



Examining Differences in 5th and 8th Grade STAAR™ Passing Rates for Districts that were High Users of STEMscopes and non-STEMscopes Districts

Description of the Study

The purpose of this study was to investigate whether the 5th grade and 8th STAAR™ passing rates of Texas public school districts that adopted STEMscopes™ and were considered high-users of STEMscopes™ (based on their user-analytics data) were higher than school districts that did not adopt STEMscopes™.

STEMscopes™ is a comprehensive, online K-12 science curriculum that is 100% aligned to the Texas science standards (the Texas Essential Knowledge and Skills) and that combines online content, activities, and teacher materials with hands-on experiments and explorations. The online component of STEMscopes™ serves as both a support and a guide to teachers, as well as a platform through which students can interact with the material and get feedback on their progress.

STEMscopes™ uses an inquiry-based approach to science, in which the teacher guides students towards the discovery of concepts and skills instead of using explicit direct instruction (Crawford, 2007). The specific way that STEMscopes™ delivers inquiry-based instruction is by building on the Biological Science Curriculum Study's 5E inquiry model (Bybee et al., 2006). The 5E refers to five steps: engagement, exploration, explanation, elaboration, and evaluation. Engagement refers to how teachers activate students' prior knowledge about and interest in a new topic, building connections between what they know and what they are learning. Exploration is the step where students take part in activities and experiments that allow them to experience and learn new concepts and skills. Explanation requires students to explain those new concepts and skills learned during the explore phase. Elaboration challenges them to deepen their conceptual understanding through new, but related, experiences. Finally, in the evaluation phase, students' knowledge is assessed to inform teachers of their progress towards mastery.

The STEMscopes™ pedagogical model adds two key steps: intervention and acceleration to make it the 5E+I/A model. Intervention means that STEMscopes™ provides teachers with the tools both to identify where students are struggling and to provide them with additional opportunities to learn and practice those learning objectives. Acceleration refers to the activities that STEMscopes™ provides for those students that have demonstrated mastery of a particular learning objective. For example, students can undertake a problem-based learning challenge, or connect science to art through a creative project. These two tools help teachers differentiate their instruction and address students' individual learning needs (Zuiker & Whitaker, 2014).

Design and Sample

The research team obtained 2012-2013 district passing rates from Pearson's Texas website and student demographic data were obtained from the state AEIS reports.¹ We defined 'high use' by examining teacher use at the district via their user analytics, which STEMscopes houses.

¹ https://tx.pearsonaccess.com/tclp/portal/tclp.portal?_nfpb=true&_pageLabel=pa2_analytical_reporting_page



Districts with more than 5,000 visits to the website were considered high-users for the purpose of this analysis.

We compared the samples of 51 districts' 5th grade passing rates and 29 districts' passing rates to those of the districts in the state that did not use STEMscopes at any grade level. Descriptive statistics for these two groups are in Table 1 below. All school districts that tested 20 or more 5th grade students on the STAAR science exam were included, with the exception of districts that adopted STEMscopesTM but were not considered high-users.

Table 1. Descriptive Statistics of STEMscopesTM and non-STEMscopesTM districts

	High Usage STEMscopes Districts	non-STEMscopes Districts
5th Grade Students		
Districts	<i>n</i> = 51	<i>n</i> = 565
% Hispanic	54.9%	36.6%
% Black	9.6%	7.0%
% White	30.2%	53.1%
% Free/Reduced Lunch	50.5%	54.4%
% LEP	18.0%	8.3%
% Bilingual	7.5%	1.4%
% ESL	4.6%	4.8%
% Special Ed	5.6%	5.4%
% Gifted/Talented	11.2%	8.2%
% Title 1 Schools	72.6%	89.9%
8th Grade Students		
Districts	<i>n</i> = 29	<i>n</i> = 633
% Hispanic	50.8%	35.7%
% Black	10.3%	7.3%
% White	32.3%	53.7%
% Free/Reduced Lunch	46.4%	49.5%
% LEP	7.6%	3.2%
% Bilingual	0.8%	0.1%
% ESL	6.7%	3.1%
% Special Ed	4.8%	5.1%
% Gifted/Talented	11.2%	9.1%
% Title 1 Schools	57.8%	69.0%

Analyses

Multiple regression was used to examine differences in district STAARTM passing rates between these two sets of districts in the 2012-2013 school year, controlling for important district demographic information (i.e., the percent of Latino students, the percent of African American students, the percent of students receiving Free/Reduced Lunch, the percent of students categorized as limited English Proficient (LEP), the percent of students participating in a Bilingual program (5th grade only), the percent of students in an ESL, the percent of students receiving Special Education services, the percent of students in Gifted/Talented programs, and the percent of Title 1 schools within a district).



For each set of analyses, comparisons for 5th grade and 8th grade passing rates were done separately. The first set of analyses examined differences between the two sets of districts, comparing the average STAARTM passing rate for *all students* in each districts (Table 2 for 5th grade results and Table 3 for 8th grade results). We also considered these differences between these two groups and the average STAARTM passing rate for students who were categorized as economically disadvantaged (as determined by qualification for free/reduced lunch; Table 4 for 5th grade results and Table 5 for 8th grade results). For these analyses, the percent of students receiving free/reduced lunch was not included as a covariate to avoid misspecification of the model.

