
Integrating Reading Apprenticeship and Science Instruction in High School Biology

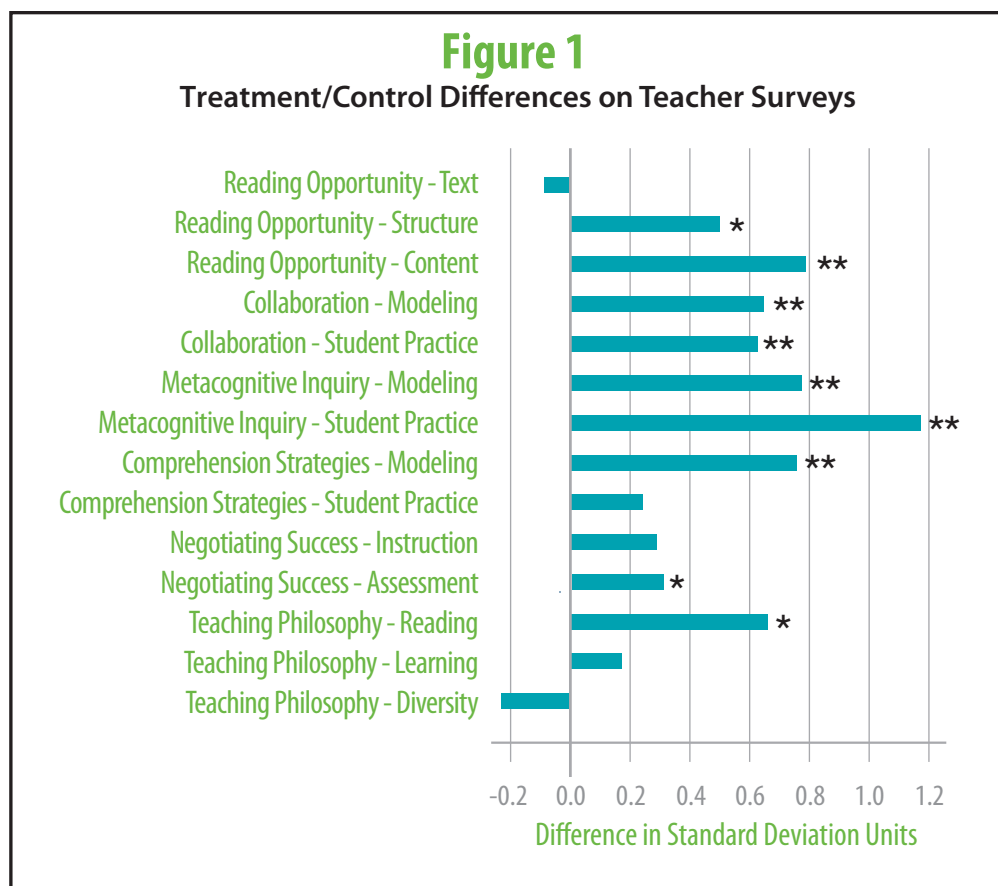
Researchers tested the effectiveness of WestEd's Reading Apprenticeship® teacher professional development with a focus on integrating reading instruction and science instruction to understand its impact on teacher knowledge and skills, instructional practices, and on student achievement in science and reading. This study was funded by the National Science Foundation ROLE Award #0440379 and involved independent evaluators from the UCLA CRESST Center. Researchers from WestEd's Strategic Literacy Initiative and STEM program contributed to the study design but did not collect or analyze outcome data.

Treatment: The treatment entailed 10 days of professional development in Reading Apprenticeship specific to science, led by trained, certified facilitators. There was ongoing support for participating teachers via a list serve. Both treatment and control teachers received classroom libraries linked to the high school biology curriculum.

Sample: This study was conducted in 70 California high schools that serve high proportions of African American, Latino, and English learner students — populations that are traditionally underrepresented in advanced sciences. Eighty-seven biology teachers participated, half in the experimental group and half in a wait-listed control group.

Teacher Surveys: The differences between treatment and control group responses on post-treatment surveys, after controlling for initial survey responses, suggest that treatment teachers in this cohort are providing more, and more varied, opportunities to read in class with support; more opportunities for collaborative meaning-making, metacognitive inquiry, and practice of comprehension strategies.

What distinguished treatment classrooms, according to survey responses, is that students — rather than teachers — were more frequently doing the work of comprehending; they received greater teacher support for this work; and that support frequently took the form of metacognitive inquiry into reading and thinking processes. The strength of the differences between the treatment and comparison classrooms on these survey outcomes is quite strong, with effect sizes ranging from 0.61 to 1.16 standard deviation units (see Figure 1).

