Florida Value-Added Models

Student Growth Implementation Committee (SGIC)
February 27, 2013
Presentation Outline

How models are designed and evaluated

- **End-of-course exams:**
  - Algebra I
  - Biology
  - Geometry

- **Optional VAM**
  - SAT-10
  - Advanced Placement (AP) Calculus AB
  - Advanced Placement (AP) English Language and Literature

- **Next Steps**
Structured Review Process

- Are the input data accurate and sensible?
  - Examine the descriptive statistics
  - Are there any red flags?

- Do the models behave as expected?
  - Examine the variance components
  - Examine R-squared to determine model fit
  - Precision of the value-added scores

- Do the results suggest advantages to certain groups?
  - Impact data based on correlations between value-added scores and class characteristics
Ideally, the predictor variables should have the following properties:

- A high statistical correlation with the outcome
- A high curricular relationship with the outcome
- A correlation with factors that contribute to student learning but are not in the control of teachers and schools
- A high correlation with the unobservable processes by which students are sorted into schools and classes

If predictors do not fully capture selection effects, teacher and school value-added estimates may be biased.
Covariates Included in Most Models

- Prior test scores
- Students with Disabilities (SWD) status
- Gifted status
- English Language Learner (ELL) status (time as ELL)
- Attendance
- Mobility (number of transitions)
- Difference from modal age in grade
- Class size
- Homogeneity of entering test scores in the class
- Percentage in each grade, when appropriate
- Percent gifted in class
- Number of subject-relevant courses
End of Course Value-Added Model: Algebra I
Students are included only if they have a 2010–11 FCAT 2.0 math score available as a predictor variable.

The model was run three times, each with a different subset of students:

- Model 1a: Includes all students
- Model 1b: Includes students in grades 6–8
- Model 1c: Includes only students in grade 9
### Number of Students per Model

<table>
<thead>
<tr>
<th>Model</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1a (All Students)</td>
<td>155,581</td>
</tr>
<tr>
<td>Model 1b (Grades 6–8)</td>
<td>57,988</td>
</tr>
<tr>
<td>Model 1c (Grade 9)</td>
<td>97,593</td>
</tr>
</tbody>
</table>
The following descriptive statistics are presented to show that the data seem reasonable and that observed patterns in the level scores are also observed in the value-added scores.
Algebra I

2011–12 Algebra I EOC Scores, Overall and by Subgroup

The graph shows the distribution of 2011-12 Algebra I EOC scores for different subgroups. The x-axis represents the score range from 300 to 500, and the y-axis lists the subgroups including All Students, Not ELL, ELL, Not SWD, SWD, Not Gifted, Gifted, Not ED, ED, Non-White, and White. The box plots visually represent the spread and central tendency of the scores within each subgroup.
Algebra I

2011–12 Algebra I EOC Scores, Overall and by Grade
Algebra I

2010–11 Math FCAT Scores, Overall and by Subgroup

![Box plot showing 2010-11 Math FCAT Scores by subgroup](chart)

- All Students
- Not ELL
- ELL
- Not SWD
- SWD
- Not Gifted
- Gifted
- Not ED
- ED
- Non-White
- White
Algebra I EOC and Math 8 FCAT Scores (Correlation = 0.70)
The data show that students in lower grades score higher on the Algebra I EOC than students in the higher grades.

There are large systematic differences between student groups.

The correlation between the Algebra EOC and the Math 8 FCAT is 0.70.
The next slide shows the teacher and school standard deviations.

The teacher component is typically expected to have more variability than the school component.

The school component is larger than expected in two of the three Algebra I EOC models.
School-Level Variation Is Larger than Expected Relative to Teacher-Level Variation
Algebra I

The R-Squared Is One Indicator of Model Fit

The closer the value is to 1, the better the model predicts the outcome scores. Model 1a, which includes the most observations, provides the best fit of the data.

