Florida FCAT and Algebra I EOC
2013-14 Results

August 2014
Presentation Overview

- Summarize 2013-14 FCAT and Algebra I EOC value-added model
- Are the input data accurate and sensible?
  - Examine the descriptive statistics
- Does the model behave as expected?
  - Examine R-squared to determine model fit
  - Examine the variance components
  - Precision and distribution of the value-added scores
- Do the results suggest relationships between value-added scores and classroom characteristics?
  - Impact data based on correlations between value-added scores and class characteristics
Model Background
After exploring eight different types of value-added models, the SGIC recommended a model from the class of covariate adjustment models.

These models begin by establishing an expected growth for each student, which is based on growth of similar students in the same grade during the same year.

To isolate the impact of the teacher on student learning, the model developed by the SGIC and approved by the Education Commissioner accounts for the characteristics of the student and the classroom.
Students Included in the Models

- Models estimated separately by grade and subject (reading 4-10, math 4-8, algebra 8-9)
- Students are included in the FCAT model if they have a 2012-13 FCAT score in the same subject
  - Grade of 2012-13 score cannot be higher than 2013-14 grade
- SGIC and Commissioner approved grade 9 EOC model; use of grade 8 EOC results optional
- Students are included in EOC model if they have at least one prior math score available:
  - Grade 9 students must have a grade 8 FCAT 2.0 math score
  - Grade 8 students must have a grade 7 FCAT 2.0 math score
The goal of a value-added model is to isolate the contributions of current teachers and schools to student learning by using model covariates to control for factors that are not attributable to current teachers and schools.

If model covariates do not successfully control for these factors, value-added scores might reflect not only teacher and school contributions to student learning, but also factors that should not be attributed to teachers and schools.

Evidence presented below suggests the FCAT and grade 9 Algebra I EOC models successfully isolate the contributions of current teachers and schools to student learning.
Model Covariates

- FCAT and Algebra I EOC models have student-level and classroom-level covariates
- Ideally, predictor variables should have the following properties:
  - A high statistical correlation with the outcome
  - A high curricular relationship with the outcome (Math 4 -> Math 5)
  - 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
FCAT Model Covariates

- Up to two prior test scores
- Fourteen students with disabilities (SWD) status indicators
- Gifted status
- Four English Language Learner (ELL) status indicators (time as ELL)
- Attendance (percent of days present)
- Mobility (number of transitions)
- Difference from modal age in grade
- Indicators (up to 5) for number of subject-relevant courses
- Class size
- Similarity of prior test scores among students in the class
Algebra I EOC Model Covariates

- Up to two prior FCAT 2.0 math scores
- Variable indicating student was enrolled in 2 or more relevant courses
- English Language Learner (ELL) status (time as ELL)
- Students with Disabilities (SWD) status
- Gifted status
- Difference from modal age in grade
- Mobility (number of transitions)
- Attendance
- Class size
- Similarity of prior test scores among students in the class
- Percent gifted in class (not in FCAT models)
- Percent at modal grade (not in FCAT models)
- Mean prior test score in class (not in FCAT models)
Understanding Value-Added
Florida’s value-added models estimate the contributions of each of the following to students’ 2013-14 test scores:

• Observable student- and classroom-level characteristics
  – Prior test scores
  – ELL status
  – SWD status
  – Class size
  – Etc.
• Teacher component
• School Component
Teacher and School Components

- The model recognizes that there is an independent factor related to the school that impacts student learning: a school component
- The school component may represent the impact of the school’s leadership, the culture of the school, the environment of the school, and other school-level factors on student learning
- Teachers contribute to the overall school component, but there are other factors embedded in the component that are outside the teacher’s direct control
Teacher and School Components

- FCAT and EOC models include a school component and a teacher component.
- FCAT: one-half of the school component is added to the teacher component to create the final teacher value-added (VAM) score.
- EOC: school component is *not* added to the teacher component to create the teacher’s final Algebra I EOC VAM score.
  - More than a third of schools have only one or two Algebra I teachers teaching grade 9 students.
  - More than half of schools have only one or two Algebra I teachers teaching grade 8 students.
A teacher’s value-added score reflects the average amount of learning growth of the teacher’s students above or below the expected growth of similar students in the state, using covariates accounted for in the model.

