making a meaningful difference

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# EAST® Initiative in Arkansas

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## Background of the Study

The Environmental and Spatial Technology (EAST®) Initiative is a nonprofit organization that provides a student-centered, service-oriented, project-based technology education curriculum. Focusing on student-driven service projects through the use of the latest in technology, EAST® strives to promote equity of educational opportunities, and to raise achievement through an emphasis on higher order thinking skills as well as on the positive attitudes and habits of mind that will help students succeed in school and in life. It provides students with collaborative learning experiences and opportunities to apply various technologies and teachers and school administrators with pedagogical training and continuous support required to facilitate learning. EAST® classrooms create a unique learning environment where the intellectual and problem-solving growth of students is the focus. The Initiative, which began in 1996 with approximately 20 students in one Arkansas high school, has since expanded to over 210 schools in eight states (Arkansas, California, Hawaii, Illinois, Iowa, Louisiana, Mississippi and Pennsylvania).

In 2007-2008 in the state of Arkansas, there are approximately 180 EAST® schools with over 17,000 students. EAST® contracted with Metis Associates to conduct a statewide follow-up of an IES-supported randomized control study regarding the EAST® students in Arkansas that we conducted between 2003 and 2006. The following research questions are of major interest to the present study:

RQ (1). Did EAST® students who participated in the program during 2007-2008 perform significantly better than the comparison students who never joined the program?

RQ (2). Among the high school EAST® students in 2007-2008, did those who started the program in middle school significantly outperform their counterparts who started the program in high school?

## Methodology

To answer the above research questions regarding the intervention effectiveness, the Metis evaluation team employed a rigorous propensity score matching (PSM) approach to generate an equivalent or closely matched comparison group to the EAST® students from the entire state for the outcome analysis[1]. The statewide PSM approach was capable of achieving a high level of evaluation's internal validity. That is, in the evaluation samples, treatment students and comparisons were balanced on observed covariates and the net differences observed in outcomes can be attributed to the intervention.

PSM serves to remove any statistically significant imbalances on observed covariates between treated and comparison groups. In this study, the covariates used in the

[1] Under the PSM framework (Rosenbaum & Rubin, 1983, 1985; Rosenbaum, 2002), a propensity score for a participant is the conditional probability of assignment to a particular treatment versus non-treatment given the observed covariates.

statewide PSM included gender, race/ethnicity, special education status, English Language Learner (ELL) status, Free/Reduced Price Lunch (FRL) eligibility, average daily attendance (ADA), and baseline test score[2] when available. The statewide PSM was conducted for reading and math respectively[3] in each grade[4].

Another approach to generating a comparison group for the outcome analysis was to simply use the non-participants who were in the same schools with the EAST® counterparts. This was a more convenient but less rigorous approach.

After the comparison groups were generated for the EAST® students based on the two different approaches, multiple regression analysis was utilized to investigate the relationship between current (i.e., SY0708) student achievement outcome and its potential predictors. This method is particularly useful when one is interested in explaining or accounting for the variation in a dependent variable (i.e., an outcome) based on a set of independent variables (i.e., predictors).

### *Analysis for RQ1*

The following student demographic and achievement covariates were used in the regression modeling for RQ1: gender, race/ethnicity (i.e., White, Black, and other race[5]), ELL status, FRL eligibility, special education status, ADA, baseline achievement, and treatment indicator (EAST® vs. non-EAST®). The treatment indicator was certainly the variable of particular interest. The 4th Grade Benchmark test scores were used as the baseline achievement for Grades 4-8, whereas the 8th Grade Benchmark test scores served as the baseline performance for Grades 9-12. For each grade, separate regression models were generated based on the different comparison groups to predict student performance[6] in SY0708.

### *Analysis for RQ2*

The main predictor of interest for RQ2 was whether an EAST® high school student started the program in middle school or high school. The other predictors in the regression analysis were the same as those used in the above analysis for RQ1. Based on the exploratory analysis of the data, it was found that only ninth grade had a substantial proportion of students who started the EAST® program in middle school, while the vast majority of students in other grades started the program in high school. Therefore, the analysis for research question 2 was only conducted for the EAST® students in Grade 9.

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[2] For students in Grades 5-8, their 4th Grade Benchmark test scores were used as baseline, while for high school students (i.e., Grades 9-12), their 8th Grade Benchmark test scores were used as baseline.

[3] For the samples matched on math, the baseline test score was Benchmark math scale score, whereas for the samples matched on reading, the baseline test score was Benchmark ELA scale score. All the other covariates used in the statewide PSM remained to be the same (i.e., NCLB indicators and ADA).