<table>
<thead>
<tr>
<th>Model</th>
<th>R-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1a (All Students)</td>
<td>0.63</td>
</tr>
<tr>
<td>Model 1b (Grades 6–8)</td>
<td>0.53</td>
</tr>
<tr>
<td>Model 1c (Grade 9)</td>
<td>0.51</td>
</tr>
</tbody>
</table>
Both Models Are Able to Identify More and Less Effective Teachers

- Reliability Ratio numerator: How precise are the teacher estimates on average?
- Reliability Ratio denominator: What is the overall distribution of teacher estimates?
- Low ratio → Better able to distinguish among teachers on the basis of effectiveness
## Teacher Reliability Ratios

<table>
<thead>
<tr>
<th>Model</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a (All Students)</td>
<td>0.90</td>
</tr>
<tr>
<td>1b (Grades 6–8)</td>
<td>0.89</td>
</tr>
<tr>
<td>1c (Grade 9)</td>
<td>0.95</td>
</tr>
</tbody>
</table>
## Algebra I

### Percent of Teachers and Schools Significantly Different from Average

<table>
<thead>
<tr>
<th>Model</th>
<th>Teachers (above and below)</th>
<th>Schools (above and below)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a (All Students)</td>
<td>12%</td>
<td>14%</td>
</tr>
<tr>
<td>1b (Grades 6–8)</td>
<td>11%</td>
<td>14%</td>
</tr>
<tr>
<td>1c (Grade 9)</td>
<td>12%</td>
<td>11%</td>
</tr>
</tbody>
</table>
Algebra I

Teacher Component Estimates by Modal Grade in Class
Impact data slides show the relationship of the teacher score to various classroom characteristics.

There are two ways to interpret a non-zero relationship:

- Teachers are not distributed randomly across students.
- Classroom characteristics affect the rate of student learning and lead to biased value-added estimates.
Algebra I

Teacher Component and Mean Normalized Prior Score
Teacher Value-Added and Mean Normalized Prior Score
Algebra I
Teacher Component and Percent Economically Disadvantaged
Teacher Value-Added and Percent Economically Disadvantaged
Algebra I

Teacher Component and Percent Students with Disabilities
Teacher Value-Added and Percent Students with Disabilities
Algebra I
Teacher Component and Percent English Language Learners
Teacher Value-Added and Percent English Language Learners

Algebra I
Algebra I

Teacher Component and Percent Gifted
Teacher Value-Added and Percent Gifted
Algebra I

Teacher Component and Percent Non-White
Algebra I

Teacher Value-Added and Percent Non-White
### Observed Correlations with Teacher Value-Added Scores

<table>
<thead>
<tr>
<th>Model</th>
<th>Model 1a</th>
<th>Model 1b</th>
<th>Model 1c</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No School</td>
<td>School</td>
<td>No School</td>
</tr>
<tr>
<td>Mean Prior</td>
<td>0.08</td>
<td>0.13</td>
<td>0.17</td>
</tr>
<tr>
<td>%ED</td>
<td>-0.13</td>
<td>-0.18</td>
<td>-0.19</td>
</tr>
<tr>
<td>%SWD</td>
<td>-0.03</td>
<td>-0.04</td>
<td>-0.04</td>
</tr>
<tr>
<td>%ELL</td>
<td>0.01</td>
<td>0.00</td>
<td>-0.04</td>
</tr>
<tr>
<td>%Gifted</td>
<td>0.09</td>
<td>0.14</td>
<td>0.14</td>
</tr>
<tr>
<td>%Non-White</td>
<td>-0.03</td>
<td>-0.06</td>
<td>-0.06</td>
</tr>
</tbody>
</table>
Impact Data Results

- Note that the relationship between student characteristics and teacher estimates increases when the school component is added.
- The change is much larger in models 1a and 1b than in 1c.
- This is as we’d expect, given the sizes of the teacher and school variances in each model.
Impact Data Results