- A score of zero indicates that students performed no better or worse than expected, based on factors controlled for in the model.
- A positive score indicates that students performed better than expected.
- A negative score indicates that students performed worse than expected.
The value-added score is an estimate of a teacher’s impact on student learning.

Because the score is an estimate, it contains some uncertainty.

The standard error is a statistical term that describes that uncertainty.

Using a standard error to construct a confidence interval around a score (like +/- 3 points in an opinion poll) is a good statistical practice that can increase the accuracy of classification decisions.
Value-Added Results Reported

- FCAT model produces results for teachers of grades 4-10 reading and 4-8 mathematics
- Algebra I EOC model produces results for teachers of grades 8 and 9
  - Algebra I teachers are not linked to students who take math FCAT
  - Grade 8 and 9 math teachers are not linked to students who take Algebra I EOC
- FCAT results for teachers are reported as one, two, and three-year averages
- Algebra I EOC results are reported as single-year scores
Aggregation

- Teachers with multiple years of VAM scores have an aggregated VAM score.
- Aggregated scores are an average of single-year scores, which are weighted by the number of students linked to the teacher that year.
- Aggregating over time is a way to improve the reliability of the VAM score.
- New teachers have only a single year VAM score; these scores will typically be less reliable than those based on multiple years of data.
Input Data
## Number of Students

<table>
<thead>
<tr>
<th>Subject</th>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
<th>Grade 7</th>
<th>Grade 8</th>
<th>Grade 9</th>
<th>Grade 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1213</td>
<td>173,403</td>
<td>176,016</td>
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<td>177,691</td>
<td>178,601</td>
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<td>176,779</td>
<td>175,521</td>
<td>180,093</td>
<td>180,043</td>
<td>175,486</td>
<td>171,798</td>
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<tr>
<td>Math</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1213</td>
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<tr>
<td>1314</td>
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<td>163,468</td>
<td>114,700</td>
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</tr>
<tr>
<td>Algebra</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1213</td>
<td></td>
<td></td>
<td></td>
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<td>53,673</td>
<td>99,717</td>
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<td>59,167</td>
<td>98,848</td>
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## Number of Teachers

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<tr>
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<th>Grade 4</th>
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<th>Grade 6</th>
<th>Grade 7</th>
<th>Grade 8</th>
<th>Grade 9</th>
<th>Grade 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading 1213</td>
<td>11,757</td>
<td>11,114</td>
<td>6,609</td>
<td>6,576</td>
<td>6,133</td>
<td>5,606</td>
<td>6,137</td>
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<tr>
<td>Reading 1314</td>
<td>11,745</td>
<td>10,991</td>
<td>6,463</td>
<td>6,467</td>
<td>6,179</td>
<td>5,546</td>
<td>6,238</td>
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<td>Math 1213</td>
<td>10,512</td>
<td>9,715</td>
<td>4,814</td>
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<td>4,528</td>
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<td>Math 1314</td>
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<td>9,693</td>
<td>4,698</td>
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<td>1,517</td>
<td>2,741</td>
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<td>2,744</td>
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<td>---------</td>
<td>---------</td>
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</tr>
<tr>
<td>Reading 1213</td>
<td>2,139</td>
<td>2,147</td>
<td>1,112</td>
<td>1,054</td>
<td>1,068</td>
<td>821</td>
<td>805</td>
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<tr>
<td>Reading 1314</td>
<td>2,129</td>
<td>2,135</td>
<td>1,131</td>
<td>1,075</td>
<td>1,096</td>
<td>809</td>
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<td>2,144</td>
<td>1,112</td>
<td>1,055</td>
<td>1,072</td>
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<td>2,143</td>
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<tr>
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<td>691</td>
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<tr>
<td>Algebra 1314</td>
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<td></td>
<td></td>
<td>867</td>
<td>701</td>
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</table>
### Average Growth by Subject and Grade

