PREKINDERGARTEN PROGRAM COST ALLOCATION ANALYSIS

Department of Research and Evaluation
AUSTIN INDEPENDENT SCHOOL DISTRICT

Research Brief

Background. Department of Research and Evaluation (DRE) staff conducted a cost allocation study for Austin Independent School District's (AISD) full-day prekindergarten (pre-K) program, based on a reduction in estimated future special education services and grade retention. The methods replicated the Voices for Utah Children (VUC, 2011) study that demonstrated a sustainable financing model for high-quality pre-K programs that involved diverting funds saved through reduced special education services and reinvesting in pre-K expansion. Although the financing model did not apply to AISD (i.e., because many elementary schools in the district already participate in full-day pre-K), the method did provide a way to estimate costs associated with the increased number of students who may require special education placement.

Numerous studies have found that pre-K programs reduced special education placements and grade-level retention (Barnett & Masse, 2007; Heckman & Masterov, 2007; Temple & Reynolds, 2007; Zhao & Modarresi, 2010). The premise of this study was that if the current full-day pre-K program were scaled back, costs associated with an increased number of students placed in special education or increased grade-level retention would be realized. The analyses provided did not address the availability of funding for required services to support student needs; the source of funding (i.e., local, state, and federal); and how funds were allocated for various programs.

Allocation optimization. Cost comparisons can be made through a resource allocation optimization framework. Under the supposition that resources are optimized when more students can be served by the same resource, programs can be compared based on how many students can be served with the same amount of resources (i.e., in this case, money). Figure 1 shows a cost per student comparison for full-day pre-K, grade retention, and special education, based on 2010–2011 dollars.

AISD's full-day pre-K program has been shown to raise the district's pre-k student average receptive vocabulary scores by nearly one standard deviation (*SD*; Brunner, 2011a). From 2006–2007 through 2010–2011, an average of 21% of the incoming pre-K cohort scored 1.5 *SD* below the national norm in receptive

Key Findings

- *The cost associated with full-day pre-K per student was much lower than the costs associated with grade retention or special education services.*
- *Up to 480 more AISD students were estimated to require special education services with half-day pre-K than with full-day pre-K (based on 2010–2011 enrollment).*
- *Up to 115 more AISD students were estimated to be retained at grade level with half-day pre-K than with full-day pre-K (based on 2010–2011 enrollment).*
- *In 2010–2011, the average cost per student for AISD's pre-K program was less than the average cost for pre-K at the state and national level and for Head Start.*
- *One factor that lowers the cost of AISD full-day pre-K is the staff-to-student ratio, which was 1:18 in 2010–2011.*