- Not only are there average differences in level scores between groups of students, but there are also average differences in value-added scores across classrooms and schools with different student demographic characteristics.
- It is not possible to determine the source of the differences across classrooms and schools.
End-of-Course Value-Added Model: Biology
Three Different Model Specifications Were Estimated

- The three models are identical except for the different prior achievement scores included:
  - Model 2a: Science FCAT score
  - Model 2b: Science FCAT score and up to two prior Math FCAT scores
  - Model 2c: Science FCAT score and up to two prior Reading FCAT scores
## Biology

Prior FCAT Score Depends on Student’s Grade

<table>
<thead>
<tr>
<th>Current Grade</th>
<th>Science FCAT</th>
<th>First Math FCAT</th>
<th>Second Math FCAT</th>
<th>First Reading FCAT</th>
<th>Second Reading FCAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>11</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>6</td>
</tr>
</tbody>
</table>
# Number of Students per Model

<table>
<thead>
<tr>
<th>Model</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 2a (Science FCAT)</td>
<td>147,869</td>
</tr>
<tr>
<td>Model 2b (Science and Math FCATs)</td>
<td>160,376</td>
</tr>
<tr>
<td>Model 2c (Science and Reading FCATs)</td>
<td>168,713</td>
</tr>
</tbody>
</table>
2011–12 Biology EOC Scores: Overall and by Subgroup

- All Students
- Not ELL
- ELL
- Not SWD
- SWD
- Not Gifted
- Gifted
- Not ED
- ED
- Non-White
- White
Biology

2011–12 Biology EOC Scores: Overall and by Grade

![Box plot showing 2011-12 Biology EOC scores for all students and by grade.](chart)
Science 8 FCAT Scores: Overall and by Subgroup
Biology EOC and Science 8 FCAT Scores (Correlation = 0.78)
Summary of Descriptive Statistics

- The data show that students in lower grades score higher on the Biology EOC than students in the higher grades.
- There are large systematic differences between student groups.
- The correlation between the Biology EOC and Science 8 FCAT is within the expected range.
### Biology

**R-Squared Is Similar Across Models**

<table>
<thead>
<tr>
<th>Model</th>
<th>R-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 2a (Science 8)</td>
<td>.62</td>
</tr>
<tr>
<td>Model 2b (Science 8 and Math)</td>
<td>.61</td>
</tr>
<tr>
<td>Model 2c (Science 8 and Reading)</td>
<td>.63</td>
</tr>
</tbody>
</table>
### Biology

Percent of Teachers and Schools Significantly Different from Average

<table>
<thead>
<tr>
<th>Model</th>
<th>Teachers (above and below)</th>
<th>Schools (above and below)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a (Science)</td>
<td>12%</td>
<td>10%</td>
</tr>
<tr>
<td>2b (Science and Math)</td>
<td>12%</td>
<td>10%</td>
</tr>
<tr>
<td>2c (Science and Reading)</td>
<td>12%</td>
<td>9%</td>
</tr>
</tbody>
</table>
## Reliability Ratio Is Not Atypical

<table>
<thead>
<tr>
<th>Model</th>
<th>Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a (Science)</td>
<td>0.96</td>
</tr>
<tr>
<td>2b (Science and Math)</td>
<td>0.98</td>
</tr>
<tr>
<td>2c (Science and Reading)</td>
<td>0.97</td>
</tr>
</tbody>
</table>
Teacher Component and Mean Normalized Prior Score

Biology
Biology

Teacher Value-Added and Mean Normalized Prior Score

[Graphs showing the relationship between Teacher Value-Added and Mean Prior Normalized FCAT Score for different models.]
Teacher Component and Percent Economically Disadvantaged
Teacher Value-Added and Percent Economically Disadvantaged
Biology

Teacher Component and Percent Students with Disabilities

![Graphs showing teacher component and percent students with disabilities for three models. Each graph has fitted values indicated.](image-url)
Biology