[4] The nearest neighbor matching within caliper (also known as greedy matching) was used as the matching algorithm. Based on Rosenbaum and Rubin (1985), a caliper size of a quarter of a standard deviation of the sample estimated propensity scores (i.e., $\varepsilon = .25\sigma_P$, where $\sigma_P$ denotes standard deviation of the estimated propensity scores of a sample) was adopted for matching.

[5] Other race included American Indian or Alaskan Native, Asian or Pacific Islander, and Hispanic.

[6] We used Benchmark test outcomes whenever available. However, Benchmark tests were not available for most of the students in Grades 9-12, so other tests such as SAT10, EOC, and ACT were selected as outcome variables based on data availability.

The regression analysis was conducted in Statistical Package for the Social Sciences (SPSS) following the automatic stepwise search procedure to identify the final model. Listwise deletion was adopted to remove students with missing data from all the analytic samples.

Note that statistical significance of an estimate (i.e., *p*-value < .05) does not necessarily guarantee that the estimate also has a practical significance, especially given the large sample size in this study. Researchers typically employ an effect size index to measure the practical importance of a finding (Cohen, 1988). Under the context of multiple linear regression, Cohen's $f^2$ is an appropriate effect size measure. This measure[7] was therefore generated for each predictor retained in the final regression models.

## Results

### *Introduction*

For Grades 5 - 12, a separate stepwise regression analysis was carried out at each grade level for various outcomes in SY0708. Tables 1 and 2 summarize the results for the primary predictors of interest (i.e., treatment indicator for RQ1, and EAST® starting grade indictor for RQ2) in the regression analysis. Tables A1 – A10 in the appendix present the major results based on the final regression models retained following stepwise procedures. Note that all the regression coefficients presented in Tables A1 – A10 are statistically significant with *p*-values less than .05. The $R^2$ change in Appendix Tables A1 – A10 basically shows the percent of variation in the outcome explained by adding a given predictor to the model that had already included a subset of predictors in the stepwise procedure. The effect sizes (i.e., Cohen's $f^2$) were calculated based on the $R^2$ change.

### *Results for RQ1*

Table 1
Summary of Results for EAST® Treatment Effect based on Samples Selected Using the Statewide PSM Approach

| Grade Level | Benchmark Math | Benchmark ELA | SAT10 Math | SAT10 Language | SAT10 Reading | EOC Algebra | EOC Geometry | EOC 11th Grade Literacy |
|---|---|---|---|---|---|---|---|---|
| 5 | N | N | | | | | | |
| 6 | N | N | | | | | | |
| 7 | N | N | | | | | | |
| 8 | N | Y+ | | | | | | |
| 9 | | | Y+ | Y+ | Y+ | Y+ | N | |
| 10 | | | | | | | Y+ | |
| 11 | | | | | | | N | Y+ |

N: Non-significant predictor; Y+: Significant predictor with positive direction; Y-: Significant predictor with negative direction.

[7] The Cohen's $f^2$ is calculated based on the squared multiple correlation: $R^2/(1-R^2)$ . Cohen has loosely defined effect sizes of $f^2$ = 0.02, 0.15, and 0.35 as small, medium, and large, respectively.

Based on the statewide PSM matched comparison group (Table 1), it was found that the EAST® treatment did not appear to be a significant predictor of student Benchmark test outcomes in Grades 5 -7. In Grade 8, this primary predictor of interest did show significantly positive influence on Benchmark ELA test scores, although it was still non-significant for Benchmark Math test outcome. For ninth graders, the EAST® treatment served as a significantly positive predictor for all the outcomes investigated except EOC Geometry test. In addition, EAST® students significantly outperformed non-participants on EOC Geometry tests in Grade 10 but not in Grade 11. However, the eleventh graders who participated in the EAST® program performed significantly better on EOC 11th Grade Literacy exam than their counterparts.

Table 2
Summary of Results for EAST® Treatment Effect based on Samples Selected Using the Same-School Comparison Group Approach

| Grade Level | Benchmark Math | Benchmark ELA | SAT10 Math | SAT10 Language | SAT10 Reading | EOC Algebra | EOC Geometry | EOC 11th Grade Literacy |
|---|---|---|---|---|---|---|---|---|
| 5 | Y+ | Y+ | | | | | | |
| 6 | Y+ | N | | | | | | |
| 7 | Y+ | N | | | | | | |
| 8 | Y+ | Y+ | | | | | | |
| 9 | | | Y+ | Y+ | Y+ | Y+ | Y+ | |
| 10 | | | | | | | Y+ | |
| 11 | | | | | | | N | Y+ |

N: Non-significant predictor; Y+: Significant predictor with positive direction; Y-: Significant predictor with negative direction.

