

2017-18 Evaluation of the STEM Academy for Science Teachers and Leaders

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EA18-610-4

At-a-Glance

The STEM Academy for Teachers and Leaders was a partnership between the Dallas Independent School District (ISD) Science, Technology, Engineering, and Mathematics (STEM) Department and Southern Methodist University (SMU).¹ The partnership goals, supported by a \$644,430 grant from Texas Instruments Foundation, were to grow the abilities of middle school science teachers to integrate active learning experiences in lessons, foster professional growth and leadership, increase student science achievement, and promote student pursuit of STEM coursework. The Dallas ISD contributed \$75,600 of cohort one program expenses: \$25,600 for participant tuition at SMU, and \$50,000 for supplies.

Intended to run for four years, the program started with a planning year in 2016-17 followed by the first intensive three-week academy during summer 2017. The training was supplemented by direct coaching and professional learning communities during the school year. Cohort one consisted of grade seven and grade eight teachers from six campuses.² This cohort started the program in summer 2017 and will complete three program years. Cohort two included new teachers from the original six campuses, and grade six through grade eight teachers from seven new campuses.³ This cohort was recruited during the 2017-18 school year to attend two years of the academy during summers 2018 and 2019. For program participation, cohort one participants received four SMU graduate credits and discounted tuition for any further credit hours toward a degree. Recruiting challenges for cohort two led program administrators to offer a \$1,000 stipend in addition to graduate credit.

The STEM Academy also included a campus-level science instructional leader program meant to support the teacher academy and promote professional growth among teacher participants. Instructional leaders assisted teachers with pedagogy and content and supported teachers in self-reflection and change implementation. Seven instructional leaders attended a one-week training in the summer of 2017 and received

on-campus training from SMU instructional coaches throughout the 2017-18 school year.

This purpose of this evaluation was to report demographic characteristics for cohorts one and two and 2017-18 cohort one teacher and student outcomes.

Demographics

The evaluator retrieved demographic data from the district personnel file for participants identified by program staff members, as summarized in Table 1. Participants had taught for an average of 5.6 (cohort one) and 5.9 (cohort two) years. Whereas cohort one consisted of grade seven and grade eight teachers, cohort two also included grade six teachers.

Table 1: Summer 2017 and Summer 2018 Participating Teacher Demographics by Cohort

	Cohort One (N = 15)	Cohort Two (N = 32)
Gender		
Female	12	20
Male	3	12
Race/Ethnicity		
Asian	0	2
African American	8	20
Hispanic	4	2
White	3	8
Grade Level Taught*		
Six	0	15
Seven	11	12
Eight	10	11

Source: Teacher data from SMU on May 19, 2018 (cohort one) and November 2, 2018 (cohort two). District personnel files dated May 20, 2018 (cohort one) and September 16, 2018 (cohort two).

Note: *Teachers may have taught multiple grade levels.

Student Experience Survey

The evaluator compared favorable response rates on the five student experience survey⁴ subsections (Expectations and Rigor, Student Engagement, Classroom Environment, Supportive Relationships, and Pedagogical Effectiveness) for cohort one teachers for the 2016-17 (pre-training) and 2017-18 (post-training) school years. The evaluator also compared changes in

¹ Caruth Institute for Engineering Education, Lyle School of Engineering, and Annette Caldwell Simmons School of Education & Human Development

² Ann Richards Middle School, Young Men's Leadership Academy at Fred F. Florence Middle School, Billy Earl Dade Middle School, Francisco F. "Pancho" Medrano Middle School, Seagoville Middle School, and William H. Atwell Law Academy

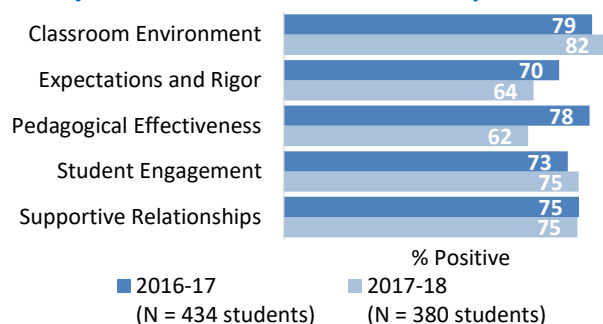
³ W.E. Greiner Middle School; Robert T. Hill Middle School; Piedmont G.L.O.B.A.L. Academy Middle School; Thomas C. Marsh Preparatory Academy; H.W. Longfellow Career Exploration Academy; Harold W. Lang, Sr. Middle School; and Hector P. Garcia Middle School

⁴ For more information, see Chawla 2018.

overall favorable response rates from 2016-17 to 2017-18 for STEM Academy participants and all other grade seven and grade eight science teachers.