Results of the Study

The first analysis found that districts that were high STEMscopesTM users had significantly higher STAARTM passing rates compared to districts that did not use STEMscopesTM, after controlling for important district demographic information. For 5th grade, the average passing rate for students in non-STEMscopesTM districts was 71%, and the average passing rate for students in STEMscopesTM districts was 76%. This indicates that 5% more 5th grade students received a passing score on the STAARTM when in districts that were high users of STEMscopesTM. This difference was statistically significant.

Table 2. Differences in Average 5th Grade STAARTM Passing Rate.

	Unstandardized B	Standard Error	t	p-value
Average Passing Rate*	70.52	0.47	149.19	< 0.001
High STEMscopes User*	5.19	1.72	3.02	0.003
% Hispanic	-0.09	0.12	-0.77	0.443
% Black	-0.23	0.14	-1.66	0.097
% White	0.05	0.12	0.40	0.692
% Free/Reduced Lunch*	-0.22	0.04	-6.19	< 0.001
% LEP*	0.15	0.06	2.58	0.010
% Bilingual	-0.02	0.07	-0.21	0.834
% ESL	-0.04	0.09	-0.46	0.643
% Special Ed*	-0.46	0.12	-3.71	< 0.001
% Gifted/Talented*	0.27	0.08	3.26	0.001
% Title 1 Schools	-0.01	0.02	-0.64	0.520

Note. Dependent variables is average 2013 STAAR passing rates for all students.

For 8th grade, the average passing rate for students in non-STEMscopesTM districts was 73%, and the average passing rate for students in STEMscopesTM districts was 78%. Similar to the 5th grade results, 5% more 8th grade students received a passing score on the STAARTM when in districts that were high users of STEMscopesTM. This difference was statistically significant.



Table 3. Differences in Average 8th Grade STAAR™ Passing Rate.

	Unstandardized B	Standard Error	t	p-value
Average Passing Rate*	72.53	0.43	167.17	< 0.001
High STEMscopes User*	4.88	2.22	2.20	0.028
% Hispanic	-0.19	0.12	-1.58	0.115
% Black	-0.23	0.13	-1.77	0.078
% White	-0.13	0.12	-1.10	0.273
% Free/Reduced Lunch*	-0.25	0.03	-7.28	< 0.001
% LEP	1.15	0.62	1.84	0.066
% Bilingual	-1.07	0.80	-1.34	0.180
% ESL	-1.23	0.63	-1.94	0.053
% Special Ed*	-0.63	0.11	-5.66	< 0.001
% Gifted/Talented*	0.17	0.07	2.37	0.018
% Title 1 Schools*	-0.03	0.01	-2.34	0.019

Note. Dependent variables is average 2013 STAAR passing rates for all students.

Results from the second analysis indicate that districts that were high users of STEMscopes™ had higher district passing rates for economically disadvantaged students compared to districts that did not use STEMscopes™. For 5th grade, the average passing rate for economically disadvantaged students in non-STEMscopes™ districts was 60%, and the average passing rate for economically disadvantaged students in STEMscopes™ districts was 65%. This indicates that 5% more economically disadvantaged students received a passing score on the STAAR™ when in districts that were high users of STEMscopes™. This difference was statistically significant.

Table 4. 5th Grade STAAR™ Passing Rates for Economically Disadvantaged Students.

	Unstandardized B	Standard Error	t	p-value
Average Passing Rate*	59.63	0.72	83.42	< 0.001
High STEMscopes User*	5.66	2.56	2.21	0.027
% Hispanic	-0.33	0.18	-1.86	0.064
% Black*	-0.40	0.20	-2.01	0.045
% White	-0.18	0.18	-1.00	0.319
% LEP	-0.11	0.09	-1.25	0.210
% Bilingual	0.18	0.11	1.55	0.121
% ESL*	0.27	0.13	2.04	0.042
% Special Ed*	-0.38	0.19	-2.07	0.038
% Gifted/Talented	0.12	0.13	0.95	0.341
% Title 1 Schools	-0.01	0.03	-0.45	0.655

Note. Dependent variables is average 2013 STAAR passing rates for students who qualify for free or reduced lunch.

For 8th grade, the average passing rate for economically disadvantaged students in non-STEMscopes™ districts was 61%, and the average passing rate for economically disadvantaged students in STEMscopes™ districts was 69%. Therefore, 8% more economically disadvantaged



students received a passing score on the STAAR™ when in districts that were high users of STEMscopes™. This difference was statistically significant.

Table 5. 8th Grade STAAR™ Passing Rates for Economically Disadvantaged Students.

	Unstandardized B	Standard Error	<i>t</i>	<i>p</i> -value
Average Passing Rate*	60.91	0.69	87.89	< 0.001
High STEMscopes User*	7.85	3.43	2.29	0.023
% Hispanic	-0.16	0.18	-0.91	0.366
% Black	-0.10	0.20	-0.51	0.610
% White	-0.06	0.19	-0.33	0.743
% LEP	0.93	1.00	0.93	0.354
% Bilingual*	-3.65	1.24	-2.94	0.003
% ESL	-0.84	1.02	-0.82	0.412
% Special Ed*	-0.86	0.19	4.55	< 0.001
% Gifted/Talented	0.12	0.12	1.04	0.298
% Title 1 Schools*	-0.05	0.02	-3.12	0.002

Note. Dependent variables is average 2013 STAAR passing rates for students who qualify for free or reduced lunch.

In conclusion, 5th and 8th grade students in districts where teachers frequently use STEMscopes™ do significantly better on their STAAR science exam. We found this to be particularly true for students considered economically disadvantaged.