<table>
<thead>
<tr>
<th>Subject</th>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
<th>Grade 7</th>
<th>Grade 8</th>
<th>Grade 9</th>
<th>Grade 10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reading 2013 to 2014</strong></td>
<td>10.5</td>
<td>8.8</td>
<td>7.1</td>
<td>5.6</td>
<td>6.9</td>
<td>2.9</td>
<td>5.1</td>
</tr>
<tr>
<td><strong>Reading 2012 to 2013</strong></td>
<td>9.8</td>
<td>7.4</td>
<td>4.8</td>
<td>6.6</td>
<td>6.2</td>
<td>2.9</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>Math 2013 to 2014</strong></td>
<td>13.7</td>
<td>5.9</td>
<td>6.3</td>
<td>10.3</td>
<td>7.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Math 2012 to 2013</strong></td>
<td>12.6</td>
<td>6.1</td>
<td>4.6</td>
<td>9.2</td>
<td>6.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Differences in average growth between 2012-13 score and 2013-14 score are one reason models are run separately by grade and subject.
Distribution of 2013-14 FCAT 2.0 Math Scores by Grade—All Students

![Boxplot showing distribution of Math scores by grade for all students in 2013-14 FCAT 2.0](image)
Distribution of 2013-14 FCAT 2.0 Math Scores by Grade—ELLs
Distribution of 2013-14 FCAT 2.0 Math Scores by Grade—SWDss
Distribution of 2013-14 FCAT 2.0 Reading Scores by Grade—All Students
Distribution of 2013-14 FCAT 2.0 Reading Scores by Grade—ELLs
Distribution of 2013-14 Algebra I EOC Scores by Grade and Subgroup
### Shares of Students with Scores at the “Ceiling”

<table>
<thead>
<tr>
<th></th>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
<th>Grade 7</th>
<th>Grade 8</th>
<th>Grade 9</th>
<th>Grade 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>At HOSS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>1.0%</td>
<td>1.1%</td>
<td>1.0%</td>
<td>1.1%</td>
<td>1.3%</td>
<td>0.6%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Math</td>
<td>2.5%</td>
<td>0.5%</td>
<td>0.6%</td>
<td>0.3%</td>
<td>0.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Algebra</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.4%</td>
<td>0.0%</td>
</tr>
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</table>
Model Results
R-Squared Measures How Well Model Fits the Data
2012-13 Model Variance Components

![Bar chart showing standard deviations for various categories like Math4, Math5, Math6, Math7, Math8, Algebra8, Algebra9, Read4, Read5, Read6, Read7, Read8, Read9, Read10, with categories separated for Student, Teacher, and School.]
2014 Distribution of Teachers Math VAM Scores by Grade

![Graph showing distribution of Math VAM scores by grade.](chart.png)
2013 Distribution of Teachers Math VAM Scores by Grade

Teacher Value-Added Math Scores
2014 Distribution of Teachers Reading VAM Scores by Grade
2013 Distribution of Teachers Reading VAM Scores by Grade
2014 Distribution of Teachers
Combined VAM Scores by Grade

Note: Combined 8 and Combined 10 Include Only Reading Teachers
2013 Distribution of Teachers

Combined VAM Scores by Grade

Note: Combined 9 and Combined 10 include only reading teachers.
Distribution of Teacher Algebra I EOC VAM Scores

Graph showing the distribution of Teacher Value-Added Algebra Scores for different years:
- Algebra 9 2014
- Algebra 9 2013
- Algebra 8 2014
- Algebra 8 2013

The graph displays a box plot with data points indicating the spread and central tendency of the scores.
Share of Teachers Significantly Different Than Average (p = 0.05)
Note: In 2013-14 only, students scoring at the highest attainable scale score are included in set of students scoring at or above their predicted scores.
Model Impact Results
Impact data show the relationship of the teacher score to various classroom characteristics.