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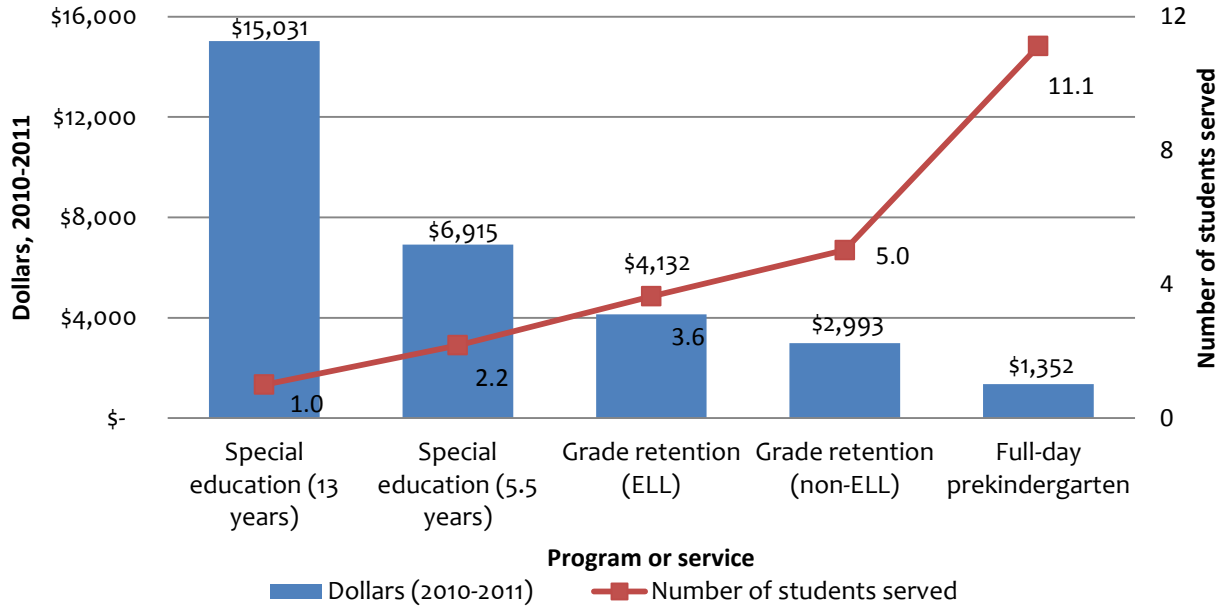
vocabulary (i.e., at or below the cut-off to qualify for special education services in AISD; see Appendix A). However, only 6% of AISD pre-K students eventually received special education services (i.e., 6% of students were expected to score 1.5 *SD* below the average), which indicates the effectiveness of the pre-K program in reducing the need for special education placement.

Also, students who attended full-day pre-K at AISD had lower grade retention rates than did students who attended kindergarten only in AISD but were assumed to have been eligible for pre-K (i.e., were English language learners [ELL] or qualified for free or reduced-priced lunches). DRE staff estimated 2.2% to 3.6% of pre-K students avoided grade retention (see Appendix B). In the present study, the cost associated with full-day pre-K per student was much lower than the costs associated with grade retention or special education services (Figure 1).

Figure 1. Allocation per Student and Number of Students Served, Compared With Highest Allocation, by Program or Services, in 2010–2011 Dollars



Sources. Texas Education Agency (TEA) Academic Excellence Indicator System (AEIS) report, 2010–2011; Brunner, 2011b

Note. Costs for programs were determined by cost per student for all funds (i.e., local, state, and federal). Grade retention assumes one year of retention only (see Appendix A). Net present value for future costs not yet incurred was discounted by 3%. Special education (5.5 years) is based on the average time spent in special education for a student who did exit the program. ELL is English language learner. Full-day prekindergarten is the additional cost for the program over the cost for the state-mandated half-day program. The costs presented are mutually exclusive, meaning the cost solely represents the program or service. A student may be subject to more than one service or program, in which case, the amounts would be summed.

Table 1 provides a low and high estimate of the number of students who would be placed in special education services and the number of students who would be retained at least one grade level if only half-day pre-K were offered in the district. The estimates were based on a 5-year program average for special education reduction and a 3-year program average for grade retention. Enrollment for 2010–2011 was used as a baseline to provide the overall projected numbers.

Based on 2010–2011 enrollment, an estimated 190 to 481 more AISD students would require special education services and 70 to 115 more students would be retained at least one grade level with a half-day pre-K program than with a full-day pre-K program. The Department of Special Education director recommended the high estimate for special education services (i.e., the 6th percentile). The conservative cut-score used for the high estimate was slightly below the 6th percentile, and thus may be an underestimation of students who would require special education services.

Table 1. Estimated Program and Service Costs, in 2010–2011 Dollars

Program	Baseline *n*	Estimated students served Low *n*	Estimated students served High *n*	Program or service cost in 2010–2011 dollars Low $	Program or service cost in 2010–2011 dollars High $
Full-day pre-K	5,176	5,176		$6,997,952	
Special ed. (5.5 years)	5,176	190	481	$1,313,850	$3,326,115
Special ed. (13 years)	5,176	190	481	$2,855,890	$7,229,911
Grade retention (ELL)	5,176	70	115	$289,240	$475,180
Grade retention (non-ELL)	5,176	70	115	$209,510	$344,195

Source. AISD student records, Figure 1

Note. Baseline is based on Fall 2010 enrollment. Program or service costs were calculated by multiplying estimated students served by program or service cost per student in Figure 1. Estimated students served assumes half-day pre-K programs for alternative programs to full-day pre-K. Pre-K is prekindergarten. Special ed. is special education. ELL is English language learner. See Appendix C.