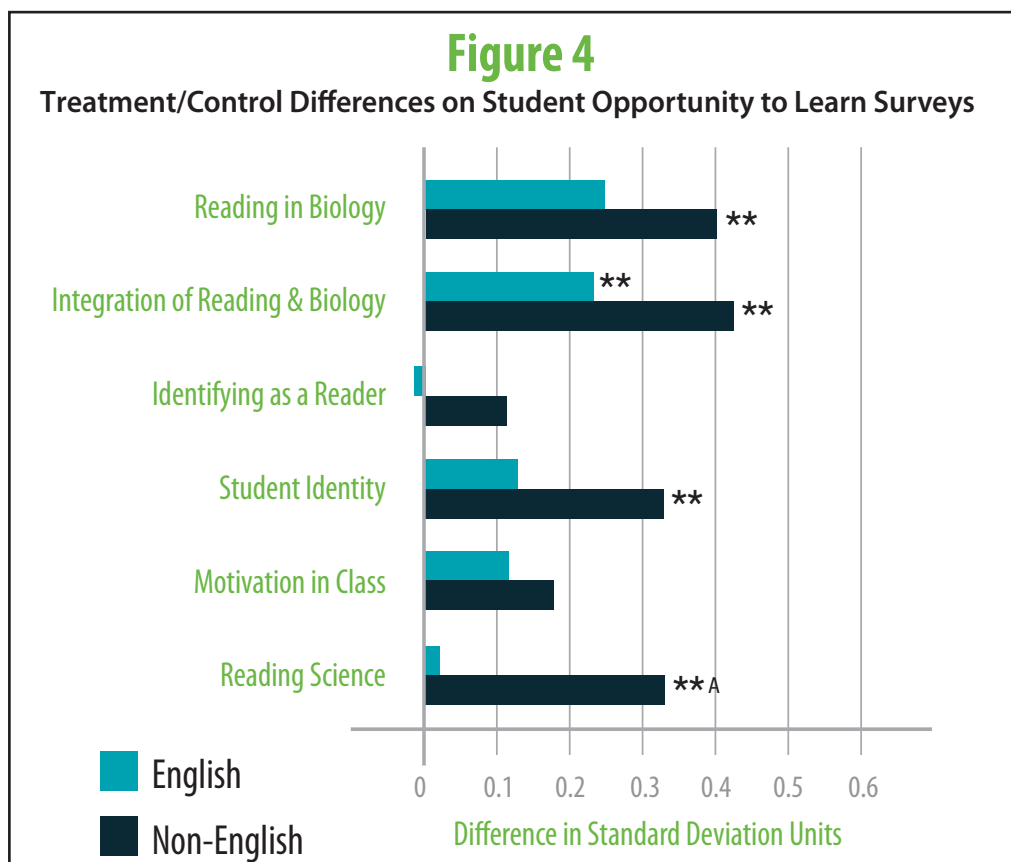


* = Statistically significant at the .05 level.

** = Statistically significant at the .01 level.

Bars represent the magnitude of difference between the treatment and control groups.

Student Opportunity-to-Learn Surveys: To investigate treatment/control group differences on the OTL survey outcomes, researchers estimated multi-level regression models that included controls for baseline characteristics (randomization strata, race/ethnicity, and whether or not the student reported speaking a non-English language at home). To some extent, the student OTL survey results corroborated findings from the Teacher Survey and Teacher Assignment ratings related to integration of biology and literacy. The results favored the treatment group and were statistically significant for two of the six measures: Emphasis on Reading in Biology — a measure of teacher instruction, guidance, and support for science reading — and Student Integration of Biology & Literacy — a measure of student practice of comprehension supporting routines and strategies. Moreover, students in treatment schools reported higher levels on the Student Identity construct than students in control schools ($p=0.054$) (see Figure 4).



State Standardized Test Scores: To examine potential program impacts on student performance in biology and reading comprehension, we examined treatment/control differences in state-mandated criterion-referenced test scores. As described above, two types of test score data were collected — linked, longitudinal test score data for students for whom we had obtained parental consent; and anonymous, unlinked, cross-sectional data for students for whom we did not obtain parental consent.

For the longitudinal test data, students in treatment schools exhibited similar levels of performance on the state standardized assessments as their counterparts in control schools. For the cross-sectional data, which is a more representative sample of the students in the study, students in the treatment schools performed better than their counterparts in control schools on all state standardized assessments: English language arts, reading comprehension, and biology (see Figure 5). Thus, there is some evidence that the intervention is associated with increases in performance on the state standardized assessments examined. An analysis of scores by demographic group found statistically significant increases in test scores for white, Latino, and English learner students in the treatment classes.