Teacher Value-Added and Percent Students with Disabilities
Biology

Teacher Component and Percent English Language Learners
Biology

Teacher Value-Added and Percent English Language Learners
Teacher Component and Percent Gifted

Biology
Teacher Value-Added and Percent Gifted
Biology

Teacher Component and Percent Non-White

![Graphs showing data distribution and fitted values for teacher component and percent non-white.](image-url)
Teacher Value-Added and Percent Non-White
### Observed Correlations with Teacher Value-Added Scores

#### Biology

<table>
<thead>
<tr>
<th>Model</th>
<th>Model 2a</th>
<th>Model 2b</th>
<th>Model 2c</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No School</td>
<td>School</td>
<td>No School</td>
</tr>
<tr>
<td>Mean Prior</td>
<td>0.21</td>
<td>0.19</td>
<td>0.21</td>
</tr>
<tr>
<td>%ED</td>
<td>-0.19</td>
<td>-0.21</td>
<td>-0.19</td>
</tr>
<tr>
<td>%SWD</td>
<td>-0.08</td>
<td>-0.08</td>
<td>-0.08</td>
</tr>
<tr>
<td>%ELL</td>
<td>-0.09</td>
<td>-0.08</td>
<td>-0.09</td>
</tr>
<tr>
<td>%Gifted</td>
<td>0.12</td>
<td>0.10</td>
<td>0.13</td>
</tr>
<tr>
<td>%Non-White</td>
<td>-0.07</td>
<td>-0.07</td>
<td>-0.09</td>
</tr>
</tbody>
</table>
Impact Data Results

- Unlike the Algebra EOC models, the relationship between student characteristics and teacher estimates increases when the school component is added.
- This is as we might expect, given that the variation in teacher quality is greater across teachers than across schools.
End-of-Course Value-Added Model: Geometry
The three models are identical except for the different prior achievement scores that were included:

- Model 2a: Algebra I EOC scores
- Model 2b: Up to two prior Math FCAT scores
- Model 2c: Algebra I EOC scores and up to two prior Math FCAT scores
## Prior Scores Included Depend on the Student’s Current Grade

<table>
<thead>
<tr>
<th>Current Grade</th>
<th>Algebra I EOC</th>
<th>First Prior Math FCAT</th>
<th>Second Prior Math FCAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Algebra I</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>11</td>
<td>Algebra I</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>10</td>
<td>Algebra I</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>Algebra I</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>Algebra I</td>
<td>7</td>
<td>6</td>
</tr>
</tbody>
</table>
### Number of Students per Model

<table>
<thead>
<tr>
<th>Model</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 2a (Algebra EOC)</td>
<td>142,956</td>
</tr>
<tr>
<td>Model 2b (Math FCAT)</td>
<td>155,859</td>
</tr>
<tr>
<td>Model 2c (Algebra EOC and Math FCAT)</td>
<td>165,843</td>
</tr>
</tbody>
</table>
2011–12 Geometry EOC Scores, Overall and by Subgroup
Geometry

2011–12 Geometry EOC Scores, Overall and by Grade

2011-12 Geometry EOC Scores, Overall and by Grade
Prior Algebra EOC Scores, Overall and by Subgroup
Geometry EOC and Algebra EOC Scores (Correlation = 0.76)
Summary of Descriptive Statistics

- The data show that students in lower grades score higher on the Geometry EOC than students in the higher grades.
- There are large systematic differences between student groups.
- Correlation between Geometry EOC and Algebra EOC scores is within the expected range.
R-Squared Is Similar Across Models

<table>
<thead>
<tr>
<th>Model</th>
<th>R-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 2a (Algebra EOC)</td>
<td>.62</td>
</tr>
<tr>
<td>Model 2b (Math FCAT)</td>
<td>.62</td>
</tr>
<tr>
<td>Model 2c (Algebra &amp; Math FCAT)</td>
<td>.65</td>
</tr>
</tbody>
</table>
### Geometry

