

EXECUTIVE SUMMARY

The Dallas Independent School District (ISD) partnered with the Dallas Arboretum Botanical Society (DABS) during the 2018-19 and 2019-20 school years to deliver science instruction through the Jonesville Pathway to Science Education (JPSE) program at nine elementary schools in the Bryan Adams feeder pattern (the feeder pattern nearest the arboretum) and one elementary school in the Woodrow Wilson feeder pattern.¹ Like the previous year, the Arboretum intended to deliver four lessons and a field trip to the Rory Meyers Children's Adventure Garden (CG) to every grade three, four, and five student at participating campuses.² However, in 2019-20, the number of lessons and field trip opportunities was limited because of the Dallas ISD transition to at-home learning following Spring Break in response to the COVID-19 pandemic.³

Each lesson lasted approximately 50 minutes and was conducted by an educator from the Arboretum working with the classroom teacher. Each lesson topic and the relevant Texas Essential Knowledge and Skills (TEKS)⁴ are presented in Table 1.

Table 1: 2019-20 JPSE Lesson Topics and TEKS by Grade Level

Lesson	Grade 3	Grade 4	Grade 5
One	Traveling Seeds 3.5(A)	Matter Over Time 4.5(A)	Landform Formation 5.7(B)
Two	Energy in the Garden 3.6(A)	Pickle Powered 4.6(A)	Exploring Day and Night 5.8(C)
Three	Rapid Changes 3.7(B)	Ecosystems in Action 4.9(B)	Eco Flow 5.9(A)
Four	Models: Sun, Earth, & Moon 3.8(C)	No Lessons Delivered	No Lessons Delivered

Source: DABS on 04/07/20.

Note: The Arboretum did not deliver any lessons after 03/12/20 because of the district transition to at-home learning in response to the COVID-19 pandemic.

The JPSE was initially funded for the 2018-19 school year through a \$100,000 grant from the Jonesville Foundation and supplemented with a \$50,000 grant from the Sammons Corporation. The program funding for the 2019-20 school year consisted of the same amounts and sources.

PURPOSE OF THE EVALUATION

The purpose of this evaluation was to report the characteristics of students at campuses served by the JPSE program, report student participation, and examine the science-related academic achievements of students who received JPSE instruction.

EVALUATION QUESTIONS/OUTCOMES

What were the characteristics of students at participating campuses and at other district campuses?

Methodology

The evaluator summarized data from the district Public Education Information Data Management System (PEIMS) student demographic file (dated October 28, 2019) for grade-three, grade-four, and grade-five students at participating campuses and at other district elementary school campuses.

Results

Students at JPSE campuses were more likely to be Hispanic and less likely to be African American than other Dallas ISD students in the same grades (Table 2). A smaller proportion of students at JPSE campuses were economically disadvantaged (81.2%) than other district students (86.5%). The percentages of JPSE students with other characteristics were similar to the percentages for other district students.

¹ Participating schools included Bayles Elementary School, Casa View Elementary School, Charles A. Gill Elementary School, Victor H. Hexter Elementary School, Edwin J. Kiest Elementary School, Mount Auburn STEAM Academy, Martha Turner Reilly Elementary School, Reinhardt Elementary School, Alex Sanger Preparatory School, and Larry G. Smith Elementary School.

² All students received four free passes to visit the garden with family.

³ At-home learning began March 23, 2020 and continued through the remainder of the spring semester.

⁴ Descriptions of all science TEKS can be found at <https://tea.texas.gov/curriculum/teks/>.