Although the overall program cost for full-day pre-K exceeded the program alternatives considered for analysis, this was due to pre-K serving more students than the alternatives. The analysis did not evaluate program effectiveness; therefore, readers should not assume all program alternatives are equally effective (e.g., students' academic outcomes would be the same) or equally cost effective (i.e., the cost for the marginal effect would be less because the overall allocation would be lower). For example, grade retention has been associated with a greater likelihood of a student dropping out of school (Roderick, 1994), which has a direct impact on the student's future earnings.

Although the alternative programs or services only consider lower ability students, the benefits to all students served by full-day pre-K were not analyzed. For example, in 2010–2011, 75% of English-speaking pre-K students and 79% of Spanish-speaking pre-K students demonstrated growth beyond the national expected growth rate in receptive vocabulary (Brunner, 2011b). Also, this report does not address future cost at the personal level of the student. Other cost benefits directly linked to pre-K attendance (e.g., increased high school completion rates and higher rates of 4-year college attendance [Ludwig & Phillips, 2008; Temple & Reynolds, 2007]) could be realized but were not

included in these analyses. Another source for savings not yet considered in the literature may be related to the reduced need for Tier 2 response to intervention (RTI) in early grade levels by those who attend full-day pre-K.

Cost-per-student allocation for 2010–2011. AISD offered a full-day pre-K program to 5,614 pre-K students, supported through the use of local, state, and federal funds in the amount of $18.3 million (Brunner, 2011b). The overall cost per student for the 2010–2011 AISD pre-K program was $3,234, a $94 per-student decrease from the 2009–2010 year. This amount was less than spent statewide. For 2010–2011, the average overall cost per pre-K student enrolled in the state of Texas was $3,761 (for both half-day and full-day pre-K programs using state funds only), according to the National Institute for Early Education Research (NIEER; Barnett, Carolan, Fitzgerald, & Squires, 2011). Based on AISD's Fall 2010 enrollment, the estimated cost savings was $2.8 million (i.e., $527 per student). Based on last year's total AISD pre-K enrollment of 5,614 students, a nearly $3 million dollar saving compared with the cost of other Texas programs. The total spending per student in Texas for Head Start averaged $8,236 in 2010–2011, and nationally the average spending per student enrolled for pre-K programs from all reported sources was $4,151.

One factor that lowered the cost of the AISD pre-K program was that pre-K teachers did not have accessible, dedicated AISD support staff (i.e., teacher aides). A few community programs provided support staff to pre-K teachers on a few campuses. AISD exceeded the NIEER early education quality benchmark recommendation of a staff-to-student ratio of 1:10 or better. The AISD staff-to-student ratio was 1:18 in 2010–2011.

Conclusion. The analysis of this report suggests full-day pre-K is an efficient allocation of funds compared with alternative programs and services that might be required for low-performing students if full-day pre-K were not offered. However, this report does not address who benefits from the cost avoidance for funding full-day pre-K. Local money spent on full-day pre-K may result in cost savings at the federal and state level (i.e., in terms of special education services and grade retention), which may lend support to administrators advocating for state and federal money for supporting full-day pre-K. In terms of local impact, this report does not address the full range of student and community benefits that might offset the cost of full-day pre-K, such as increased high school completion rates and increased 4-year college attendance found in other studies (Ludwig & Phillips, 2008; Temple & Reynolds, 2007).