Percent of Teachers and Schools Significantly Different from Average

<table>
<thead>
<tr>
<th>Model</th>
<th>Teachers (above and below)</th>
<th>Schools (above and below)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a (Algebra EOC)</td>
<td>18%</td>
<td>6%</td>
</tr>
<tr>
<td>2b (Math FCAT)</td>
<td>17%</td>
<td>11%</td>
</tr>
<tr>
<td>2c (Algebra EOC and Math FCAT)</td>
<td>18%</td>
<td>9%</td>
</tr>
</tbody>
</table>
## Geometry

### Reliability Ratio

<table>
<thead>
<tr>
<th>Model</th>
<th>Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a (Algebra EOC)</td>
<td>0.81</td>
</tr>
<tr>
<td>2b (Math FCAT)</td>
<td>0.84</td>
</tr>
<tr>
<td>2c (Algebra EOC and Math FCAT)</td>
<td>0.82</td>
</tr>
</tbody>
</table>
Geometry

Teacher Component and Mean Normalized Prior Score

![Graphs showing the relationship between Teacher Component and Mean Normalized Prior Score.](image)

- Left graph: Teacher Component vs. Mean Prior Normalized Algebra EOC
- Middle graph: Teacher Component vs. Mean Prior Normalized Algebra EOC
- Right graph: Teacher Component vs. Mean Prior Normalized Algebra EOC
Geometry

Teacher Value-Added and Mean Normalized Prior Score
Geometry

Teacher Component and Percent Economically Disadvantaged
Geometry

Teacher Value-Added and Percent Economically Disadvantaged
Teacher Component and Percent Students with Disabilities

Geometry
Geometry

Teacher Value-Added and Percent Students with Disabilities
Geometry

Teacher Component and Percent English Language Learners
Geometry

Teacher Value-Added and Percent English Language Learners

Graphs showing the relationship between Teacher Value-Added and Percent English Language Learners.
Geometry

Teacher Component and Percent Gifted

[Graphs showing scatter plots with fitted values]

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Geometry

Teacher Value-Added and Percent Gifted

![Graphs showing teacher value-added and percent gifted](image-url)
Geometry

Teacher Component and Percent Non-White

![Graphs showing teacher component and percent non-white relationship](image)
Geometry

Teacher Value-Added and Percent Non-White
### Observed Correlations with Teacher Value-Added Scores

<table>
<thead>
<tr>
<th>Model</th>
<th>Model 2a</th>
<th>Model 2b</th>
<th>Model 2c</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No School</td>
<td>School</td>
<td>No School</td>
</tr>
<tr>
<td>Mean Prior</td>
<td>0.20</td>
<td>0.23</td>
<td>0.21</td>
</tr>
<tr>
<td>%ED</td>
<td>-0.20</td>
<td>-0.26</td>
<td>-0.22</td>
</tr>
<tr>
<td>%SWD</td>
<td>-0.05</td>
<td>-0.06</td>
<td>-0.03</td>
</tr>
<tr>
<td>%ELL</td>
<td>-0.07</td>
<td>-0.09</td>
<td>-0.07</td>
</tr>
<tr>
<td>%Gifted</td>
<td>0.07</td>
<td>0.07</td>
<td>0.11</td>
</tr>
<tr>
<td>%Non-White</td>
<td>-0.13</td>
<td>-0.19</td>
<td>-0.14</td>
</tr>
</tbody>
</table>
Impact Data Results

- The impact of the mean prior score, the percent ED, and the percent non-white is larger than the impact of other characteristics.
- Adding the school component increases the impact of percent ED and percent non-white more than it affects the impact of other school characteristics.
Optional Value-Added Model: SAT-10
SAT-10 Background Information

- SAT-10 scores are used to create value-added scores for grade 2 teachers.
- Grade 1 scores are used as predictors for the grade 2 outcome variable.
- SEMs were not provided; as a result, measurement error is not accounted for.
  - If SEMs are available, they should be used to account for measurement error.
- The VAM implemented for SAT-10 is the same statistical model used for the FCAT VAMs.
2010–11 SAT-10 Scores: All Students and by Subgroup

