

## RESEARCH SUMMARY

### A Comparison Group Study of the Effects of *Premier Science*, a Standards-based Middle School Product, on Student Achievement

Two issues guided our research for Jefferson County School District: their interest in the impact of middle school science adoption choices and the science achievement gap between African American and White students. Our study, conducted in 2003-04 with 1,289 students in nine schools, compared *Premier Science* (Frey Scientific) to other products used in the district. We found that students at the lower end of the reading scale scored higher on the Kentucky Core Content Test (KCCT) if they were in classes using *Premier Science*. These findings support the continued use of *Premier Science*.

**Intervention.** *Premier Science*, emphasizing inquiry activities and conceptual understandings, follows a learning cycle common to many inquiry programs. Its 12 middle school curriculum units cover life, physical, and earth sciences and are supported by student materials, multimedia presentations, and an extensive teacher guide.

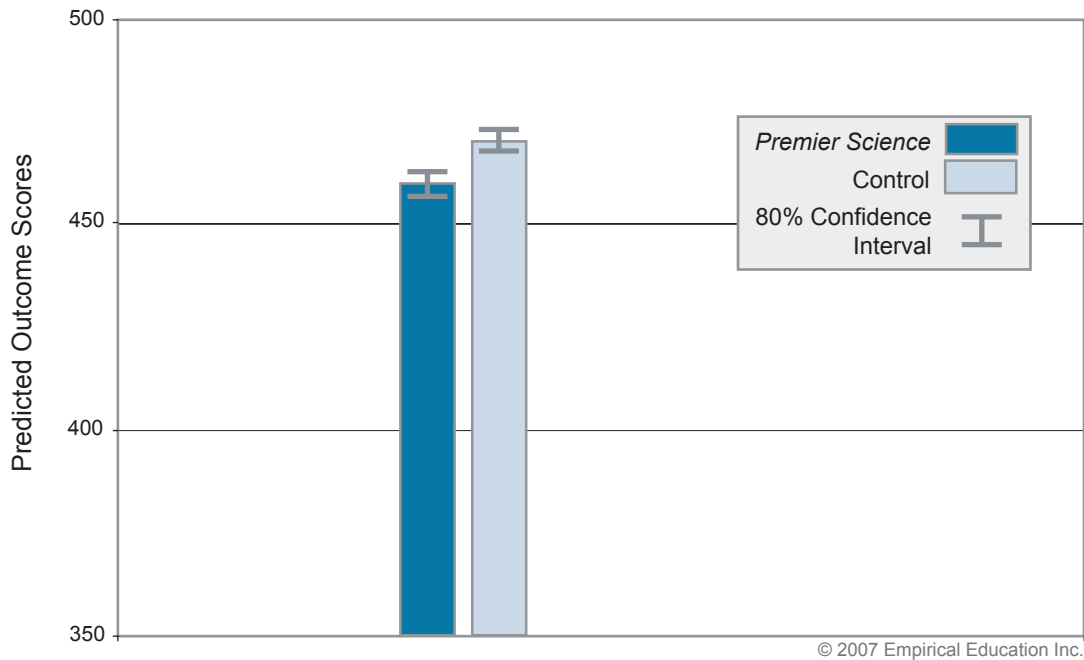
**Research design.** We used a quasi-experimental research design to compare the performance of 7<sup>th</sup> grade science students attending schools using *Premier Science* to performance of students at similar schools taught with other products. Because we had 7<sup>th</sup> grade KCCT scores as well as information on student demographics and student clustering in classrooms, we could investigate whether the product had differential effects on student groups.

**Participants.** *Premier Science* users attended three schools, whereas students in six district schools with similar demographics and test scores constituted the comparison group. This arrangement allowed a comparison of student performance but did not meaningfully control for many factors that make the two groups of schools different. The schools' previous self-selection into groups systematically confounded teacher and/or school leadership preference for a kind of teaching and the choice of a compatible instructional product. Teacher characteristics could provide alternative explanations for any differences we found.

**Statistical Analysis.** Recognizing that statistical analyses cannot make up for constraints in the original research design—especially for the potential bias that arises from not performing a randomized experiment, we used analyses of covariance to control for the effects of possible confounders and to increase the precision of the estimated treatment effect. We also modeled random effects to account for intra-class correlation at the class level. Application of these methods yielded data sets for users of *Premier Science* and for the comparison group including the student's school attended and class period for science, socio-economic status, sex, race, and score on the Stanford Diagnostic Reading Test (SDRT) from the beginning of the 2002-2003 school year, as well as the 7<sup>th</sup> grade score on the state science test (KCCT), which was the outcome measure. (For the SDRT and KCCT we used the scale score.) We developed a statistical model to identify the set of variables that account for most of the variance in the outcome, selecting those that were important theoretically or related to critical policy decisions.

**Results.** The statistical modeling gave some control over selection bias that could arise due to the covariates being distributed differently in the two conditions. The strongest influence on, or predictor of, science achievement on the KCCT was found to be the initial SDRT score. Because the presence of other variables did not affect the estimate of the treatment impact or the interaction of interest (between the prior score and treatment), they were excluded from further analyses.

We found that students in the *Premier Science* group had a small advantage in science achievement overall. This effect was substantially stronger for students at the lower end of reading ability. The bar graph represents the impact of *Premier Science* for the median student scoring in the bottom quartile of the SDRT pre-test. The bar graph includes the 80% confidence interval as a marker at the top of the bars. Because the markers do not overlap, we have reasonable confidence that *Premier Science* would make a difference for this student.



Median Student of the Bottom Quartile of the Pretest

The difference in science test scores for the median student in the bottom quartile amounts to 10.6 points—a small difference, but unlikely to have occurred by chance.

Since an initial concern of the school district was the gap in science achievement between African American students and other students, we also addressed this issue. Overall, the African American students are represented more heavily in the lower quartiles of reading ability. As noted above, our analysis showed that the reading pre-test score was the best predictor of science achievement. Thus the apparent advantage that *Premier Science* gave African American students can be explained as an artifact of differences in reading ability.

**Conclusion.** We found a small but significant impact from being in the *Premier Science* classes for the students at the lower end of the reading scale. For the students at the higher end, there was no difference between *Premier Science* and comparison groups. We can speculate that the textbooks used in the comparison condition accompanied a more text-based mode of instruction with greater emphasis on reading. *Premier Science*, on the other hand, is largely activity-based, thus encouraging learning through exploration and discussion. Although we cannot be sure what kind of instructional practices actually occurred in classrooms that resulted in improved achievement on the state science test for students using *Premier Science*, our study provides positive evidence for the use of *Premier Science* as an alternative to traditional science education products for 7<sup>th</sup> graders with low reading ability in this district.

**To read the complete report, contact:**

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