Effects of Problem Based Economics on High School Economics Instruction

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Final Report
The case for economic literacy is obvious. High school graduates will be making economic choices all their lives, as breadwinners and consumers, and as citizens and voters. A wide range of people will be bombarded with economic information and misinformation for their entire lives. They will need some capacity for critical judgment. They will need it whether or not they go to college.

James Tobin, Yale Economist and Nobel Laureate
Wall Street Journal, July 9, 1986
Purpose

• Assess student-level impacts of a problem-based instructional approach to high school economics.

• Tests the effectiveness of Buck Institute for Education curriculum on student learning of economics content and problem solving skills.

• Within-school randomized controlled trial in urban and rural high schools in California and Arizona during the 2007/08 school year.
Why Study Economics Instruction?

- For decades, economists, educators, and business and government leaders have advocated for economic literacy as a component in school curricula.
- In general, high school economics does not help students understand our economic system.
- Most teachers are not adequately prepared to teach economics.
- 48 states include content standards in economics. 40 require implementation of standards, 23 require testing, and 17 require an economics course for graduation.
What is Problem-Based Economics Instruction?

- Teachers use economic problems to help students learn to contextualize, understand, and solve problems.
- Each of five curriculum modules is built around a case study well-suited to student-driven problem solving.
- Teaching guide lays out all aspects of instruction, including problem statement, placement in curriculum, concepts taught, objectives, resources materials and do’s and don’ts.
- Teachers in the intervention group receive professional development introducing the curriculum.
Conceptual Framework

- Student achievement outcomes are of primary importance and are hypothesized to be mediated by changes in teacher knowledge and pedagogical practice.
# Conceptual Framework

Logic model for the study of high school instruction with Problem-based Economics

<table>
<thead>
<tr>
<th>Teacher Professional Development</th>
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</thead>
<tbody>
<tr>
<td><strong>Content</strong></td>
</tr>
<tr>
<td>• Review of economic theory and related applications; curriculum review</td>
</tr>
<tr>
<td><strong>Pedagogy</strong></td>
</tr>
<tr>
<td>• Problem-based approach to teaching and support strategies for students</td>
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<tr>
<th>Classroom Instruction</th>
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<tbody>
<tr>
<td><strong>Curriculum</strong></td>
</tr>
<tr>
<td>• Fluent presentation of curriculum; scaffolding for students</td>
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<td><strong>Engagement</strong></td>
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<tr>
<td>• Problem-solving strategies that build economic content and reinforce core analytic thinking</td>
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<tr>
<th>Student Performance</th>
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<tr>
<td><strong>Concepts</strong></td>
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<tr>
<td>• Broad-based literacy in micro- and macroeconomic concepts</td>
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<tr>
<td><strong>Problem Solving</strong></td>
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<tr>
<td>• Ability to apply concepts and analytic approaches to real-world problems</td>
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Research Questions

1. Does PBE change students’ content knowledge in economics?
2. Does PBE change students’ problem-solving skills in economics?
3. Does PBE change teachers’ content knowledge of economics?
4. Does use of PBE change economics teachers’ instructional practices?
5. Does the use of PBE change teachers’ satisfaction with teaching materials and methods used to teach economics?
Key Outcomes to be Studied and Their Measures

- The primary outcome measure is content knowledge gains for students in economics measured by the Council for Economic Education’s Test of Economic Literacy.
- Student problem-solving skills are measured with open-response performance assessment of applied economic concepts developed by UCLA CRESST.
- Teachers’ content knowledge was also measured using the Test of Economic Literacy. Pedagogical practices and teacher satisfaction were measured using a series of survey measures.
# Key Study Characteristics

## Study characteristics and data collection schedule

<table>
<thead>
<tr>
<th>Study design</th>
<th>Cluster-randomized trial</th>
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<tbody>
<tr>
<td>Unit of assignment</td>
<td>Teachers</td>
</tr>
<tr>
<td>Statistical power estimates</td>
<td>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(^a)</td>
</tr>
<tr>
<td>Implementation began</td>
<td>Summer 2007</td>
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<tr>
<td>Student measures</td>
<td></td>
</tr>
<tr>
<td>Test of Economic Literacy (pre/post)</td>
<td>Administered January 2008, June 2008</td>
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<tr>
<td>Student surveys (pre/post)</td>
<td>Administered January 2008, June 2008</td>
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<tr>
<td>Performance task assessments</td>
<td>Administered June 2008</td>
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<tr>
<td>Teacher measures</td>
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<tr>
<td>Test of Economic Literacy (pre/post)</td>
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<tr>
<td>Teacher surveys (pre/post)</td>
<td>Administered June–August 2007, June 2008</td>
</tr>
</tbody>
</table>

Note: \(^a\) The estimates were based on 83 teachers, with an average of 40 students per teacher.
Teacher Participants

Allocation

Allocated to intervention group: n = 64
- 44 teachers from 44 singleton schools
- 20 teachers from 16 schools with 2 or more participating teachers.