Based on the same-school comparison group (Table 2), the results were substantially different for Grades 5 -8 in that the EAST® treatment showed significantly positive influence on student Benchmark test performance except the Benchmark ELA test in Grades 6 and 7. This was largely inconsistent with the findings based on the statewide PSM matched samples, although both sets of analysis indicated that the EAST® students in Grade 8 performed significantly better on Benchmark ELA test.

In addition, the EAST® students in Grade 9 outperformed the non-participants on all the outcomes investigated. The results for the tenth and eleventh graders were consistent with those found with the statewide PSM matched samples. That is, the EAST® participants were higher performers on EOC Geometry test in Grade 10 and EOC 11th Grade Literacy test, but not in Grade 11 Geometry.

***The American College Test (ACT)***

Although Metis' original analysis plan included an examination of ACT scores, we found that unlike the state achievement tests, ACT is not a requisite in the state of Arkansas. In as much as a large proportion of 11th and 12th grade EAST® students did not appear to take the ACT, we investigated whether current EAST® students who took the ACT were representative of the EAST® population as a whole. To this end, we used the EOC 11th Grade Literacy test to serve as an appropriate outside measure since the majority of the eleventh graders took this test.

A t-test comparing the EOC 11th Grade Literacy scores of the two groups (those EAST® students who took the ACT and those who did not) showed that the difference between them was significant and educationally meaningful, with those EAST® participant who took the ACT outperforming those who did not take the exam (Table 3). This clearly indicated that current EAST® students who took the ACT and those who did not were non-equivalent groups. Therefore, as the students for whom we have ACT scores do not accurately reflect the achievement level of the EAST® population as a whole, an analysis of ACT outcomes was not considered a valid answer to the research question and was not conducted.

Table 3
Summary Statistics for EOC 11th Grade Literacy Test Comparing Current EAST® Students with ACT and those without ACT in Grade 11

| | **n** | **Mean** | **SD** | **Independent Samples *t*-statistic (*p*-value, Cohen's d[8])** |
|---|---|---|---|---|
| With ACT | 1275 | 212.52 | 16.99 | 27.706 (P<0.001, d=0.956) |
| Without ACT | 2078 | 194.86 | 19.33 | |

### *Results for RQ2*

Table 4
Summary of Results for Start of EAST® Participation (Middle vs. High School) - Grade 9 only

| Comparison Approach | SAT10 Math | SAT10 Language | SAT10 Reading | EOC Algebra | EOC Geometry |
|---|---|---|---|---|---|
| Statewide PSM | Y+ | Y+ | Y+ | Y+ | Y+ |
| Same-School | Y+ | Y+ | Y+ | Y+ | Y+ |

Based on the comparison between the EAST® students and the group selected from the statewide PSM matched sample (Table 4), it was found that the ninth graders who started the EAST® program in middle school performed significantly better than those who started the program in high school for all outcomes investigated. The results based on the data concerning EAST® students from the same-school comparison analytic sample resulted in the same outcome. The findings consistently indicated that the EAST® students in Grade 9 who started the program in middle school were higher achievers than those who started the program in high school.

### *Results regarding Pertinent Covariates*

Student baseline achievement served as an important predictor for various outcomes in all the final regression models. Students with higher baseline test scores significantly outperformed their counterparts. ADA was also a significantly positive predictor of

[8] Cohen's d is a measure of effect size. A value of 0.20 - 0.49 is considered 'small'; 0.50 - 0.79 is considered 'medium; and 0.80 or higher is considered 'large'.

student academic achievement in most cases. In regard to NLCB indicators, special education status and FRL eligibility frequently appeared to be significant predictors: As expected, students receiving special education and students eligible for FRL performed significantly worse than their counterparts[9].

Sometimes ELL status also served as a significant predictor, with ELL students performing significantly worse than non-ELL students. Gender appeared to be a significant predictor in many regression models as well. In some cases female students outperformed their male counterparts, whereas in other cases male students performed significantly better. In addition, Black students were found to perform significantly worse than White students under most circumstances[10], whereas students other than White or Black scored either higher or lower than Whites in some cases.

## Conclusions

EAST® program participation frequently appeared to have significantly positive impact on state test outcomes for high school students when the influence of salient subject covariates was controlled. Conversely, participation in EAST® did not stand out as a significant predictor for Benchmark tests performance in lower grades.

