PREKINDERGARTEN PROGRAM, 2011–2012
ISSUE 2: TUITION-SUPPORTED PROGRAM

Department of Research and Evaluation
AUSTIN INDEPENDENT SCHOOL DISTRICT

Research Brief

Background. In 2011–2012, Austin Independent School District (AISD) provided a tuition-supported prekindergarten (pre-K) program to 4-year-old students who were not eligible to enroll in the state-mandated program to help provide revenue to lower the cost of providing full-day pre-K district wide. The program was offered at 22 elementary schools that had the capacity to enroll more students than usually enroll through the state-mandated pre-K program. Tuition pre-K students enrolled at 19 elementary campuses.[1] The purpose of this report is to (a) evaluate tuition-supported pre-K students' achievement on the Peabody Picture Vocabulary Test-IV (PPVT) during the 2011–2012 school year, (b) examine performance of mandatory pre-K students in tuition-supported classrooms, and (c) provide a fiscal summary for the tuition-supported pre-K program.

PPVT and pre-literacy skills. The PPVT measures knowledge of receptive vocabulary in English (Dunn & Dunn, 2007). Receptive (i.e., hearing) vocabulary, a domain of language development, is an acquired knowledge that has been linked to reading comprehension (Anderson & Freebody, 1981; Baumann, Kame'enui, & Ash, 2003).

Pre- and post-assessments, using a stratified cluster design, were administered by the Department of Research and Evaluation (DRE) staff to a random sample of mandatory pre-K students at 40 selected elementary campuses to test English-proficient students (n = 20) and bilingual Spanish students (n = 20). A total of 98 tuition-supported pre-K students were tested at the sampled schools (n = 14) in both semesters of 2011–2012, representing 74% of all tuition-supported students enrolled in Fall 2012 (N = 133).[2]

Growth on PPVT. As shown in Figure 1a, tuition-supported pre-K students had an average 69.5 normal curve equivalent (NCE, see Appendix B) score in Fall 2011, a 1.7 standard deviation above mandatory pre-K students' average Fall NCE score (mean = 35.0, SD = 20.8; Brunner, in press). The median equivalent age (5 years, 11 months) for tuition-supported students in Fall 2011 was 16 months above their median actual age (4 years, 7 months).

Program description. AISD provides a full-day tuition-supported pre-K program for children who are 4-years-old on or before September 1st of the current school year and who are not eligible to attend the state mandated pre-K program (TEC §29.153, [b]; see Appendix A).

The AISD pre-K program provides certified teachers in a child-centered classroom that focuses on developing children academically, physically, and socially. The district's pre-K curriculum is closely tied to the guidelines issued by the state to prepare students for success in kindergarten.

Annual tuition per student in 2011–2012 was $4,656. Tuition students attending a school outside their attendance area were granted a 1-year transfer.

[1] Becker, Baldwin, Boone, Brentwood, Casis, Davis, Dawson, Govalle, Gullett, Hill, Kocurek, Mills, Palm, Perez, Ridgetop, Summitt, Sunset Valley, Travis Heights, and Zilker (Although Gullett did not offer pre-K in 2010–2011, it enrolled both tuition-supported and mandatory pre-K students in 2011–2012.)
[2] Based on AISD's Public Education Information Management System (PEIMS) Fall 2011 submission