As shown in Figure 1, favorable response rates for cohort one STEM Academy teachers trended upward on the Classroom Environment and Student Engagement subscales, and trended downward on two of the three other subscales, most noticeably on the Pedagogical Effectiveness subscale, with a one-year decline of 16 percentage points.

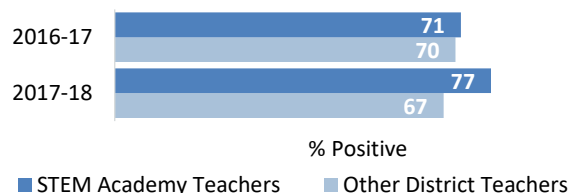
Figure 1: 2016-17 and 2017-18 Percentage of Favorable Ratings on the Student Experience Survey Subsections for STEM Academy Teachers



Source: Student experience survey data dated November 13, 2018.

Overall favorable response rates improved after year one of the academy. As shown in Figure 2, although the overall favorable response rates for STEM Academy teachers were like those for other science teachers prior to the STEM Academy, overall favorable responses for STEM Academy teachers post-program increased six percentage points and exceeded those for other science teachers by 10 percentage points.

Figure 2: 2016-17 and 2017-18 Overall Percentage of Favorable Ratings on the Student Experience Survey for STEM Academy and Other District Teachers



Source: Student experience survey data dated November 13, 2018.

Note: STEM Academy Teachers: 2016-17 (N = 434 students), 2017-18 (N = 380 students). Other District Teachers 2016-17 (N = 7,026 students), 2017-18 (N = 4,428 students).

Student Academic Outcomes

The evaluator used propensity score matching (PSM) to create matched comparison groups of students who were not taught by STEM Academy participants. For the five science courses with large enrollment (Science 7, Sheltered Science 7, Science 7 Pre-AP, Science 8, and Sheltered Science 8), the evaluator included the

following covariates to determine comparison students: student attendance for 2016-17 and 2017-18, number of years identified as limited-English proficient, socio-economic status, special education status, talented and gifted participation, whether retained the previous school year (not used for Science 7 Pre-AP), and 2017 STAAR performance on the reading and mathematics subtests. The evaluator used *chi-square* analyses (statistical significance) and Cramer's V (practical significance) to compare passing rates for students of STEM Academy teachers to comparison students on the fall 2017 *Assessments of Course Performance* (ACP) for the five courses. The evaluator also compared the rates of STEM Academy and comparison group students who met the Approaches Grade Level or Above (Approaches+), Meets Grade Level or Above (Meets+), and Masters Grade Level (Masters) performance standards on the spring 2018 *State of Texas Assessments of Academic Readiness* (STAAR) science subtest.

The percentages of STEM Academy students passing science ACPs at the end of the first semester ranged from 44 percent (Sheltered Science 7) to 69 percent (Science 7 Pre-AP) (Table 2). STEM Academy students in sheltered courses passed the science ACPs at higher rates than comparison students, but passed the Science 7, Science 7 Pre-AP, and Science 8 ACPs at lower rates than comparison students. None of these differences were statistically significant.

Table 2: Fall 2017 ACP Results

	N	% Passing
Science 7		
STEM Academy	389	44.7
Comparison Group	389	48.1
District Overall	5,796	48.4
Sheltered Science 7		
STEM Academy	125	44.0
Comparison Group	125	41.6
District Overall	1,356	46.5
Science 7 Pre-AP		
STEM Academy	232	69.0
Comparison Group	232	71.1
District Overall	2,383	78.0
Science 8		
STEM Academy	312	55.8
Comparison Group	312	60.3
District Overall	5,325	56.4
Sheltered Science 8		
STEM Academy	229	48.9
Comparison Group	229	47.2
District Overall	1,401	45.0

Source: District Fall 2017 ACP data files dated March 6, 2018.

Note: ACP = Assessment of Course Performance.

Students in two courses (Science 7 and Sheltered Science 7) took a science ACP at the end of the spring semester. As shown in Table 3, passing rates between STEM Academy students and comparison group students enrolled in Science 7 were comparable (70%). As in the fall, STEM Academy Sheltered Science 7 students passed at a higher rate (60%) than

comparison students (55%). None of these differences were statistically significant.