Table 2: 2019-20 Characteristics of Students at JPSE Campuses and Other District Students

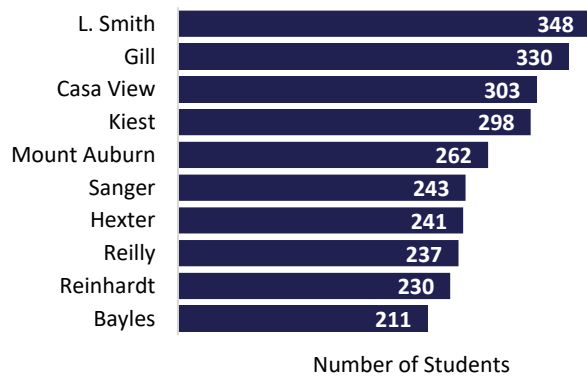
	JPSE Students (N = 2,613)		Other District Students (N = 31,860)	
	n	%	N	%
Race/Ethnicity				
Asian	21	0.8	306	1.0
African American	335	12.8	6,939	21.8
Hispanic/Latino	2,012	77.0	22,368	70.2
Native American	4	0.2	56	0.2
Hawaiian/PI	0	0.0	10	<0.1
Two or More Races	47	1.8	593	1.9
White	194	7.4	1,588	5.0
Sex				
Female	1,246	47.7	15,565	48.9
Male	1,367	52.3	16,295	51.1
Special Student Populations				
Eco Dis	2,122	81.2	27,564	86.5
EL	1,376	52.7	16,394	51.5
TAG	412	15.8	6,018	18.9
SPED	270	10.3	3,766	11.8

Source: District PEIMS demographic file dated 10/28/19.

Note: PI = Pacific Islander. Eco Dis = economically disadvantaged. EL = English learner. TAG = talented and gifted. SPED = special education. Totals may not sum to 100 percent because of rounding.

Students could enroll at JPSE campuses and begin participating in JPSE lessons at any time during the school year. Overall, 2,703 students participated in at least one JPSE lesson or field trip. Participation ranged from 211 students at Bayles Elementary to 348 students at Larry Smith Elementary (Figure 1).

Figure 1: 2019-20 Number of Students Receiving JPSE Instruction by Campus (N = 2,703)



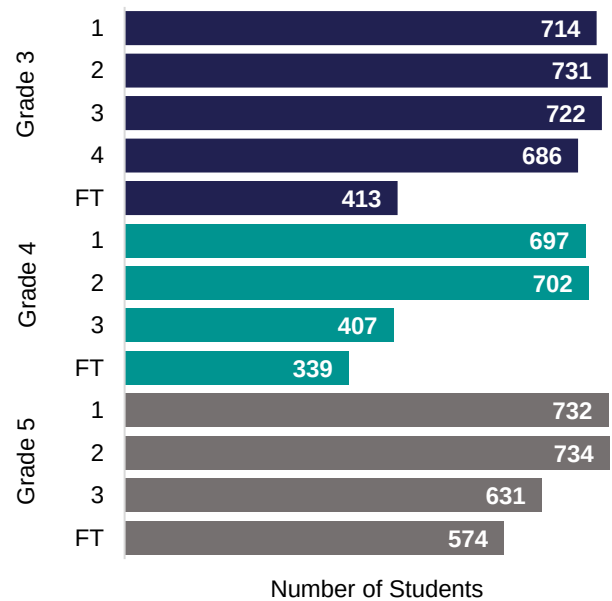
Source: DABS on 04/01/20.

Note: Includes students with valid identification numbers who participated in at least one lesson or field trip.

The number of students who participated in each JPSE lesson or attended a field trip by grade level is presented in Figure 2 and ranged from 339 students in the grade four field trip to 734 students in lesson two for grade five (Exploring Day and Night). As a result of district transition to at-home learning because of the COVID-19 pandemic, not all grades received all planned lessons or the field trip. The

Arboretum delivered all four lessons to all grade three classes; four of the ten campuses did not receive grade three field trips. Students in grades four and five received at least two lessons, but some students received more. At grade four, seven campuses received three lessons and six campuses took field trips to the CG. At grade five, nine campuses received three lessons and seven campuses took field trips. No grade-four or grade-five students received all four lessons.

Figure 2: 2019-20 Number of Students Receiving JPSE Instruction by Grade Level (N = 2,703)



Source: DABS on 04/01/20.

Note: Includes students with valid student identification numbers who participated in at least one lesson or field trip. FT = field trip.

Over 27 percent of grade-three students ($n = 901$) participated in all five JPSE instructional events (four lessons and a field trip; Table 3). Some campuses received three lessons for grade-four and grade-five students; few received all four lessons.