There are several ways to interpret a non-zero relationship, including the following:

- The model does not fully account for non-random assignment of students to teachers.
- Classroom characteristics affect the rate of student learning.
- There are real differences in teacher effectiveness, which are correlated with classroom characteristics.
### Observed Correlations with Teacher VAM Scores

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mean Prior</th>
<th>%ED</th>
<th>%SWD</th>
<th>%ELL</th>
<th>%Non-White</th>
<th>% at HOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 2014</td>
<td>0.05</td>
<td>-0.07</td>
<td>-0.04</td>
<td>-0.01</td>
<td>-0.07</td>
<td>0.18</td>
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<tr>
<td>Math 2013</td>
<td>0.01</td>
<td>-0.08</td>
<td>-0.04</td>
<td>-0.01</td>
<td>-0.08</td>
<td></td>
</tr>
<tr>
<td>Reading 2014</td>
<td>-0.03</td>
<td>-0.05</td>
<td>0.00</td>
<td>0.01</td>
<td>-0.04</td>
<td>0.09</td>
</tr>
<tr>
<td>Reading 2013</td>
<td>0.01</td>
<td>-0.09</td>
<td>-0.01</td>
<td>-0.01</td>
<td>-0.02</td>
<td></td>
</tr>
<tr>
<td>Algebra 9 2014</td>
<td>0.07</td>
<td>-0.02</td>
<td>-0.09</td>
<td>0.06</td>
<td>0.03</td>
<td>0.15</td>
</tr>
<tr>
<td>Algebra 9 2013</td>
<td>0.06</td>
<td>-0.04</td>
<td>-0.03</td>
<td>0.04</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Algebra 8 2014</td>
<td>0.17</td>
<td>-0.09</td>
<td>-0.05</td>
<td>0.01</td>
<td>-0.02</td>
<td>0.31</td>
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</table>
Teacher VAM Score and Mean Prior Student Score

Teacher Math Value-Added and Mean Prior Score

Teacher Reading Value-Added and Mean Prior Score
Teacher VAM Score and Mean Prior Student Score

Grade 8 Algebra Value-Added and Mean Prior Score

Grade 9 Algebra Value-Added and Mean Prior Score
Teacher VAM Score and Share of Students Who Are Low-Income
Teacher VAM Score and Share of Students Who Are Low-Income

Grade 8 Algebra Value-Added and Percent Low Income

Grade 9 Algebra Value-Added and Percent Low Income
Teacher VAM Score and Share of Students Who Are Disabled

Teacher Math Value-Added and Percent Disabled

Teacher Reading Value-Added and Percent Disabled
Teacher VAM Score and Share of Students Who Are Disabled

Grade 8 Algebra Value-Added and Percent Disabled

Grade 9 Algebra Value-Added and Percent Disabled
Teacher VAM Score and Share of Students Who Are English Learners

Teacher Math Value-Added and Percent ELL

Teacher Reading Value-Added and Percent ELL
Teacher VAM Score and Share of Students Who Are English Learners

Grade 8 Algebra Value-Added and Percent ELL

Grade 9 Algebra Value-Added and Percent ELL
Teacher VAM Score and Share of Students Who Are Non-White
Teacher VAM Score and Share of Students Who Are Non-White

Grade 8 Algebra Value-Added and Percent Non-White

Grade 9 Algebra Value-Added and Percent Non-White
Teacher VAM Score and Share of Students Scoring at HOSS

Teacher Math VAM and Percent Scoring at HOSS

Teacher Reading VAM and Percent Scoring at HOSS
Teacher VAM Score and Share of Students Scoring at HOSS

Grade 8 Algebra VAM and Percent Scoring at HOSS

Grade 9 Algebra VAM and Percent Scoring at HOSS
2013-14 and 2012-13 FCAT and EOC model results are similar.

Shares of teachers significantly different than average in 2013-14 similar to shares in 2012-13, with exception of Reading 6.