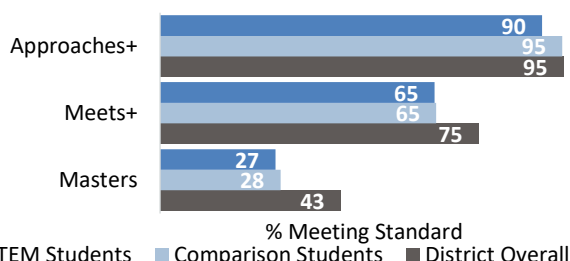
Table 3: Spring 2018 ACP Results

	N	% Passing
Science 7		
STEM Academy	389	69.9
Comparison Group	389	69.9
District Overall	5,796	71.6
Sheltered Science 7		
STEM Academy	125	60.0
Comparison Group	125	55.2
District Overall	1,356	63.3

Source: Spring 2018 ACP data files dated September 12, 2018.
Note: ACP = Assessment of Course Performance.

As shown in Figure 3, although not statistically significant, STEM Academy Science 7 Pre-AP students met the Approaches+ and Masters standards on the spring STAAR science test at slightly lower rates than comparison students, but performed at the same rates at the Meets+ standard (see Figure 4).

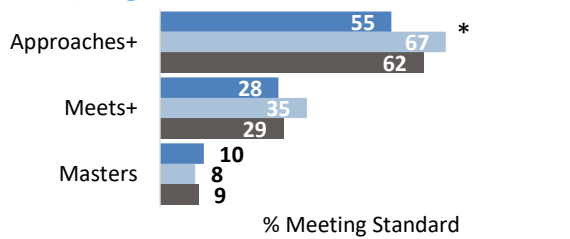
Figure 3: Spring 2018 Science 7 Pre-AP STAAR Results



Source: Spring 2018 STAAR data files dated September 5, 2018.
Note: STEM Academy students (N = 232), comparison students (N = 232), and district students overall (N = 2,351).

Science 8 students of STEM Academy teachers met the Approaches+ standard on the science STAAR at a significantly lower rate than comparison students (Figure 4), $\chi^2 = 10.77$, $p < 0.01$, but the practical effect was small (Cramer's V = 0.13). Students of STEM Academy teachers performed at the same rates as comparison students at Meets+ and at higher rates than comparison students at Masters, but these differences were not statistically significant.

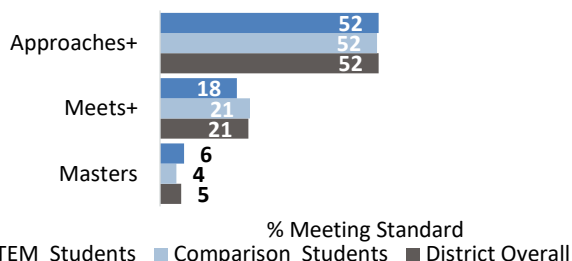
Figure 4: Spring 2018 Science 8 STAAR Results



Source: Spring 2018 STAAR data files dated September 5, 2018.
Note: *Indicates statistically significant difference, $p < 0.01$. STEM Academy students (N = 312), comparison students (N = 312), and district students overall (N = 5,521).

Students of STEM Academy teachers in Sheltered Science 8 performed at the same rates as comparison students at the Approaches+ standard, but met the Meets+ standard at a lower rate than the comparison group (Figure 5). A higher percentage of STEM Academy students met the Masters standard. None of these differences were statistically significant.

Figure 5: Spring 2018 Sheltered Science 8 Pre-AP STAAR Results



Source: Spring 2018 STAAR data files dated September 5, 2018.
Note: STEM Academy students (N = 229), comparison students (N = 229), and district students overall (N = 1,385).

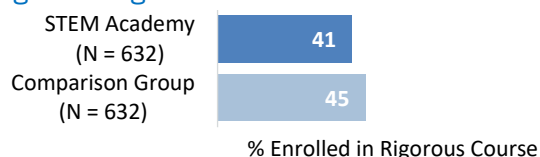
High School Rigorous Course Enrollment

The evaluator used PSM to create a matched comparison group of students who were not taught by cohort one STEM Academy participants. Student attendance for 2016-17 and 2017-18, number of years identified as limited-English proficient, socio-economic status, special education status, talented and gifted participation, and 2017 STAAR performance on the reading and mathematics subtests were included as covariates during the PSM process. The evaluator used *chi-square* analyses (statistical significance) and calculated Cramer's V (practical significance) to compare the percentages of former STEM Academy participant students and comparison students who, in grade nine (the next school year: 2018-19), enrolled in pre-Advanced Placement, Advanced Placement, or dual credit mathematics or science courses.