Findings regarding EAST® students in Grade 9 further suggested that participants who started the program in middle school performed significantly better than those who started the program in high school. However, these findings should be taken with caution as observed effect sizes were often small.

## References


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[9] One anomaly appeared in the final regression model for ACT Reading in Grade 11. Students receiving special education unexpectedly outperformed their counterparts. This result was counterintuitive, but should not cause much concern given the trivial effect size.

[10] The only exception appeared in the final regression model for Benchmark Math in Grade 5 based on the same-school comparison group. Black students scored significantly higher than their White counterparts.

# APPENDIX

Table A1
Stepwise Regression Results for Benchmark Test Outcomes of the Statewide PSM Matched Samples in Grades 5 - 8

| | | | Baseline Test$^{\Delta}$ | ADA | Special Ed | FRL | ELL | Female | Black | Other Race | EAST® Trt |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G5 | Math (n = 780) | Coefficient | 0.655 | | -28.462 | -19.763 | | | | | |
| | | Effect Size | 1.762 | | 0.006 | 0.010 | | | | | |
| | | $R^2$ Change | 0.638 | | 0.006 | 0.010 | | | | | |
| | ELA (n = 775) | Coefficient | 0.775 | | -99.994 | -25.922 | -45.900 | 31.580 | -20.132 | | |
| | | Effect Size | 2.040 | | 0.014 | 0.005 | 0.002 | 0.006 | 0.002 | | |
| | | $R^2$ Change | 0.671 | | 0.014 | 0.005 | 0.002 | 0.006 | 0.002 | | |
| G6 | Math (n = 1,694) | Coefficient | 0.677 | 100.868 | -37.681 | -16.307 | | | -18.273 | -18.442 | |
| | | Effect Size | 1.101 | 0.002 | 0.007 | 0.012 | | | 0.004 | 0.001 | |
| | | $R^2$ Change | 0.524 | 0.002 | 0.007 | 0.012 | | | 0.004 | 0.001 | |
| | ELA (n = 1,704) | Coefficient | 0.743 | | -76.650 | -24.157 | | 24.354 | -43.552 | | |
| | | Effect Size | 1.915 | | 0.010 | 0.003 | | 0.004 | 0.009 | | |
| | | $R^2$ Change | 0.657 | | 0.010 | 0.003 | | 0.004 | 0.009 | | |
| G7 | Math (n = 2,989) | Coefficient | 0.431 | 146.954 | -63.501 | -25.337 | | | -36.393 | | |
| | | Effect Size | 0.715 | 0.005 | 0.024 | 0.033 | | | 0.019 | | |
| | | $R^2$ Change | 0.417 | 0.005 | 0.023 | 0.032 | | | 0.019 | | |
| | ELA (n = 2,987) | Coefficient | 0.568 | 87.735 | -105.480 | -34.580 | | 29.369 | -38.944 | | |
| | | Effect Size | 1.336 | 0.001 | 0.019 | 0.013 | | 0.007 | 0.007 | | |
| | | $R^2$ Change | 0.572 | 0.001 | 0.019 | 0.013 | | 0.007 | 0.007 | | |
| G8 | Math (n = 3,477) | Coefficient | 0.742 | 169.963 | -46.521 | -11.946 | -39.962 | -7.110 | -17.760 | 16.522 | |
| | | Effect Size | 1.268 | 0.008 | 0.012 | 0.003 | 0.001 | 0.001 | 0.008 | 0.001 | |
| | | $R^2$ Change | 0.559 | 0.008 | 0.012 | 0.003 | 0.001 | 0.001 | 0.008 | 0.001 | |
| | ELA (n = 3,473) | Coefficient | 2.812 | 286.655 | -141.229 | -24.816 | -102.286 | 13.688 | -52.915 | | 10.805 |
| | | Effect Size | 0.984 | 0.009 | 0.049 | 0.005 | 0.002 | 0.002 | 0.020 | | 0.001 |
| | | $R^2$ Change | 0.496 | 0.009 | 0.047 | 0.005 | 0.002 | 0.002 | 0.020 | | 0.001 |

Δ For Benchmark math outcome, the baseline test was the 4th grade Benchmark math scale score, while for Benchmark ELA outcome, the baseline test was the 4th grade Benchmark ELA scale score.