Update. The following information was not available at the time of the original report in April, 2012. In 2011–2012, AISD provided a tuition-supported full-day pre-K program to help bring in local revenue to off-set the cost of providing full-day pre-K to students who qualify for the state-mandated program. DRE staff concluded that as a whole, tuition-supported pre-K could not completely offset the cost of full-day pre-K district wide (Brunner, 2012). 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.[1] 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

[1] 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.

for the district (i.e., 7% of the estimated $7 million required to pay for full-day pre-K).

According to AISD's chief financial officer, AISD plans to lower the staff-to-student ratio from 1:20 to 1:19 for the 2013–2014 school year. The increase to the staff-to-student ratio in 2012–2013 was "only made as part of a budget balancing maneuver due to severe budgetary constraints resulting from significant State cuts" (N. Conley-Abram, personal communication, December 21, 2012). Although the proposed staff-to-student ratio for 2013–2014 might be lower than the 2012–2013 year, the ratio is higher than the 1:18 ratio in 2010–2011 and prior school years.

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Appendix

Appendix A. From 2006–2007 through 2010–2011, AISD tested a sample of pre-K students in the fall and spring with the Peabody Picture Vocabulary Test (PPVT; English version). Spanish-speaking English language learners (ELLs) were additionally tested with the Test de Vocabularío en Imagenes Peabody (TVIP; Spanish version). The PPVT and the TVIP measure knowledge of receptive (i.e., hearing) vocabulary (Dunn & Dunn, 2007).

Receptive vocabulary is one domain of language development, and cut-off scores of 1.5 and 2 standard deviations (*SD*) below the mean are commonly used benchmarks in language delay diagnosis (VUC, 2011). Based on the normed distribution of scores, 6% of students should score 77 or below (i.e., 1.5 *SD* below the mean), while 2% are expected to score 70 or below (i.e., 2 *SD* below the mean).

The PPVT and TVIP are reliable assessments, meaning students are very likely to continue to score near their pretest score without intervention. DRE staff assumed students who would potentially be eligible for special education services would score on the PPVT/TVIP in the students' native language at 75 or below (i.e., 5th percentile) for the high estimate and at 70 or below (i.e., 2nd

percentile) for the low estimate. AISD's Department of Special Education recommended the 6th percentile, which would be higher than the high estimate.

DRE further assumed that pre-K students who scored 1.5 or 2 *SDs* below the mean in the fall of their pre-K year and later did not receive special education services eventually would have been declassified (i.e., dismissed) from special education without the availability of a pre-K program. This assumption differed from the assumption of the VUC study, which found students would not have been declassified (due to the low rate [i.e., 5% to 10%] of students who are declassified nationally). The VUC study estimated the cost savings for special education services based on 13 years of services (i.e., kindergarten through 12th grade). DRE staff estimated the cost for special education services on 5.5 years of service.

DRE staff used data from five cohorts of pre-K students, from 2006–2007 through 2010–2011. Cohorts were based on the fall snapshot date for the Public Education Information Management System (PEIMS) submission and PPVT/TVIP results from the corresponding school year. Average cost per student for special education came from Academic Excellence Indicator System (AEIS) district reports (TEA, 2008, 2009, 2010, 2011). To calculate a present value for future costs not yet incurred, a discount rate of 3% was applied.

Table A-1. Student Prekindergarten Cohorts, 2006–2007 Through 2010–2011

Cohort	Total fall enrollment	Total English non-ELLs and Spanish ELLs	% English non-ELLs and Spanish ELLs	Total in PPVT sample	% in PPVT sample
2006–2007	4,622	4,389	95	1,817	41
2007–2008	4,704	4,490	95	2,109	47
2008–2009	4,682	4,453	95	2,193	49
2009–2010	5,019	4,775	95	915	19
2010–2011	5,176	4,891	94	1,090	22

Source. Public Education Information Management Information System (PEIMS) and AISD student records

Note. Percentage in Peabody Picture Vocabulary Test (PPVT) sample is based on total English non-English language learners (ELLs) and Spanish ELLs.