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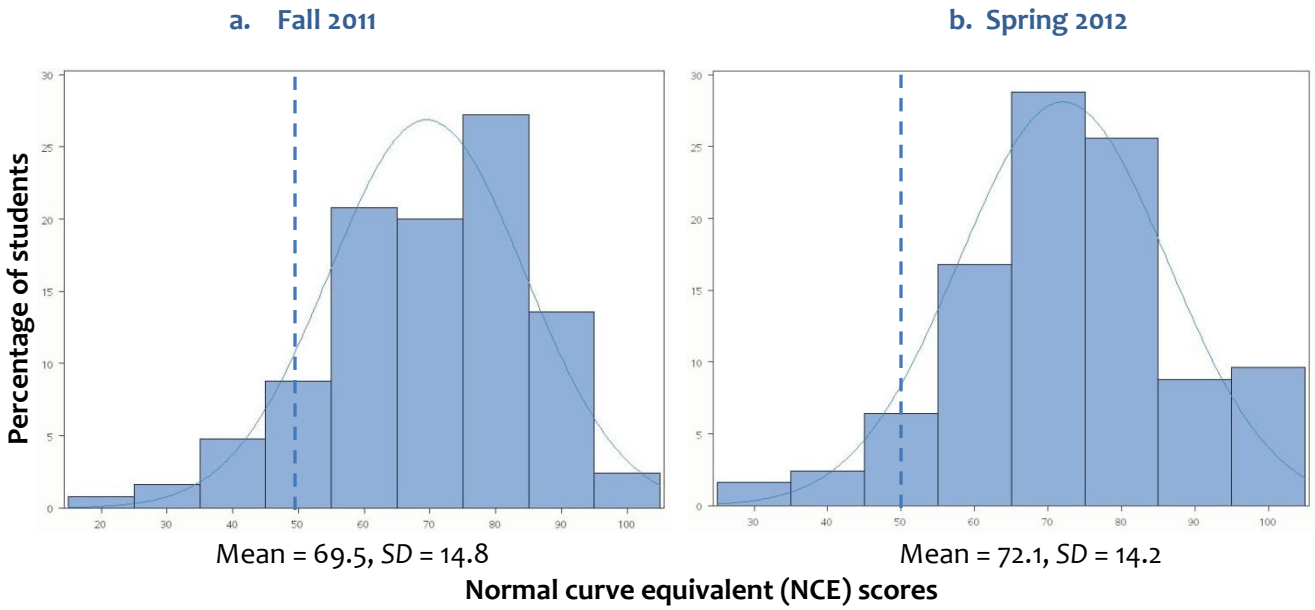
Figure 1. Tuition-Supported Prekindergarten (Pre-K) Students' Peabody Picture Vocabulary Test (PPVT- IV) Performance Scores, by Semester, 2011–2012



Source. AISD student records, Department of Research and Evaluation
Note. Results were based on a weighted sample to reflect the pre-K Fall enrollment. The original sample was *n* = 98. The dotted line represents the national mean NCE score.

In Spring 2012, tuition-supported pre-K students scored an average 72.1 NCE (Figure 1b). Although tuition-supported students scored above the national average on the PPVT in the Fall, they did demonstrate growth at a rate that could be considered meaningful (*d* = .18).[3] The median age-equivalent score for tuition-supported students in Spring 2012 was 6 years, 6 months (i.e., still 16 months above the actual median age for tuition-supported students). This implies tuition-supported pre-K students, on average, maintained expected growth although they started with high performance in the academic year.

Mandatory pre-K students' performance in tuition-supported classrooms. Using propensity score analysis (PSA),[4] DRE staff matched mandatory pre-K students who were enrolled in a classroom with three or more tuition-supported students (i.e., tuition group) to similar mandatory pre-K students who were enrolled in a classroom with no tuition-supported students (i.e., control group) to determine any difference in performance on the PPVT or Test de Vocabularío en Imagenes Peabody (TVIP).

Among the 474 sampled mandatory pre-K students tested with the PPVT or TVIP in 2011–2012, 24 English-speaking, mandatory pre-K students were matched to a control group of 24 similar pre-K students, based on primary language spoken at home; race/ethnicity (i.e., Hispanic, African-American, and White); gender; special education services; and Fall 2011 PPVT standard scale scores.