Table A2

Stepwise Regression Results for Benchmark Test Outcomes of the EAST® Students and the Same-School Comparison Group in Grades 5 - 8

| | | | Baseline Test$^{\Delta}$ | ADA | Special Ed | FRL | ELL | Female | Black | Other Race | EAST® Trt |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G5 | Math (n = 1,624) | Coefficient | 0.708 | | -30.969 | -20.520 | -33.237 | 5.223 | 9.418 | 32.331 | 7.035 |
| | | Effect Size | 2.268 | | 0.009 | 0.008 | 0.003 | 0.001 | 0.001 | 0.001 | 0.001 |
| | | $R^2$ Change | 0.694 | | 0.009 | 0.008 | 0.003 | 0.001 | 0.001 | 0.001 | 0.001 |
| | ELA (n = 1,624) | Coefficient | 0.813 | | -77.568 | -31.735 | -42.571 | 16.907 | | 39.165 | 14.724 |
| | | Effect Size | 2.788 | | 0.010 | 0.004 | 0.001 | 0.002 | | 0.001 | 0.001 |
| | | $R^2$ Change | 0.736 | | 0.010 | 0.004 | 0.001 | 0.002 | | 0.001 | 0.001 |
| G6 | Math (n = 3,607) | Coefficient | 0.720 | 46.150 | -31.186 | -14.870 | -18.515 | | -19.686 | | 6.423 |
| | | Effect Size | 1.695 | 0.001 | 0.008 | 0.005 | 0.000 | | 0.009 | | 0.001 |
| | | $R^2$ Change | 0.629 | 0.001 | 0.008 | 0.005 | 0.000 | | 0.009 | | 0.001 |
| | ELA (n = 3,607) | Coefficient | 0.777 | 69.254 | -73.443 | -19.112 | -37.204 | 24.352 | -39.139 | | |
| | | Effect Size | 2.367 | 0.000 | 0.007 | 0.002 | 0.000 | 0.003 | 0.008 | | |
| | | $R^2$ Change | 0.703 | 0.000 | 0.007 | 0.002 | 0.000 | 0.003 | 0.008 | | |
| G7 | Math (n = 5,066) | Coefficient | 0.422 | 91.233 | -55.437 | -24.127 | -30.292 | 4.964 | -35.832 | | 9.282 |
| | | Effect Size | 0.739 | 0.002 | 0.029 | 0.014 | 0.001 | 0.001 | 0.038 | | 0.002 |
| | | $R^2$ Change | 0.425 | 0.002 | 0.028 | 0.014 | 0.001 | 0.001 | 0.037 | | 0.002 |
| | ELA (n = 5,066) | Coefficient | 0.592 | 136.556 | -87.218 | -32.969 | -57.849 | 33.334 | -39.456 | | |
| | | Effect Size | 1.421 | 0.001 | 0.014 | 0.012 | 0.001 | 0.007 | 0.008 | | |
| | | $R^2$ Change | 0.587 | 0.001 | 0.014 | 0.012 | 0.001 | 0.007 | 0.008 | | |
| G8 | Math (n = 9,547) | Coefficient | 0.725 | 175.972 | -40.557 | -14.106 | | | -14.652 | 6.753 | 4.931 |
| | | Effect Size | 1.392 | 0.009 | 0.012 | 0.004 | | | 0.006 | 0.000 | 0.000 |
| | | $R^2$ Change | 0.582 | 0.009 | 0.012 | 0.004 | | | 0.006 | 0.000 | 0.000 |
| | ELA (n = 9,547) | Coefficient | 2.845 | 254.070 | -139.734 | -29.376 | -24.475 | 17.446 | -43.824 | | 6.935 |
| | | Effect Size | 1.049 | 0.009 | 0.053 | 0.006 | 0.000 | 0.002 | 0.016 | | 0.000 |
| | | $R^2$ Change | 0.512 | 0.009 | 0.050 | 0.006 | 0.000 | 0.002 | 0.016 | | 0.000 |

$\Delta$ For Benchmark math outcome, the baseline test was the 4th grade Benchmark math scale score, while for Benchmark ELA outcome, the baseline test was the 4th grade Benchmark ELA scale score.