SAT-10 Score

- White
- Non-White
- ED
- Not ED
- Gifted
- Not Gifted
- SWD
- Not SWD
- ELL
- Not ELL

All Students

SAT-10 Score range: 425 to 725
Prior Year SAT-10 Scores: All Students and by Subgroup

All Students
Not ELL
ELL
Not SWD
SWD
Not Gifted
Gifted
Not ED
ED
Non-White
White

SAT-10 Score
425 500 575 650 725
The differences between groups are typical for in-level score analyses.

All discrepancies appear normal.

Correlation between current and prior score (0.77) is typical.
For the SAT-10, the R-squared is 0.62.
This is on par with the FCAT R-squared.
Reliability Ratio

- For SAT-10, the teacher reliability ratio is 0.95.
- Percent significantly above or below average:
  - Teachers: 8.9%
  - Schools: 16.8%
Teacher Value-Added and Percent Students with Disabilities
Teacher Value-Added and Percent English Language Learners

Correlation of Teacher Score with Percent ELL in Class

- With School Component
- No School Component
SAT-10

Teacher Value-Added and Percent Gifted

Correlation of Teacher Score with Percent Gifted in Class

With School Component | No School Component

Teacher Score

Percent Gifted in Class
Teacher Value-Added and Percent Economically Disadvantaged
SAT-10

Teacher Value-Added and Percent Non-White

Correlation of Teacher Score with Percent Non-White in Class

With School Component        No School Component

Teacher Score

Percent Non-White in Class
Teacher Value-Added and Mean Prior SAT-10 Score
# Observed Correlations with Teacher Value-Added Scores

## SAT-10

<table>
<thead>
<tr>
<th>Model</th>
<th>No School Component</th>
<th>With School Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Prior</td>
<td>0.07</td>
<td>0.15</td>
</tr>
<tr>
<td>%ED</td>
<td>-0.12</td>
<td>-0.27</td>
</tr>
<tr>
<td>%SWD</td>
<td>-0.03</td>
<td>-0.05</td>
</tr>
<tr>
<td>%ELL</td>
<td>-0.04</td>
<td>-0.07</td>
</tr>
<tr>
<td>%Gifted</td>
<td>0.02</td>
<td>0.04</td>
</tr>
<tr>
<td>%Non-White</td>
<td>-0.12</td>
<td>-0.24</td>
</tr>
</tbody>
</table>
The impact data correlations are larger when the teacher score includes some of the school component.

In this instance, it suggests that the school component adds back some of the systematic differences between schools that a VAM is trying to account for.
Optional Value-Added Models: AP English and AP Calculus
Unlike the FCAT, SAT-10, and EOC exams, AP scores are categorical and not continuous, ranging from 1 to 5.

A categorical model known as an ordered probit is used instead of a multilevel linear model.
There is often only one AP teacher per school. This makes it impossible to estimate teacher effects and school effects separately. Therefore, the teacher value-added score includes only a teacher component and does not include a school component.

Because student grade level is not reported with AP scores, models do not include grade-level covariates.
Three Times as Many Students Take AP English as Take AP Calculus AB

<table>
<thead>
<tr>
<th>Model</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP English</td>
<td>22,518</td>
</tr>
<tr>
<td>AP Calculus AB</td>
<td>7,330</td>
</tr>
</tbody>
</table>
FCAT Scores Are Used as Prior Test Scores

- AP English: Grade 9 and 10 English FCAT scores
- AP Calculus: Grade 7 and 8 Math FCAT scores
Distribution of AP English Scores

AP English Score Distribution
2011-12

Frequency

score

0 1 2 3 4 5

0 2000 4000 6000 8000
Distribution of AP Calculus AB Scores

AP Calculus AB Score Distribution
2011-12
Distribution of FCAT Reading 10 Scores by AP English Score
Distribution of FCAT Math 8 Scores, by AP Calculus AB Score
Both Models Are Able to Identify More and Less Effective Teachers