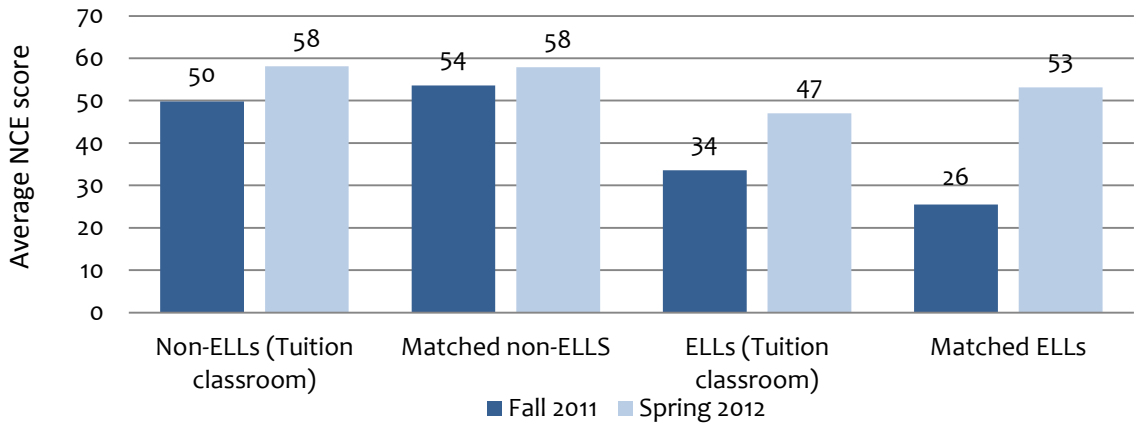
[3] *d* is the Cohen's *d* statistic. See Appendix C for explanation.
[4] See Appendix D for explanation.

Twenty-one Spanish-speaking English language learners (ELLs) in a tuition classroom were matched to a control group of 21 similar Spanish ELLs, based on ELL status, primary language spoken at home, immigrant status, eligibility for free or reduced-priced lunch, gender, and Fall 2011 TVIP standard scale scores.

DRE staff did not find any significant difference[5] in performance on the PPVT between mandatory English-speaking pre-K students who shared a classroom with three or more tuition-supported students and matched mandatory pre-K students. The mean Spring 2012 NCE score for English-speaking pre-K students enrolled in a tuition-supported classroom was 58.1, and it was 57.9 for matched students (Figure 2).[6]

Overall, tuition-supported pre-K students demonstrated growth at a rate that could be considered meaningful for students scoring above the national average on the PPVT.

Figure 2. Mandatory Prekindergarten Students' Peabody Picture Vocabulary Test (PPVT- IV) and Test de Vocabularío en Imagenes Peabody (TVIP) Normal Curve Equivalent (NCE) Scores, by Test Period, English Language Learner (ELL) Status, and Enrollment in Tuition-Supported Classroom, 2011–2012



Source. AISD student records, Department of Research and Evaluation

Note. Non-ELLs (tuition classroom) = 24; matched non-ELLs = 24; ELLs (tuition classroom) = 21; matched ELLs = 21.

[5] Anova t-tests, $p < .05$.

[6] The Fall 2011 scores were statistically similar. The Fall PPVT/TVIP standard scores were used to calculate the propensity scores used in matching students (see Appendix D).

Mandatory pre-K ELLs' performance, cont. On the other hand, pre-K ELLs who were enrolled in a classroom with tuition-supported students did not show as much growth in receptive vocabulary in their native language (i.e., Spanish) as did matched pre-K ELLs. On average, Spanish-speaking pre-K ELLs enrolled in a tuition-supported classroom scored 47.0 NCEs in Spring 2012, while matched ELLs scored an average of 53.1 NCEs (Figure 2).[7]

Because classrooms that had at least three tuition-supported pre-K students and ELLs were also two-way dual language (DL) classrooms, it is unclear whether the difference in receptive vocabulary growth among Spanish ELLs was related to the tuition program; the DL program; or another factor related to both (e.g., classroom ELL composition). The performance of pre-K ELLs in the tuition-supported, two-way DL program was not significantly different than that of similar pre-K ELLs in English receptive vocabulary.[8]

Pre-K ELLs who were enrolled in a classroom with at least 3 tuition-supported students did not show as much growth on the TVIP as did matched pre-K ELLs.