Table A3

Stepwise Regression Results for SAT10 and EOC Test Outcomes of the Statewide PSM Matched Samples in Grade 9

| | | | Baseline Test$^{\Delta}$ | ADA | Special Ed | FRL | ELL | Female | Black | Other Race | EAST® Trt |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G9 | S10_mth (n = 4,528) | Coefficient | 0.092 | 120.421 | -25.848 | -7.291 | | | -20.595 | | 5.700 |
| | | Effect Size | 0.143 | 0.021 | 0.018 | 0.004 | | | 0.029 | | 0.003 |
| | | $R^2$ Change | 0.125 | 0.021 | 0.018 | 0.004 | | | 0.028 | | 0.003 |
| | S10_lan (n = 4,572) | Coefficient | 0.097 | 113.833 | -26.517 | -10.011 | | 16.411 | -40.846 | | 6.227 |
| | | Effect Size | 0.083 | 0.004 | 0.005 | 0.002 | | 0.006 | 0.026 | | 0.001 |
| | | $R^2$ Change | 0.077 | 0.004 | 0.005 | 0.002 | | 0.006 | 0.025 | | 0.001 |
| | S10_rdg (n = 4,572) | Coefficient | 0.080 | 66.486 | -25.221 | -9.637 | -15.591 | 3.473 | -21.290 | | 7.207 |
| | | Effect Size | 0.222 | 0.004 | 0.016 | 0.009 | 0.001 | 0.001 | 0.030 | | 0.005 |
| | | $R^2$ Change | 0.182 | 0.004 | 0.016 | 0.009 | 0.001 | 0.001 | 0.029 | | 0.005 |
| | EOC_alg (n = 3,015) | Coefficient | 0.106 | 105.603 | -34.047 | -5.309 | -15.034 | | -22.207 | | 10.046 |
| | | Effect Size | 0.248 | 0.024 | 0.042 | 0.005 | 0.003 | | 0.056 | | 0.014 |
| | | $R^2$ Change | 0.199 | 0.023 | 0.040 | 0.005 | 0.003 | | 0.053 | | 0.014 |
| | EOC_geo (n = 1,089) | Coefficient | 0.079 | 102.752 | -23.414 | -10.570 | | -7.822 | -28.548 | | |
| | | Effect Size | 0.195 | 0.019 | 0.003 | 0.016 | | 0.010 | 0.099 | | |
| | | $R^2$ Change | 0.163 | 0.019 | 0.003 | 0.016 | | 0.010 | 0.090 | | |

Δ For S10_mth, EOC_alg, and EOC_geo, the baseline test was the 8th grade Benchmark math scale score, while for S10_lan and S10_rdg, the baseline test was the 8th grade Benchmark ELA scale score.

Table A4

Stepwise Regression Results for SAT10 and EOC Test Outcomes of the Matched EAST® Students in Grade 9

| | | | Baseline Test$^{\Delta}$ | ADA | Special Ed | FRL | ELL | Female | Black | Other Race | MidvsHigh$^{\#}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G9 | S10_mth (n = 2,245) | Coefficient | 0.293 | 70.018 | | | | | -8.018 | | -141.081 |
| | | Effect Size | 0.071 | 0.004 | | | | | 0.003 | | 0.287 |
| | | $R^2$ Change | 0.066 | 0.004 | | | | | 0.003 | | 0.223 |
| | S10_lan (n = 2,245) | Coefficient | 0.209 | 140.101 | | | | 20.371 | -39.700 | | -129.578 |
| | | Effect Size | 0.040 | 0.004 | | | | 0.008 | 0.047 | | 0.054 |
| | | $R^2$ Change | 0.038 | 0.004 | | | | 0.008 | 0.045 | | 0.051 |
| | S10_rdg (n = 2,245) | Coefficient | 0.153 | 71.313 | -8.880 | -4.932 | | | -18.751 | | -89.076 |
| | | Effect Size | 0.107 | 0.006 | 0.002 | 0.002 | | | 0.020 | | 0.202 |
| | | $R^2$ Change | 0.097 | 0.006 | 0.002 | 0.002 | | | 0.020 | | 0.168 |
| | EOC_alg (n = 1,471) | Coefficient | 0.357 | 51.203 | -17.179 | -2.649 | | | -4.198 | | -165.173 |
| | | Effect Size | 0.163 | 0.005 | 0.011 | 0.001 | | | 0.002 | | 0.748 |
| | | $R^2$ Change | 0.140 | 0.005 | 0.011 | 0.001 | | | 0.002 | | 0.428 |
| | EOC_geo (n = 613) | Coefficient | 0.369 | | | -6.041 | | -5.312 | -5.080 | | -177.042 |
| | | Effect Size | 0.080 | | | 0.005 | | 0.005 | 0.121 | | 0.767 |
| | | $R^2$ Change | 0.074 | | | 0.005 | | 0.005 | 0.108 | | 0.434 |

Δ For S10_mth, EOC_alg, and EOC_geo, the baseline test was the 8th grade Benchmark math scale score, while for S10_lan and S10_rdg, the baseline test was the 8th grade Benchmark ELA scale score.