Table 3: 2019-20 Cumulative Grade-Level JPSE Instruction Received by Students

Cumulative Instruction*	Grade 3		Grade 4		Grade 5	
	n	%	N	%	n	%
One	86	9.5	148	17.4	139	14.6
Two	69	7.7	264	31.1	160	16.8
Three	189	21.0	279	32.9	404	42.4
Four	310	34.4	158	18.6	250	26.2
Five	247	27.4	0	0.0	0	0.0
Total	901	100.0	849	100.0	953	100.0

Source: DABS on 04/01/20.

Note: Includes students with valid identification numbers. *Cumulative instruction includes JPSE classroom lessons and CG field trip attendance. Thus, students could have attended up to five events (four lessons and one field trip). Some opportunities became unavailable due to the COVID-19 pandemic and the district's transition to at-home learning after Spring Break.

What were the academic achievement outcomes of participating students?

Methodology

Pre- and Post-Lesson Assessments

Arboretum staff members developed a pre- and post-lesson assessment for each lesson. Each assessment consisted of three multiple choice questions, was administered online or on paper, and was available in English and Spanish. The questions and answer choices were re-ordered on the post-test. Because of the district's transition to at-home learning after Spring Break in response to COVID-19, classes did not receive all four lessons across all grade levels as originally planned. Grade four and grade five classes received two lessons at all campuses and could have answered six pre-lesson and post-lesson assessment questions. Grade three classes received all four lessons and could have answered 12 pre-lesson assessment questions and 12 post-lesson assessment questions. For students who completed all questions for each available pre- and post-test, the evaluator used a repeated-measures *t* test (statistical significance) and calculated Cohen's *d* (practical significance) at each grade level to compare the average number of correct answers on the pre-lesson assessments to the average number of correct answers on the post-lesson assessments.

Formal Science Assessments

The evaluator used propensity score matching (PSM) to match grade-five students who participated in the first JPSE lesson during fall 2019 with a comparison group of district students who did not receive JPSE instruction.⁵ The evaluator included the following covariates to determine comparison students: 2018-19 attendance, spring 2019 *State of Texas Assessments of Academic Readiness* (STAAR) performance on the reading and mathematics subtests, 2019-20 attendance for semester one, race, sex, English learner status, socio-economic status, special education status, talented and gifted participation, and whether retained the previous school year. The evaluator then used *chi-square* analyses (statistical significance) and Cramer's *V* (practical significance) to compare passing rates for students who received JPSE instruction to comparison students on the fall 2019 Science ACP. The evaluator also calculated the likelihood that JPSE students would answer all items addressing the grade five TEKS standard on landform formation correctly compared to matched students.⁶

The evaluator intended to include comparisons of the rates of JPSE students and comparison group students who met

the Approaches Grade Level or Above, Meets Grade Level or Above, and Masters Grade Level performance standards on the spring 2020 STAAR science subtest. However, the state canceled spring 2020 STAAR in response to the COVID-19 pandemic.⁷

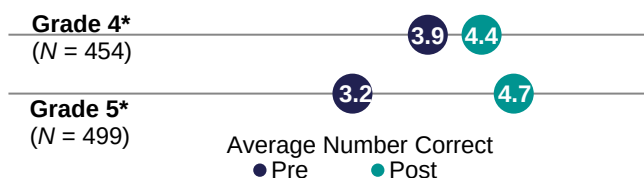
Results

Pre- and Post-Lesson Assessments

Grade-three students at all campuses received four JPSE lessons. These students averaged 1.9 more correct answers on all 12 post-test questions than on pre-test questions (7.7 vs 9.6), $t(260) = 16.11, p < .01$. This gain was practically significant ($d = 1.00$).⁸ Grade three students answered, on average, 1.7 more correct answers on post-tests than on pre-tests during the previous school year (2018-19).

As shown in Figure 3, students in grades four and five answered significantly more post-test than pre-test questions correctly. Grade-five student performance increased the most strongly of the grade levels by answering an average of 1.5 more questions correctly on post-tests than on pre-tests through two lessons, $t(498) = 25.08, p < .01$. Grade four average student gain from pre- to post-test was 0.5 more correct answers, $t(453) = 6.92, p < .01$. These gains were practically significant at both grade levels though weaker at grade four (grade four: $d = 0.32$; grade five: $d = 1.12$). JPSE students showed positive gains during the 2018-19 school year through four lessons (Mickelson, 2019).