DRE staff did not have access to other language assessment data (e.g., *pre*LAS) to examine the effect of the DL program for pre-K ELLs. DRE staff recommends collecting further assessment data in the future from schools with both a two-way DL program and tuition-supported pre-K for evaluation.

Fiscal consideration. In its pilot year (i.e., 2011–2012), the tuition-supported pre-K program brought in a total of $575,862 in tuition and fees. The program's expenditures totaled $77,178, 93% of which went toward teachers' professional salaries and benefits. The tuition-supported pre-K program brought in excess revenue of $498,685, which is equivalent to 10.4 full-time employees' (FTE) salaries and benefits.[9] Five of the 19 elementary campuses accounted for more than 50% of the tuition-supported pre-K program revenue (i.e., Becker, 14%; Baldwin, 13%; Gullett, 11%; Casis, 10%; and Mills, 7%).

[7] Generalized linear modeling (GLM) also showed pre-K ELLs in tuition-supported classrooms scored 12 NCEs lower on the TVIP, on average, than did pre-K ELLs who were not enrolled in a tuition-supported classroom.

[8] When DRE staff used a GLM with standard scale (SS) scores, they found nearly a 9-point difference in SS scores between pre-K ELLs in the tuition-supported, two-way DL program and other similar ELLs. The mean Spring 2012 SS score for pre-K ELLs in the tuition-supported, two-way DL program was 82, and the mean SS score for the matched pre-K ELLs was 73. In terms of age-equivalency scores, pre-K ELLs in the tuition-supported, two-way DL program had an age-equivalent performance in English similar to the average native-English speaker at 2 years, 11 months of age, while the matched pre-K ELL had that age-equivalent performance in English at 2 years, 9 months of age.

[9] The median pre-K teacher salary for a FTE with benefits for the 2011–2012 year was estimated by AISD Human Resources as $47,752. (A. Campbell, personal communication, June 8, 2012)

Conclusion. In the pilot year, the tuition-supported pre-K program helped the district bring in excess revenue to slightly offset the cost of the full-day pre-K program. As a whole, tuition-supported pre-K cannot completely offset the cost of full-day pre-K district wide. To provide the extra half day of pre-K programming for a school, minimum enrollment per classroom would need to average at least five tuition-supported pre-K students for every 10 to 15 mandatory students enrolled.[10] However, the tuition-supported pre-K program did maximize allocations of fixed cost (i.e., teachers, facilities, and other fixed assets or resources served more students) and provided an additional source of revenue for the district (i.e., 7% of the estimated $7 million required to pay for full-day pre-K).

The data suggest tuition-supported students benefited from AISD's pre-K program academically. Although English-speaking students who qualified for AISD's mandatory pre-K program demonstrated greater than expected growth on the PPVT, mandatory students in integrated tuition-supported classrooms did not show more growth in receptive vocabulary than did other similar English-speaking students who were not in an integrated classroom. This finding implies the tuition-supported pre-K program may increase program efficiency of the mandatory pre-K program (i.e., lower cost per student for same performance outcome, see Appendix E). The results were unclear in determining the benefit or harm for Spanish-speaking pre-K ELLs who share a classroom with at least three tuition-supported students. Further evaluation is suggested to monitor pre-K classrooms at campuses with both the tuition program and DL program to determine the programs' effect.

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[10] Estimate is calculated by dividing half the median pre-K teacher's salary by the tuition received per student. The optimal class size was assumed to be between 15 and 20 students.

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About this report. This report is part of a series outlined in the district's pre-K evaluation plan for 2011–2012. Funding for this report was provided by Title I funds.

Appendix

Appendix A. AISD provides a full-day pre-K program for all children who are 4-years-old on or before September 1st of the current school year and who meet one of the following eligibility criteria: qualify for free or reduced-price lunch program, are ELL, are homeless, are the child of an active-duty military member or a military member who was injured or killed in service, or reside or have ever resided in foster care (TEC §29.153, [b]).