# For MidvsHigh, EAST® participation starting from middle school = 0, EAST® participation starting from high school = 1.

Table A5

Stepwise Regression Results for SAT10 and EOC Test Outcomes of the EAST® Students and the Same-School Comparison Group in Grade 9

| | | | Baseline Test$^{\Delta}$ | ADA | Special Ed | FRL | ELL | Female | Black | Other Race | EAST® Trt |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G9 | S10_mth (n = 13,853) | Coefficient | 0.170 | 139.573 | -19.850 | -6.187 | | 2.184 | -14.656 | -3.608 | 11.087 |
| | | Effect Size | 0.209 | 0.021 | 0.011 | 0.003 | | 0.000 | 0.012 | 0.000 | 0.005 |
| | | $R^2$ Change | 0.173 | 0.021 | 0.011 | 0.003 | | 0.000 | 0.012 | 0.000 | 0.005 |
| | S10_lan (n = 13,852) | Coefficient | 0.162 | 183.509 | -12.562 | -8.431 | | 18.491 | -38.085 | -9.191 | 12.791 |
| | | Effect Size | 0.138 | 0.009 | 0.001 | 0.002 | | 0.006 | 0.017 | 0.000 | 0.002 |
| | | $R^2$ Change | 0.121 | 0.009 | 0.001 | 0.002 | | 0.006 | 0.017 | 0.000 | 0.002 |
| | S10_rdg (n = 13,852) | Coefficient | 0.127 | 105.704 | -16.105 | -8.738 | -8.128 | 2.475 | -20.015 | -4.578 | 9.912 |
| | | Effect Size | 0.319 | 0.012 | 0.005 | 0.006 | 0.001 | 0.000 | 0.018 | 0.000 | 0.004 |
| | | $R^2$ Change | 0.242 | 0.012 | 0.005 | 0.006 | 0.001 | 0.000 | 0.018 | 0.000 | 0.004 |
| | EOC_alg (n = 9,745) | Coefficient | 0.209 | 105.584 | -24.755 | -6.281 | -14.586 | 2.470 | -15.816 | | 14.394 |
| | | Effect Size | 0.548 | 0.027 | 0.028 | 0.006 | 0.005 | 0.001 | 0.029 | | 0.014 |
| | | $R^2$ Change | 0.354 | 0.026 | 0.027 | 0.006 | 0.005 | 0.001 | 0.028 | | 0.014 |
| | EOC_geo (n = 3,058) | Coefficient | 0.179 | 102.929 | -25.895 | -9.808 | | -2.673 | -25.542 | | 5.513 |
| | | Effect Size | 0.580 | 0.021 | 0.004 | 0.010 | | 0.001 | 0.075 | | 0.003 |
| | | $R^2$ Change | 0.367 | 0.021 | 0.004 | 0.010 | | 0.001 | 0.070 | | 0.003 |

Δ For S10_mth, EOC_alg, and EOC_geo, the baseline test was the 8th grade Benchmark math scale score, while for S10_lan and S10_rdg, the baseline test was the 8th grade Benchmark ELA scale score.

Table A6

Stepwise Regression Results for SAT10 and EOC Test Outcomes of the Unmatched EAST® Students in Grade 9

| | | | Baseline Test$^{\Delta}$ | ADA | Special Ed | FRL | ELL | Female | Black | Other Race | MidvsHigh$^{\#}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G9 | S10_mth (n = 2,146) | Coefficient | 0.293 | 73.202 | | | | | -8.389 | | -141.073 |
| | | Effect Size | 0.042 | 0.005 | | | | | 0.068 | | 0.221 |
| | | $R^2$ Change | 0.040 | 0.005 | | | | | 0.064 | | 0.181 |
| | S10_lan (n = 2,146) | Coefficient | 0.210 | 142.011 | | | | 21.777 | -40.577 | | -130.649 |
| | | Effect Size | 0.036 | 0.004 | | | | 0.014 | 0.049 | | 0.047 |
| | | $R^2$ Change | 0.035 | 0.004 | | | | 0.014 | 0.047 | | 0.045 |
| | S10_rdg (n = 2,146) | Coefficient | 0.154 | 73.642 | -8.185 | -4.616 | | | -18.828 | | -90.136 |
| | | Effect Size | 0.104 | 0.006 | 0.001 | 0.002 | | | 0.020 | | 0.200 |
| | | $R^2$ Change | 0.094 | 0.006 | 0.001 | 0.002 | | | 0.020 | | 0.167 |
| | EOC_alg (n = 1,408) | Coefficient | 0.358 | 49.235 | -17.138 | -2.746 | | | -4.548 | | -165.473 |
| | | Effect Size | 0.168 | 0.005 | 0.011 | 0.001 | | | 0.003 | | 0.733 |
| | | $R^2$ Change | 0.144 | 0.005 | 0.011 | 0.001 | | | 0.003 | | 0.423 |
| | EOC_geo (n = 592) | Coefficient | 0.366 | | | -6.625 | | -5.435 | -5.749 | | -175.022 |
| | | Effect Size | 0.079 | | | 0.006 | | 0.006 | 0.133 | | 0.733 |
| | | $R^2$ Change | 0.073 | | | 0.006 | | 0.006 | 0.117 | | 0.423 |