To examine longitudinal trends, the evaluator also used *chi-square* analyses and calculated Cramer's V to compare the rates of students of cohort one STEM Academy participants who enrolled in rigorous courses in grade nine in fall 2016, fall 2017, and fall 2018.

Of the 632 former students of STEM Academy teachers in grade nine matched with a comparison group, 41 percent enrolled in rigorous science or mathematics courses (Figure 6). The rate was lower for former students of STEM Academy teachers than for matched-comparison students, but the difference was not statistically significant.

Figure 6: 2018-19 Grade Nine Enrollment of STEM Academy Students and Comparison Students in Rigorous High School Math or Science Courses

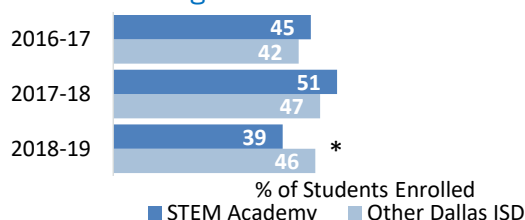


Source: District course files dated October 22, 2018.

Note: Rigorous courses were defined as Advanced Placement, Pre-Advanced Placement, and Dual Credit courses. Data include only matched students.

After each of the two school years before the STEM Academy, former students of STEM Academy teachers enrolled in rigorous high school mathematics or science courses at higher rates than other Dallas ISD students (Figure 7). Following the program year, former students of STEM Academy teachers enrolled in rigorous courses for the 2018-19 school year at a significantly lower rate than other district students, $\chi^2 = 33.33$, $p < 0.01$, but the practical effect was small (Cramer's $V = 0.06$).

Figure 7: 2016-17, 2017-18, and 2018-19 Grade Nine STEM Academy and Other District Student Enrollment in Rigorous Math or Science Courses



Source: District course files dated October 31, 2016; October 30, 2017; and October 22, 2018.

Note: Rigorous courses were defined as Advanced Placement, Pre-Advanced Placement, and Dual Credit courses. * = statistically significant difference. 2018-19 was the first school year that former students of academy teachers entered grade nine. Data include all students.

Professional Growth

The evaluator used descriptive statistics to compare the Teacher Excellence Initiative (TEI)⁵ evaluation ratings of STEM Academy participants and other district science teachers for the program year (2017-18) and pre-program years. Of the 12 STEM Academy teachers who received ratings in both 2016-17 and 2017-18, two decreased, eight remained the same, and two increased. Over 66 percent of STEM Academy teachers were rated Proficient I or higher each school year (Table 4). Generally, greater percentages of STEM academy teachers than other district science teachers earned Proficient I or higher evaluation ratings. These results should be viewed with caution, however, because of large sample size differences and potential bias introduced by teachers opting into the STEM Academy.

Table 4: 2015-16, 2016-17, and 2017-18 Percentages of Science Teachers Receiving Proficient I or Above TEI Evaluation Rating

	STEM Academy (N = 9)	Other Science Teachers (N = 115)
2015-16	66.7	60.9
2016-17	77.8	64.3
2017-18	77.8	67.8

Source: District TEI data files received October 30, 2018.

Note: The overall TEI target distribution rated approximately 60 percent of teachers as Proficient I or higher each year. Teachers shown received TEI evaluation ratings all three years.

Recommendations

- **Continue to examine the academic performance of English Learners (ELs).** While not statistically significant, sheltered grade seven students of program teachers outperformed comparison students on fall and spring ACPs. Sheltered grade eight students of participating teachers outperformed comparison students on the fall ACP and met the Approaches+ and Masters STAAR standards at higher rates than comparison students. These findings may indicate a program benefit for students in sheltered classrooms.
- **Analyze trends in former students enrolling in advanced middle school science courses.** The STEM Academy aimed to promote student enrollment in rigorous STEM classes. Because cohort two included grade six and seven teachers, future analyses also should consider rigorous course enrollment at the upper middle school level.
- **Carefully examine second-year outcomes for cumulative results.** Although few positive student outcomes were evident, a small number of teachers comprised cohort one, and one year may not be long enough for program results to manifest. Examining outcomes over time will provide more insight about the mid- to long-term program impact.

Reference

Chawla, N. (2017). 2016-17 Student Experience Survey. Dallas, TX: Dallas Independent School District.

An electronic version of this report can be found at www.dallasisd.org/Page/888. For more information, please contact Program Evaluation at evaluation@dallasisd.org.

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⁵ For more information, see <http://tei.dallasisd.org>.