Appendix B. To provide an estimate of students who would have been retained without pre-K, DRE staff compared retention rates for three cohorts of kindergarten students (i.e., 2007–2008 through 2009–2010) who either attended AISD for pre-K or who were assumed to have qualified for pre-K based on their ELL status, free- or reduced-priced lunch status, or both, in the fall snapshot of their kindergarten year. Any grade retention that occurred prior to the cohort year was not used in the calculation (i.e., students in their second year of kindergarten). DRE staff assumed the difference in retention rates between students who attended AISD pre-K and those assumed to have qualified was the reduction of grade retention due to pre-K enrollment. The rate difference was then applied to the kindergarten cohort who attended AISD pre-K to obtain an estimate.

Appendix C. Costs were based on average full program funding for the 2010–2011 year according to AISD's AEIS report. The costs were assumed not to change. Grade retention and special education services were assumed to begin after the pre-K year (i.e., 2010–2011 costs were not applied). A

discount rate of 3% was applied to program years after 2010–2011. The additional cost per student for full-day pre-K was estimated by dividing $7 million (i.e., the non-local fund allocation for the additional amount needed for full-day pre-K made in the 2011–2012 year) with the enrollment for 2010–2011.

Table C-1. Reported All Funds Cost Per Student, 2010–2011

Eligibility criteria	Dollars (2010–2011)
Bilingual/English as a second language programs	$1,173
Prekindergarten (pre-K)–full day	$3,234
Pre-K–half day (.67 of full day)	$2,167
Regular education	$3,083
Special education	$1,510

Source. Academic Excellence Indicator System (AEIS, 2011) and Brunner 2011b

Note. Half-day pre-K was estimated by taking 67% of the pre-K cost for full-day pre-K, based on the percentage of pre-K allocation in 2011–2012 that used local funds. The other 33% of pre-K allocation was from a federal funding source (i.e., EduJobs).

Appendix D. Because the numbers provided are estimates, a low and high is presented to provide a range based on a 95% confidence interval. Full-day pre-K was estimated to reduce special education placement between 6% and 15%. For grade retention, the reduction was 2.2% to 3.6%. To take into account the difference between half-day and full-day pre-K programs, totals were multiplied by 62%, based on combined assumptions made on reduced pre-K enrollment and reduced effectiveness of half-day pre-K compared with full-day pre-K using other studies (i.e., the effect for full-day pre-K estimated previously mentioned compared full-day program to no pre-K; half-day pre-K was assumed to partially contribute to the outcomes observed; Center for Public Education [2011]; Plucker et al. [2004]; Van Overschelde & Koenig [2011]; Zhoa [2010]).

Due to state mandate, AISD must provide a minimum half-day program. If AISD only provides a half-day program, the E3 Alliance estimated AISD would have an 18% reduction in pre-K use (Van Overschelde & Koenig, 2011). This estimate assumed supplemental support services would be provided to deliver an equivalent of full-day programming. When transitioning to full-day pre-K programs starting in 2002–2003, the campuses that provided half-day pre-K the prior year experienced nearly three times greater growth in student enrollment than did campuses that provided full-day programs in the previous year (Brunner, 2010), lending credence to the assumption that pre-K enrollment will decrease if half-day programs are implemented.

DRE staff assumed 23% of students will not attend pre-K if the program becomes half day, calculated by the following: (18%/79%) or 23%. The AISD enrollment rate of pre-K eligible students was 79% (Van Overschelde & Koenig, 2011). Neighboring districts with half-day programs had a 61% use rate, which was 18% lower than the rate for AISD. For example, if enrollment was 5,000 students (79%), the estimated total of eligible pre-K students would be 6,329. For half-day programs, only 61% of the 6,329 students would attend, or 3,861 students, which is 77% of the 5,000 who actually enrolled. The reduction in student enrollment was 23%.

This assumption likely will be an underestimate of the need for special education services because

students with greater need for academic intervention (i.e., students who are low income, immigrant, or from single-parent households) might be disproportionally affected (Barnett, 2008; Crosnoe, 2007).