Figure 3: 2019-20 Pre- and Post-Lesson Assessment Results for JPSE Students through Two Lessons



Source: DABS on 04/01/20.

Note: Includes students who completed all six pre- and six post-lesson assessment. * = Indicates statistically significant difference, $p < .01$.

Formal Science Assessments

During the 2018-19 school year, significantly higher percentages of grade-five JPSE students than matched-comparison students passed the fall 2019 science ACP, met the Approaches Grade Level or Above standard on STAAR science subtest, and met the Meets Grade Level or Above standard on the STAAR science subtest

⁵ The first lesson was delivered to grade-five students at all campuses before the fall 2019 *Assessment of Course Performance* (ACP) administration. Other lessons were to be delivered during the spring 2020 semester. Students at five campuses also attended a field trip to the CG before the fall 2019 ACP administration.

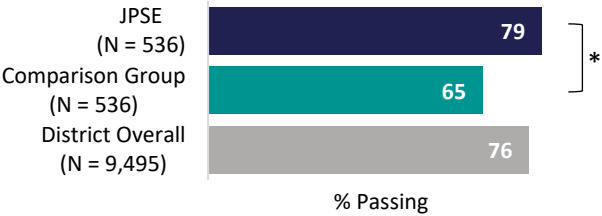
⁶ Students were expected to recognize how landforms such as deltas, canyons, and sand dunes are the result of changes to the Earth's surface by wind, water, or ice (Texas Education Agency, 2019).

⁷ <https://tea.texas.gov/about-tea/news-and-multimedia/correspondence/taa-letters/cancellation-of-staar-testing-for-the-remainder-of-the-school-year>

⁸ Cohen's *d* values of .20, .50, and .80 are considered small, medium, and large, respectively (Cohen, 1988).

(Mickelson, 2019). While the STAAR was not administered during the 2019-20 school year, the results for JPSE students continued to be positive on the fall science ACP. JPSE grade-five students passed the fall science ACP at a significantly higher rate than matched-comparison students, $\chi^2 = 23.29, p < .01$ (Figure 4). The practical effect was small (Cramer's $V = .15$).⁹ Prior to taking the ACP, JPSE students received a lesson on landform formation. JPSE students were 1.8 times more likely than comparison students to correctly answer all ACP items that addressed the TEKS standards on landform formation ($\chi^2 = 15.08, p < .01$). The practical effect was small (Cramer's $V = .12$).

Figure 4: 2019 Fall Grade Five Science ACP Results



Source: DABS on 04/01/20.

Note: Includes students who participated in the first lesson.

* = Indicates statistically significant difference, $p < .01$. District rates are shown for informational purposes only.

RECOMMENDATIONS

Continue to provide science lessons and field trips to Dallas ISD students. Grade-five students who received JPSE instruction significantly outperformed matched-comparison students on the fall 2018 and fall 2019 science ACPs. Additionally, JPSE students were 1.8 times more likely than comparison students to correctly answer all fall 2019 assessment items related to landform formation.

Consider recording pre- and post-lesson assessment and field trip participation data in one spreadsheet. Because data from each lesson assessment was included on separate spreadsheets, assessing cumulative instruction and field trip participation meant matching up to five spreadsheets (four post-lesson assessments and field trip participation). Any incorrect or missing student data on a spreadsheet meant a student would not be credited with participation. This led to undercounting student participation in the JPSE program.

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- Mickelson, N. (2019). 2018-19 Evaluation of the Jonesville Pathway to Science Education. Dallas, TX. Dallas Independent School District.
- Texas Education Agency (2019). Texas Essential Knowledge and Skills for Grade 5. Retrieved April 2, 2020, from <https://tea.texas.gov/curriculum/teks/>.

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⁹ Cramer's V values of .10, .30, and .50 are considered small, medium, and large, respectively (Cohen, 1988).