Economics Instruction*, relative to students in the comparison classes. However, the effect size of 0.29 for the economics knowledge domain was positive and large enough to be considered substantively important according to WWC criteria (that is, at least 0.25 standard deviations).

## Appendix A: Study details

**Finkelstein, N., Hanson, T., Huang, C.-W., Hirschman, B., & Huang, M. (2011). *Effects of Problem Based Economics on high school economics instruction* (NCEE 2010-4002rev). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education.**

**Setting**

The study was conducted in 106 high schools in Arizona and California.

**Study sample**

The original study sample included 128 teachers from 106 schools in Arizona and California who were expected to teach high school economics classes for two consecutive semesters. The teachers were randomly assigned to either the *Problem Based Economics Instruction* condition or the comparison condition, resulting in 64 teachers in each group. For the 16 schools with two or more teachers in the study sample, randomization was conducted within the school. For other schools, randomization was conducted within strata of schools defined by their 2006 average student achievement test results. Students in grades 11 and 12 selected their economics classes around the same time the teachers received their assignments. There was no indication that students' course selection was related to teacher assignment.

Half of the teachers left or were dropped from the study sample after random assignment, resulting in an analysis sample of 64 teachers (35 in the *Problem Based Economics Instruction* group and 29 in the comparison group).[6] Attrition among students of teachers in the analysis sample was very low. The analytic sample (defined as those students in the analysis sample with no missing data) included 1,728 students in 35 treatment classrooms and 1,150 students in 29 comparison classrooms in the spring 2008 semester.[7] Across all 106 schools in the analysis sample, 60% of the students were from minority race/ethnic groups, and 39% received free or reduced-price lunches. Eighty-eight percent of students with valid posttest measures were enrolled in grade 12; the remaining 12% of students in the analysis sample were in grade 11.

**Intervention group**

Teachers in intervention classrooms used *Problem Based Economics Instruction* materials as a major portion of their curriculum content and instructional program. Teachers implemented the one-semester curriculum to one set of students in the fall of 2007 and to a second set of students in the spring of 2008. The analytic sample only included students from the spring semester. Five of the nine available modules were selected for use in this study, as these modules address the fundamental concepts required for the economics curriculum in Arizona and California. Use of *Problem Based Economics Instruction* represented approximately 50%–70% of the instruction received by students in the intervention condition.

**Comparison group**

Teachers in the comparison group used their standard instructional practices during both semesters. They received regular professional development in the 2007–08 academic year.

**Outcomes and measurement**

After completing one semester of high school economics (in spring 2008), students completed the Test of Economic Literacy and a performance task assessment that measured their conceptual knowledge and economic problem-solving skills at the end of the spring 2008 semester. For a more detailed description of these outcome measures, see Appendix B.

**Support for implementation**

In the summer prior to implementation, intervention teachers received 40 hours of professional development in *Problem Based Economics Instruction* over the course of five days. The trainers reviewed one curriculum module each day. Teachers also received five additional support sessions through group phone conferences. During these phone conferences, teachers discussed the curriculum and came up with solutions to challenging questions they encountered in class. Teachers also had access to master teachers and developer staff (from Buck Institute for Education) if they had questions about program implementation.

**Reason for review**

This study was identified for review by the WWC because it is an Institute of Education Sciences (IES)-funded study conducted by 2006-11 Regional Education Laboratory West administered by WestEd.

## Appendix B: Outcome measures for the economics knowledge domain

| Economics | |
|---|---|
| *Test of Economic Literacy* | The Test of Economic Literacy, a nationally normed standardized achievement test, was developed by the National Council on Economic Education to assess basic economic concepts taught in high school economics courses in grades 11 and 12. This test has two forms, each including 40 multiple-choice items. Eleven items overlap across the two forms. Students are required to finish the test in 30 to 40 minutes. This assessment was used as a pretest and posttest measure in the current study, with form A serving as the pretest and form B serving as the posttest. |
| *Student Performance Task Assessment* | This test, developed by the National Center for Research on Education, Standards, and Student Testing at the University of California, Los Angeles (UCLA CRESST), was used as a posttest assessment of student conceptual knowledge and economic problem-solving skills. The test consisted of five assessment tasks that focused on federal funds policy, employment policy, fiscal policy, consumer demand, and opportunity costs. These tasks were chosen because of their focus on fundamental economics concepts and alignment with state standards for high school economics courses. Students in the current study were randomly assigned to complete two of the five assessment tasks at posttest. Responses were evaluated by Educational Data Systems, Inc., on overall content understanding, prior knowledge, number of principles or concepts used, use of text for elaboration, quality of the argument, and misconceptions in interpretation of the text. |

## Appendix C: Study findings for the economics knowledge domain

| Domain and outcome measure | Study sample | Sample size | Mean (standard deviation) | | WWC calculations | | | *p*-value |
|---|---|---|---|---|---|---|---|---|
| | | | Intervention group | Comparison group | Mean difference | Effect size | Improvement index | |
| **Economics knowledge** | | | | | | | | |
| *Test of Economic Literacy* | Grades 11 and 12 | 64 teachers/ 2,878 students | 23.29 (7.88) | 20.55 (8.15) | 2.74 | 0.34 | +13 | 0.03 |
| *Student Performance Task Assessment* | Grades 11 and 12 | 62 teachers/ 2,657 students | 6.78 (2.14) | 6.29 (2.01) | 0.49 | 0.24 | +9 | 0.06 |
| **Domain average for economics knowledge** | | | | | | **0.29** | **+11** | **Not statistically significant** |

**Table Notes:** Positive results for mean difference, effect size, and improvement index favor the intervention group; negative results favor the comparison group. The effect size is a standardized measure of the effect of an intervention on student outcomes, representing the change (measured in standard deviations) in an average student's outcome that can be expected if the student is given the intervention. The improvement index is an alternate presentation of the effect size, reflecting the change in an average student's percentile rank that can be expected if the student is given the intervention. The WWC-computed average effect size is a simple average rounded to two decimal places; the average improvement index is calculated from the average effect size. The statistical significance of the study's domain average was determined by the WWC; a study is characterized as not statistically significant when univariate statistical tests are reported for each outcome measure and no effects within the domain are statistically significant.

