Accounting for Co-Teaching

October 11, 2013

Using Student Test Scores to Measure Teacher Performance:
The State of the Art in Research and Practice

East Lansing, Michigan

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### Need Method for Co-Teaching

- Roster-confirmed data reveals co-teaching
  - Battelle for Kids (2009, 2013)
  - Value Added Research Center (2011)

<table>
<thead>
<tr>
<th>Year (DC Value Added)</th>
<th>Math</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Some Students Shared</td>
<td>All Students Shared</td>
</tr>
<tr>
<td>2010–2011</td>
<td>28.7%</td>
<td>9.0%</td>
</tr>
<tr>
<td>2011–2012</td>
<td>22.8%</td>
<td>8.1%</td>
</tr>
<tr>
<td>2012–2013</td>
<td>26.2%</td>
<td>14.8%</td>
</tr>
</tbody>
</table>
Assign each teacher a “dosage” = percent of instructional time spent with student

Three approaches to using dosage
- Partial credit method
- Teacher team method
- Full roster method/full roster-plus method

All methods use teacher fixed effects
## All Methods Used in DC Value Added

<table>
<thead>
<tr>
<th>Year</th>
<th>Teacher Model</th>
<th>School Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009–2010</td>
<td>Teacher team</td>
<td>Partial credit</td>
</tr>
<tr>
<td>2010–2011</td>
<td>Full roster</td>
<td>Partial credit</td>
</tr>
<tr>
<td>2011–2012</td>
<td>Full roster</td>
<td>Partial credit</td>
</tr>
<tr>
<td>2012–2013</td>
<td>Full roster-plus</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

n.a. = not applicable

*Planned
### Partial Credit Method

- Teachers’ estimates inform one another
- Teachers receive credit individually
- Some estimates may be statistically unreliable

<table>
<thead>
<tr>
<th>Students</th>
<th>A alone</th>
<th>Shared by A and B</th>
<th>B alone</th>
</tr>
</thead>
<tbody>
<tr>
<td>A alone</td>
<td>1</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>Shared by A and B</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>B alone</td>
<td>0</td>
<td>1</td>
<td></td>
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</tbody>
</table>
# Teacher Team Method

<table>
<thead>
<tr>
<th>Students</th>
<th>A's measure</th>
<th>B's measure</th>
<th>AB measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>A alone</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Shared by A and B</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>B alone</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

- Assume distinct effect of team
- Form team measures when possible
- Combine multiple estimates using student-weighted average
Full Roster and Full Roster-Plus Methods

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</table>

- Equal credit for shared students (team)
Three Basic Methods, but Only One Practical

- Partial credit: Works for schools, not teachers
- Teacher team
  - Requires complicated algorithm to determine possible teaming arrangements
  - Some students get de-linked from teachers
- Full roster/full roster-plus
  - Empirically nearly identical to teacher team method
  - More practical
  - All roster-confirmed students stay with teacher
Variations of Full Roster Method

- District policymakers choose (for full-time students)
  1. Same dosage, no matter how many courses
  2. Same dosage per teacher, no matter how many courses
  3. Same dosage per course-teacher combination

- Advantages of options 2-3
  - More robust to data errors in roster confirmation
  - Incentivize teachers to treat students equally
Full Roster Method Can Lead to Dilemma

- 100 percent dosage for co-taught students with each teacher preserves incentives for each teacher

BUT...

- Students contribute differently to calculation of student coefficients
  - Gives co-taught students extra weight in regression
  - Gives schools with co-taught students extra weight
**Full Roster-Plus Resolves Dilemma**

- **Goal:** Preserve relative weights within teacher but obtain equal weight across students

- **Full roster-plus same as full roster method plus shadow teachers**
  - Shadow teachers for each teacher
  - Estimate model with extra fixed effects (teachers plus shadow-teachers)

- **Example**
  - Maximum student dosage (any students) = 400%
  - Teacher-student dosage (Ms. Jones & Kareem) = 50%
  - Shadow teacher-student dosage (Shadow Ms. Jones & Kareem) = 350%
Full Roster-Plus Method Empirically Similar to Full Roster Method

- Compare value-added estimates under two methods
- DCPS value-added data, 2010–2011
- Correlation in math: 0.99994
- Correlation in reading: 0.99999
It’s a District Decision

- Challenging to attribute co-teaching separately
- Full roster practical solution if district ok with equal credit
- District must choose how to weight students
- Full roster-plus resolves dilemma of full roster but makes little difference empirically
- Best to leave decision to district policymakers
For More Information

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