Measuring the Impact of an Individual Course on Students’ Success

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Abstract

Using eight years of institutional longitudinal data we investigated the effects of a special mathematics course on the academic performance of students who did and did not enroll in the course. In spite of the large differences observed in raw measures of achievement, the statistical analysis revealed that after controlling for students’ prior characteristics, the effects of the course on students’ achievement are not statistically significant. The results point to possible deficiencies inherent in current institutional data for establishing effects of individual courses on students’ performance. Our current research designs and data collection processes might not target aspects of instruction that are likely to impact students’ academic performance; we suggest possible strategies to address this shortcoming.

Results

Table 1: Mean and standard deviations for dependent variables by sample and by AP score.

<table>
<thead>
<tr>
<th></th>
<th>Total Sample</th>
<th>Control Group</th>
<th>Treatment Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>X</td>
<td>SD</td>
</tr>
<tr>
<td>Math credits attempted</td>
<td>2,209</td>
<td>12.75</td>
<td>4.47</td>
</tr>
<tr>
<td>Mark credits attempted</td>
<td>2,209</td>
<td>10.10</td>
<td>4.47</td>
</tr>
</tbody>
</table>

Note: *P < 0.05 for all differences between groups. SAT scores, AP scores, and math credits attempted are statistically significantly different between groups.

Discussion & Implications

The treatment (taking Math 156) does not have an impact on later educational achievement of engineering students when measured as grades in the outcomes selected.

Prior achievement characteristics (such as SAT and score on AP tests) or personal characteristics (such as gender and ethnicity) have a greater impact on the grades.

Results might be consequence of:

- Difficulty in controlling for unobservable variables such as self-selection
- Difficulty in randomizing assignment to conditions
- Inadequate outcome variables:
  - Inability to measure the differences between the two instructional approaches
  - Are grades good measures of such differences?

The measures should:

- Capture instruction: the interaction between teacher and students with the specific content within the particular environment in which each class is conducted.
- Capture student’s ability to solve applied problems.

It is appropriate to advise students to enroll in Math 156, as other benefits are tangible (e.g., number of credits taken, and some preliminary evidence of good retention in STEM fields).

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