This study tested the theory that district use of STEMscopes science curriculum increases district reading and ELA proficiency through increases in science proficiency. Academic learning and achievement is often a synergistic process, with student learning in one subject potentially bolstering learning in other subjects. We proposed that exposure to the STEMscopes science curriculum (hereafter referred to as just “STEMscopes”) not only increases students’ science proficiency, but possibly their reading and English Language Arts as well. Specifically, we suggested a process such that: STEMscopes increased positive changes in science learning which, in turn, increased positive changes reading and ELA (see figure). STEMscopes supports science instruction that (among other things) includes and targets the specialized language used within science (e.g., vocabulary) as well as the comprehension skills necessary to make conclusions based on scientific observations and investigations that are part of realistic problem-based and experiential learning. As student learning in science increases, in turn, we may expect increases in general reading and ELA learning as well.
To test this possibility, we used a mediation model with scores from the 2019 Georgia Milestones Assessment System. Mediation models are models that include multiple simultaneous regressions and test a process regarding how an outcome (such as a reading and ELA 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, reading and ELA proficiency to ensure that results of the model are not due to one of these other predictors instead of STEMscopes. Within this large mediation model, we evaluated whether the added "pathway" or process whereby STEMscopes affects reading and Language Arts proficiency through science learning proficiency is significant, and what potential effect it has on proficiency in reading and Language Arts. Districts were identified as STEMscopes districts if they had a subscription to STEMscopes for students in 5th grade and showed usage of STEMscopes based on the analytics data. The state of Georgia creates benchmarks for proficiency in science, reading, and ELA; identifying students within four levels (beginner, developing, proficient, and distinguished learner). For the purposes of this study, the district’s proficiency rate was defined as the change between 2018 and 2019 in the percentage of students who were proficient or distinguished in science, reading and ELA. Economic disadvantage, race/ethnicity, student disability, and student gender were included as other important predictors of science, reading and ELA.

Results

As noted, in the previous report on Georgia Science Proficiency, STEMscopes districts had a greater positive change in science proficiency rates between 2018-2019 than districts that did not use STEMscopes (even when controlling 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 was whether change in science proficiency between 2018-2019 predicted positive change in reading, and ELA (tested separately) for the same year. Results indicated that increases in science proficiency between 2018-2019 predicted a significant positive change in districts’ reading and ELA proficiency. As an overall test of the two step process (STEMscopes -> science -> reading or ELA), the final step of a mediation model is to consider both steps together. We can interpret the overall test of the process as "STEMscopes effect on reading and ELA proficiency changes through changes in science proficiency." For reading, districts that used STEMscopes had a 0.89 percent increase in reading proficiency (through STEMscopes effect on science) between 2018-2019, compared to non-STEMscopes districts, and this change was significant. For ELA, districts that used STEMscopes had a 0.99 percent increase in ELA proficiency (through STEMscopes effect on science) between 2018-2019, compared to non-STEMscopes districts; this change was also significant.

Please note, the use of STEMscopes in districts did not directly increase the change in Reading or ELA proficiency between 2018-2019. It is only by accounting for the positive increase in science proficiency do we see an effect of STEMscopes on reading and ELA. When Science proficiency is left out of the model, there is not a relationship between STEMscopes and Reading or ELA proficiency change. This is to be expected because STEMscopes is not a direct instruction, comprehensive reading or ELA curriculum. Rather, it is a high quality science curriculum that includes language and reading support within the process of supporting science. Thus, we only see what is called an ‘indirect effect’ on reading and ELA proficiency when we consider the process of how STEMscopes increases science proficiency over time which, in turn, bolsters reading and ELA proficiency over time.
Conclusion

Districts that used the STEMscopes science curriculum had greater positive change in science proficiency rates than districts that did not use STEMscopes between 2018-2019. This greater change in science, in turn, led to a greater positive change in reading and ELA proficiency rates for districts that used STEMscopes science versus districts that did not used STEMscopes. Specifically, even when controlling for economic disadvantage, race/ethnicity, student disability, and student gender, STEMscopes increased the change in proficiency rate between 2018-2019 in reading (through Science) by 0.89 percent and ELA (through science) by 0.99 percent in elementary school.