- AP English: 82 (20%) teachers are significantly above average, and 67 (17%) are significantly below average.
- AP Calculus: 126 (21%) teachers are significantly above average, and 112 (19%) are significantly below average.
Precision of the Teacher Estimates Is Uncertain

- Reliability Ratios:
  - AP English: 0.55
  - AP Calculus AB: 0.48

- Estimates are relatively precise.
- We are not able to account for measurement error, so the precision may be overstated.
Teacher Component and Percent Students with Disabilities: Calculus

![Graph showing teacher component and percent SWD](image)
Teacher Component and Percent Students with Disabilities: English
Teacher Component and Percent English Language Learners: Calculus
Teacher Component and Percent English Language Learners: English

-1.5

0

1.5

Teacher Component

0 20 40 60 80 100

Percent ELL

AP English

fitted values
Teacher Component and Percent Gifted: Calculus
Teacher Component and Percent Gifted: English

AP English

fitted values
Teacher Component and Percent Non-White: Calculus
Teacher Component and Percent Non-White: English

- 1.5
- 0
- 1.5

AP English

fitted values
Teacher Component and Percent Economically Disadvantaged: Calculus
Teacher Component and Percent Economically Disadvantaged: English
AP

Teacher Component and Average Prior FCAT Math 8 Score: Calculus

![Graph showing the relationship between Teacher Component and Average FCAT 10 Calculus Score, with fitted values indicated.](chart.png)
Teacher Component and Average Prior FCAT English 10 Score: English

![Graph showing the relationship between Teacher Component and Average FCAT 10 English Score. The graph includes a scatter plot of data points and a fitted line. The x-axis represents the Average FCAT 10 English Score ranging from 1500 to 3000, while the y-axis represents the Teacher Component ranging from -1.5 to 1.5. The fitted values are indicated by a red line.]
# Observed Correlations with Teacher Value-Added Scores

<table>
<thead>
<tr>
<th>Model</th>
<th>AP Calculus</th>
<th>AP English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Prior</td>
<td>0.38</td>
<td>0.61</td>
</tr>
<tr>
<td>%ED</td>
<td>-0.38</td>
<td>-0.54</td>
</tr>
<tr>
<td>%SWD</td>
<td>-0.05</td>
<td>-0.04</td>
</tr>
<tr>
<td>%ELL</td>
<td>-0.01</td>
<td>-0.15</td>
</tr>
<tr>
<td>%Gifted</td>
<td>0.01</td>
<td>0.15</td>
</tr>
<tr>
<td>%Non-White</td>
<td>-0.29</td>
<td>-0.43</td>
</tr>
</tbody>
</table>
Discussion of Impact Analysis

- The impact of mean prior score, percent ED, and percent non-white is larger than the impact of other classroom characteristics.
- These correlations are larger than those we see in the other models.
Summary of Models: R-Squared and Reliability

- R-squared is similar across models (0.61 to 0.65), although the Algebra EOC models that subset by grade have a lower R-squared than the other models (0.53 to 0.54).
- Reliability is best in Geometry (0.81 to 0.84) and similar in other models (0.89 to 0.98).
- AP reliabilities are 0.48 and 0.55, perhaps due to measurement error.
Summary of Models: Variance Components

- Relative magnitudes of teacher and school variance are as expected in Algebra EOC models that exclude grades 6–8, Geometry and Biology EOC models, and SAT-10 model.
- AP models exclude school effect.
Summary of Models: Impact Data

- Correlation between percent of students who are economically disadvantaged and teacher component/teacher value-added is less than –10 across all models.
- Correlation with mean prior score is greater than 10 in Biology EOC and Geometry EOC models, Algebra EOC model 1b, and AP models.
- AP models have the largest correlations.
- Impact of other characteristics varies considerably across models.