Appendix B. The standard scores for the PPVT and TVIP are based on age norms from samples of native speakers in English and Spanish, respectively. The tests are best interpreted in the native language of the student.

To make group comparisons and estimates of students' gains and losses, standardized scale scores were converted into NCE scores. NCE scores have a mean of 50 and a standard deviation of 21.06 points (i.e., the national normal distribution of scores). For the national samples on which the scores were based, the majority (68%) of students scored between 29 and 71 NCEs.

Interpretation of Normal Curve Equivalent (NCE) Scores

Range of performance	NCE scores	National percentile
Very low	1–24	1–11
Low	25–35	12–25
Low average	36–44	26–39
Average	44–55	40–60
High average	56–64	61–74
High	65–75	75–88
Very high	76–99	88–99

When interpreting NCE average gain (or loss), note that a zero shows that a student's growth did not differ from the national average expected growth; a zero does not indicate "no growth." Because these tests are age normed, a student must have a raw score about 8 to 10 points higher in the spring to receive the same standard score as in the fall.

Appendix C. Effect size (i.e., Cohen's *d*) is a measure of difference in performance, in this case, between pre- and post-test. In education, $d \geq .18$ denotes meaningful growth. Effect size is calculated by the following: Cohen's $d = (\text{Mean}_1 - \text{Mean}_2) / \text{Pooled variance}$.

Appendix D. PSA is a quasi-experimental design that tries to control for preexisting differences (i.e.,

selection bias) between a treatment group (i.e., program effect) and a control group (i.e., no treatment). A propensity score (p-score) is the conditional probability for the unit's assignment into a group or program, based on a set of conditions (Rosenbaum & Rubin, 1983). Due to the small sample size of tuition-supported students, PSA was used as a statistical adjustment so analysis of variance (ANOVA) tests could be used to compare the control and treatment groups. When sample sizes are not approximately equal (i.e., unbalanced) then ANOVA model assumptions may be violated (i.e., unequal response variances). PSA was able to provide equal response variance through similarly matched groups.

DRE staff used logistic regression to create p-scores (Brunner, 2011). Caliper matching (i.e., within .5 standard deviation) without replacement (Cochran & Rubin, 1973) was used to select a random control group of similar students. DRE staff used Rubin's (2001) benchmarks to test the adequacy of the p-scores. The p-scores were adequate.

1. The difference in the group means of the logistic propensity scores should be less than half a standard deviation.
    - Non-ELLs (before PSA: 1.05 SD; after PSA: 0.03 SD)
    - ELLs (before PSA: 1.04 SD; after PSA: 0.02 SD)
2. The ratio of the group variances of the logit propensity scores should be close to one.
    - Non-ELLs (before PSA: .64; after PSA: .98)
    - ELLs (before PSA: 1.44; after PSA: .99)
3. The ratio of the variance of the residuals of the covariates should be close to one (between 4/5 and 5/4).
    - Non-ELLs (before PSA: .74; after PSA: 1.11)
    - ELLs (before PSA: 3.84; after PSA: 1.19)

The majority of pre-K students in the mandatory program qualified because they were eligible for free or reduced-priced lunch, were ELL, or both. Eligibility for free or reduced-priced lunch could not be used as a control for non-ELLs in the mandatory pre-K program because nearly all non-ELLs were eligible for pre-K based on this criterion.

Appendix E. Program's cost efficiency is calculated by: performance outcome above status quo (or alternative program) divided by cost of the program. The tuition-supported pre-K program did not change the performance outcome for mandatory English-speaking pre-K students (i.e., the numerator). However, the additional funds provided by the tuition-supported pre-K program decreased the overall cost of the mandatory program through efficiency in fixed costs (i.e., decrease in the denominator). In turn, this would result in greater cost-efficiency overall for the mandatory pre-K program.

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