Included: n = 42
- 28 teachers from 28 singleton schools
- 14 teachers from 11 schools with 2 or more participating teachers.

Not Included: n = 22
- 16 teachers from 16 singleton schools
- 6 teachers from 6 schools with 2 or more participating teachers.

Allocated to control group: n = 64
- 46 teachers from 46 singleton schools
- 18 teachers from 15 schools with 2 or more participating teachers.

Included: n = 41
- 31 teachers from 31 singleton schools
- 10 teachers from 9 schools with 2 or more participating teachers.

Not Included: n = 23
- 15 teachers from 15 singleton schools
- 8 teachers from 8 schools with 2 or more participating teachers.

Retention

Baseline Measures (Summer 2007)
- Teacher content knowledge in economics (n = 41)
- Pedagogical practices used (n = 39)
- Satisfaction with teaching materials & methods (n = 40)

Outcome Measures (June 2008)
- Teacher content knowledge in economics (n = 38)
- Pedagogical practices used (n = 38)
- Satisfaction with materials & methods (n = 37)

Data Collected & Analyzed

Baseline Measures (Summer 2007)
- Teacher content knowledge in economics (n = 29)
- Pedagogical practices used (n = 25)
- Satisfaction with teaching materials & methods (n = 29)

Outcome Measures (June 2008)
- Teacher content knowledge in economics (n = 34)
- Pedagogical practices used (n = 35)
- Satisfaction with materials & methods (n = 35)
Teacher Participants Providing Student-Level Data

Number of teachers recruited and randomized: n = 128 teachers

Allocated to intervention group: n = 64
Attrition: n = 22

Allocated to control group: n = 64
Attrition: n = 23

Number of teachers remained in the study: n = 42

In fall 2007:
• 38 teachers returned student-level data
• 3 teachers did not return any student-level data

In spring 2008:
• 35 teachers returned student-level data
• 6 teachers (including those who dropped out of the study) did not return any student-level data

Number of teachers remained in the study: n = 41

In fall 2007:
• 38 teachers returned student-level data
• 3 teachers did not return any student-level data

In spring 2008:
• 29 teachers returned student-level data
• 12 teachers (including those who dropped out of the study) did not return any student-level data

Total number of teachers who provided student-level data in spring 2008: n = 64 teachers
Student Participants

**Experimental Condition**

In intervention group (35 teachers):

- Included: n = 2,502
- Not Included: n = 0

In control group (29 teachers):

- Included: n = 1,848
- Not Included: n = 0

**Number of students consented to participate in the study & their data available to the research team:**

n = 4,350 students from 64 teachers

**Data Collected & Analyzed**

**Baseline Measures (January 2008)**

- Student content knowledge in economics
  - Non-missing: n = 2,232 (98%)
  - Missing: n = 270 (11%)
  - Number of teachers = 35

**Outcome Measures (June 2008)**

- Student content knowledge in economics
  - Included: n = 2,178 (87%)
  - Not Included: n = 324 (13%)
  - Number of teachers = 35
- Student problem-solving skills
  - Included: n = 1,918 (77%)
  - Not Included: n = 584 (23%)
  - Number of teachers = 33

**Baseline Measures (January 2008)**

- Student content knowledge in economics
  - Non-missing: n = 1,589 (86%)
  - Missing: n = 259 (14%)
  - Number of teachers = 29

**Outcome Measures (June 2008)**

- Student content knowledge in economics
  - Included: n = 1,574 (85%)
  - Not Included: n = 274 (15%)
  - Number of teachers = 29
- Student problem-solving skills
  - Included: n = 1,497 (81%)
  - Not Included: n = 351 (19%)
  - Number of teachers = 29

**Experimental Condition Data Collected & Analyzed**
Data Analysis Methods

- The analyses for this study compare outcomes for students and teachers in the treatment group with their counterparts in the control group after the economics course has been completed.
- For student outcomes, the analyses involve fitting conditional multilevel regression models (HLM) to account for the nesting of students within teachers.
Data Analysis Methods

• A random effect for teachers is included in the model to account for the nesting of student observations within teachers. Fixed effects include treatment status, baseline (pre-test) measures of outcome variables, and other student and teacher-level covariates.

• For teacher outcomes, single-level regression models that include treatment status along with certain covariates (such as pre-test measures of outcome variables and teacher background information) are used to estimate program impacts.
Student-Level Findings

- Statistically significant finding: students whose teachers had received professional development and support in PBE outscored their control group peers on the TEL by an average of 2.6 test items (effect size = 0.32).
Student-Level Findings

- 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 (effect size = .27).
Teacher-Level Findings

- No statistically significant difference between the interventions and control groups on teachers’ knowledge of economics.
- No statistically significant difference in teachers’ pedagogical style with the survey measures used.
- Statistically significant differences in favor of the intervention group teachers on a measure of satisfaction with the teaching materials and methods.
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