**Study Notes:** The adjusted posttest means presented here were reported in an appendix of the original study and come from multilevel regression models that accounted for differences in study design characteristics, teacher characteristics, student demographic characteristics, and student pretest data from the *Test of Economic Literacy*. The analytical model represented here included only students with nonmissing posttest and covariate data. The *p*-values presented here were reported in the original study. A correction for multiple comparisons was needed and resulted in significance levels that differ from those in the original study. Due to the multiple comparisons adjustment, the *p*-value of 0.03 for the *Test of Economic Literacy* was higher than the critical *p*-value for statistical significance; therefore, the WWC does not find the result to be statistically significant.

## Endnotes

[1] Single study reviews examine evidence published in a study (supplemented, if necessary, by information obtained directly from the author[s]) to assess whether its design meets WWC evidence standards. The review reports the WWC's assessment of whether the study meets WWC evidence standards and summarizes the study findings following WWC conventions for reporting evidence on effectiveness. The WWC rating applies only to the summarized results, and not necessarily to all results presented in the study. This study was reviewed using the Single Study review protocol.

[2] Absence of conflict of interest: The Regional Educational Labs were provided technical assistance by Mathematica Policy Research, which also operates the WWC. For this reason, this study was reviewed by staff from subcontractor organizations.

[3] These numbers reflect the analysis sample for the Test of Economic Literacy. The Student Performance Task Assessment analysis included 62 teachers (33 in the *Problem Based Economics Instruction* group and 29 in the comparison group).

[4] The authors provided the WWC with sample sizes, means, and standard deviations for the Test of Economic Literacy at baseline for the sample of students without imputed data.

[5] Finkelstein et al. (2011) found a statistically significant difference between the treatment and comparison groups on the Test of Economic Literacy measure and on the Student Performance Task Assessment. These effects were not statistically significant according to the WWC criteria, however, when using non-imputed data and correcting for multiple comparisons.

[6] Teachers left or were dropped from the study for various reasons, such as class schedule and position changes, personal issues, unavailability for training, and unresponsiveness to study contact attempts.

[7] These numbers reflect the analysis sample (defined as those students in the analysis sample with no missing data) for the Test of Economic Literacy. The Student Performance Task Assessment included 2,657 students (1,551 in the *Problem Based Economics Instruction* group and 1,106 in the comparison group).

## Recommended Citation

U.S. Department of Education, Institute of Education Sciences, What Works Clearinghouse. (2012, June). *WWC review of the report: Effects of Problem Based Economics on high school economics instruction*. Retrieved from http://whatworks.ed.gov.

## Glossary of Terms

**Attrition** Attrition occurs when an outcome variable is not available for all participants initially assigned to the intervention and comparison groups. The WWC considers the total attrition rate and the difference in attrition rates across groups within a study.

**Clustering adjustment** If intervention assignment is made at a cluster level and the analysis is conducted at the student level, the WWC will adjust the statistical significance to account for this mismatch, if necessary.

**Confounding factor** A confounding factor is a component of a study that is completely aligned with one of the study conditions, making it impossible to separate how much of the observed effect was due to the intervention and how much was due to the factor.

**Design** The design of a study is the method by which intervention and comparison groups were assigned.

**Domain** A domain is a group of closely related outcomes.

**Effect size** The effect size is a measure of the magnitude of an effect. The WWC uses a standardized measure to facilitate comparisons across studies and outcomes.

**Eligibility** A study is eligible for review and inclusion in this report if it falls within the scope of the review protocol and uses either an experimental or matched comparison group design.

**Equivalence** A demonstration that the analysis sample groups are similar on observed characteristics defined in the review area protocol.

**Improvement index** Along a percentile distribution of students, the improvement index represents the gain or loss of the average student due to the intervention. As the average student starts at the 50th percentile, the measure ranges from –50 to +50.

**Multiple comparison adjustment** When a study includes multiple outcomes or comparison groups, the WWC will adjust the statistical significance to account for the multiple comparisons, if necessary.

**Quasi-experimental design (QED)** A quasi-experimental design (QED) is a research design in which subjects are assigned to intervention and comparison groups through a process that is not random.

**Randomized controlled trial (RCT)** A randomized controlled trial (RCT) is an experiment in which investigators randomly assign eligible participants into intervention and comparison groups.

**Single-case design (SCD)** A research approach in which an outcome variable is measured repeatedly within and across different conditions that are defined by the presence or absence of an intervention.

**Standard deviation** The standard deviation of a measure shows how much variation exists across observations in the sample. A low standard deviation indicates that the observations in the sample tend to be very close to the mean; a high standard deviation indicates that the observations in the sample tend to be spread out over a large range of values.

**Statistical significance** Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups. The WWC labels a finding statistically significant if the likelihood that the difference is due to chance is less than 5% ($p < 0.05$).

**Substantively important** A substantively important finding is one that has an effect size of 0.25 or greater, regardless of statistical significance.

Please see the WWC Procedures and Standards Handbook (version 2.1) for additional details.