

INCREASING ENGLISH AND LANGUAGE ARTS
(ELA) AND MATHEMATICS ON THE

California Assessment *Through Science*

This study tested the theory that district use of STEMscopes increases district English Language Arts (ELA) and mathematics proficiency **through** increases in science proficiency. Academic learning and achievement is often a synergistic process, with student learning in one subject bolstering learning in other subjects. We propose that the STEMscopes science curriculum increases not only students' science proficiency but also their ELA and math proficiency (see figure). STEMscopes supports science instruction that (among other things) includes and targets the specialized language of science (e.g., vocabulary), as well as computation skills exercised within scientific observational settings and investigations that are part of experiential, problem-based learning. As science learning increases, we may also expect improvements in ELA and math performance.

STEMSCOPES
CURRICULUM USE
BY DISTRICTS



INCREASED
SCIENCE
PROFICIENCY



INCREASED
ELA & MATH
PROFICIENCY



To test this theory, we use a mediation model with scores from the 2019 California Assessment of Student Performance and Progress (CAASPP) and California Science Test (CAST). Mediation models include multiple simultaneous regressions and test how a process' outcome (such as ELA and math proficiency) is associated with a predictor (use of STEMscopes by a district) through an additional variable (or variables), such as science proficiency. Within a mediation model, we can also include other important predictors of science, ELA, and math proficiency to ensure that the model's results are not due to one of these other predictors instead of STEMscopes. Within this large mediation model, we evaluate how the added "pathway" effects ELA and math proficiency through science learning, as well as the potential effect it has on ELA and math proficiency. STEMscopes districts were defined as those that had a STEMscopes subscription for 5th grade students and showed strong usage of STEMscopes. California creates benchmarks for proficiency in science, ELA, and mathematics; identifying students as below standard, near standard, standard met, and standard exceeded. For the purposes of this study, the district's proficiency rate was defined as the percentage of students who "met or exceeded" standards for science, ELA, and math. District percentages of economically disadvantaged students, English language learners, students who attended charter schools, district size, teacher average education levels, and average years teaching were included as other important predictors of science, reading, and ELA.

Results

As noted, in the previous report on California science proficiency, STEMscopes districts had significantly higher science proficiency rates compared to districts that did not use STEMscopes, even when we controlled for other important variables that influence student proficiency. This is the first path (first step of the process) in the mediation model. The next part of the model tested whether science proficiency predicted ELA and math (tested separately) for the same year. Results indicate science proficiency rates predict districts' ELA and math proficiency rates. As an overall test of the two-step process (STEMscopes → science → ELA or math), the final step of the mediation model considers both steps together. We can interpret the overall test of the process as "STEMscopes effect on ELA and math proficiency through science proficiency." Districts that used STEMscopes saw a 1.94 percent increase in ELA proficiency compared to non-STEMscopes districts. Districts that used STEMscopes saw a 1.82 percent increase in math proficiency compared to non-STEMscopes districts—another significant change.

Please note that science acts as a mediator. In other words, STEMscopes improves ELA and math proficiency through science. There is no other relationship between STEMscopes and ELA or math proficiency. This is to be expected—STEMscopes is not a comprehensive ELA or math curriculum. Rather, it is a high quality science curriculum that includes ELA and math supports within the science learning experience.

Conclusion

Districts that used STEMscopes had higher science proficiency rates than districts that did not use STEMscopes in 2019. This higher science proficiency rate led to higher proficiency rates in ELA and mathematics for districts that used STEMscopes versus those that did not use STEMscopes. Specifically, even when controlling for district percentages of economically disadvantaged students, English language learners, students who attended charter schools, district size, teacher average education levels, and average years teaching, STEMscopes increases the ELA proficiency rate by 1.94 percent and math by 1.82 percent in elementary school.