In both years, shares of teachers significantly different than average are higher in Math 4-6.
Summary

- Impact data demonstrate no systematic relationship between teacher VAM scores and student demographics.
  - As was the case in prior years, grade 8 Algebra is an exception.
- Pattern of variance components in middle school grades, particularly grade 6, is different than pattern in other grades, but similar to pattern of middle school grades in prior years and in other VAM projects.
Contact Information

Eric Larsen
650-843-8260
slarsen@air.org

Harold Doran
202-403-5035
hdoran@air.org
## Fixed Effects Example: Grade 6 Math 2013-14 (1 of 2)

<table>
<thead>
<tr>
<th>Effect Name</th>
<th>Effect</th>
<th>Standard Error</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant Term</td>
<td>-18.511</td>
<td>2.795</td>
<td>0.000</td>
</tr>
<tr>
<td>Achievement: Prior Year</td>
<td>0.854</td>
<td>0.005</td>
<td>0.000</td>
</tr>
<tr>
<td>Achievement: Two Years Prior</td>
<td>0.152</td>
<td>0.005</td>
<td>0.000</td>
</tr>
<tr>
<td>Missing value indicator for 2011-12 score</td>
<td>33.631</td>
<td>0.973</td>
<td>0.000</td>
</tr>
<tr>
<td>Language Impaired</td>
<td>0.200</td>
<td>0.159</td>
<td>0.208</td>
</tr>
<tr>
<td>Deaf or Hard of Hearing</td>
<td>-0.195</td>
<td>0.652</td>
<td>0.765</td>
</tr>
<tr>
<td>Visually Impaired</td>
<td>2.315</td>
<td>1.029</td>
<td>0.024</td>
</tr>
<tr>
<td>Emotional/Behavioral Disability</td>
<td>-3.113</td>
<td>0.349</td>
<td>0.000</td>
</tr>
<tr>
<td>Specific Learning Disability</td>
<td>-2.333</td>
<td>0.119</td>
<td>0.000</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enrolled in 2 or more Courses</td>
<td>4.244</td>
<td>0.142</td>
<td>0.000</td>
</tr>
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<td>Enrolled in 3 or more Courses</td>
<td>-0.496</td>
<td>0.72</td>
<td>0.491</td>
</tr>
<tr>
<td>Enrolled in 4 or more Courses</td>
<td>-39.453</td>
<td>9.156</td>
<td>0.000</td>
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</table>
## Fixed Effects Example: Grade 6 Math 2013-14 (2 of 2)

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<th>p-Value</th>
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</thead>
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<td>Heterogeneity of Class 1 Prior Year Test Scores</td>
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<td>0.005</td>
<td>0.000</td>
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<td>Number of Students in Class 1</td>
<td>-0.014</td>
<td>0.006</td>
<td>0.030</td>
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<td>Difference from Modal Age</td>
<td>-1.536</td>
<td>0.055</td>
<td>0.000</td>
</tr>
<tr>
<td>Mobility: Number of School Transfers</td>
<td>-0.615</td>
<td>0.121</td>
<td>0.000</td>
</tr>
<tr>
<td>Percent days attended</td>
<td>18.925</td>
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<td>0.000</td>
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<tr>
<td>Gifted Student Indicator</td>
<td>0.081</td>
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<td>0.444</td>
</tr>
<tr>
<td>In ELL for less than 2 years</td>
<td>2.038</td>
<td>0.265</td>
<td>0.000</td>
</tr>
<tr>
<td>In ELL between 2-4 years</td>
<td>1.535</td>
<td>0.220</td>
<td>0.000</td>
</tr>
<tr>
<td>In ELL between 4-6 years</td>
<td>-0.943</td>
<td>0.298</td>
<td>0.002</td>
</tr>
<tr>
<td>In ELL greater than 6 years</td>
<td>-1.392</td>
<td>0.15</td>
<td>0.000</td>
</tr>
</tbody>
</table>