Δ For S10_mth, EOC_alg, and EOC_geo, the baseline test was the 8th grade Benchmark math scale score, while for S10_lan and S10_rdg, the baseline test was the 8th grade Benchmark ELA scale score.

# For MidvsHigh, EAST® participation starting from middle school = 0, EAST® participation starting from high school = 1.

Table A7
Stepwise Regression Results for EOC Test Outcomes of the Statewide PSM Matched Samples in Grades 10 - 11

| | | | Baseline Test$^{\Delta}$ | ADA | Special Ed | FRL | ELL | Female | Black | Other Race | EAST® Trt |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G10 | EOC_geo (n = 3,047) | Coefficient | 0.139 | 96.301 | -24.205 | -5.016 | | | -21.384 | 5.626 | 4.254 |
| | | Effect Size | 0.330 | 0.017 | 0.016 | 0.003 | | | 0.063 | 0.001 | 0.003 |
| | | $R^2$ Change | 0.248 | 0.017 | 0.016 | 0.003 | | | 0.059 | 0.001 | 0.003 |
| G11 | EOC_geo (n = 1,320) | Coefficient | 0.219 | 43.913 | -13.261 | | | | -16.386 | | |
| | | Effect Size | 0.543 | 0.004 | 0.012 | | | | 0.032 | | |
| | | $R^2$ Change | 0.352 | 0.004 | 0.012 | | | | 0.031 | | |
| | EOC_lit11 (n = 6,153) | Coefficient | 0.086 | 28.466 | -8.992 | -2.975 | | 1.814 | -6.744 | | 0.897 |
| | | Effect Size | 1.513 | 0.005 | 0.012 | 0.004 | | 0.002 | 0.016 | | 0.000 |
| | | $R^2$ Change | 0.602 | 0.005 | 0.012 | 0.004 | | 0.002 | 0.016 | | 0.000 |

Δ For EOC_geo, the baseline test was the 8th grade Benchmark math scale score, while for EOC_lit11, the baseline test was the 8th grade Benchmark ELA scale score.

Table A8
Stepwise Regression Results for EOC Test Outcomes of the EAST® Students and the Same-School Comparison Group in Grades 10 - 11

| | | | Baseline Test$^{\Delta}$ | ADA | Special Ed | FRL | ELL | Female | Black | Other Race | EAST® Trt |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G10 | EOC_geo (n = 9,290) | Coefficient | 0.228 | 89.714 | -17.046 | -1.960 | -5.057 | -1.237 | -18.331 | | 4.330 |
| | | Effect Size | 0.664 | 0.019 | 0.009 | 0.001 | 0.000 | 0.000 | 0.041 | | 0.002 |
| | | $R^2$ Change | 0.399 | 0.019 | 0.009 | 0.001 | 0.000 | 0.000 | 0.039 | | 0.002 |
| G11 | EOC_geo (n = 3,027) | Coefficient | 0.156 | 46.211 | -17.552 | | | -2.380 | -16.645 | -7.130 | |
| | | Effect Size | 0.441 | 0.009 | 0.029 | | | 0.001 | 0.038 | 0.002 | |
| | | $R^2$ Change | 0.306 | 0.009 | 0.028 | | | 0.001 | 0.037 | 0.002 | |
| | EOC_lit11 (n = 13,313) | Coefficient | 0.084 | 24.042 | -9.359 | -3.115 | -2.902 | 2.452 | -7.101 | | 0.687 |
| | | Effect Size | 1.597 | 0.005 | 0.012 | 0.004 | 0.000 | 0.003 | 0.019 | | 0.000 |
| | | $R^2$ Change | 0.615 | 0.005 | 0.012 | 0.004 | 0.000 | 0.003 | 0.019 | | 0.000 |

Δ For EOC_geo, the baseline test was the 8th grade Benchmark math scale score, while for EOC_lit11, the baseline test was the 8th grade Benchmark ELA scale score.