

EARLY CHILDHOOD PROGRAM: EVALUATION OF LONGITUDINAL IMPACT ON STUDENT OUTCOMES

Pasadena Unified School District

**FINAL REPORT
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**Submitted by:
Public Works, Inc.
90 N. Daisy Avenue
Pasadena, CA 91107
(626) 564-9890
(626) 564-0657 fax**

**Authors:
Michael H. Butler
Jia Wang, PhD
Mikala L. Rahn, PhD**

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Introduction

The Pasadena Unified School District (PUSD) offers an early education program called the Early Childhood Program (ECP)¹ in twenty-one schools. At these schools there are a total of twenty-three different ECP classrooms that can serve a maximum of 920 students a year. Pre-kindergarten children age three to four years at the time of enrollment from families whose household income meets State guidelines are eligible for participation in the program. Priority enrollment guidelines include the following:

- Child Protective Custody (three and four year old children)
- Income eligible four year olds, lowest income first;
- Income eligible three year olds, lowest income first; and
- Over income special needs children as space is available.

Originally, two separate early childhood programs existed in the District—the privately funded Kindergarten for Four Year-Olds and the State-funded State Preschool Program. During the 1992-1993 school year, these two programs were combined to form the Early Childhood Program (ECP). ECP is a pre-kindergarten experience that addresses the academic, social, and emotional development of three and four year olds in the PUSD with two key goal areas:

- To provide a comprehensive, developmentally appropriate preschool, including a full-range of services for children and families in a safe, healthy and nurturing environment.
- To provide a stimulating classroom environment and learning opportunities which are developmentally appropriate for three and four-year old children.

ECP targets children who are considered to be at at-risk for underachievement or failure later in their school career based on family socioeconomic characteristics. As such, ECP serves as an early educational intervention for both the children and their families. Through participation in ECP, children not only begin to be exposed to basic academics, but also learn skills that serve as the foundation for future learning, such as listening, taking turns and sharing.

Unlike other early childhood programs, ECP includes both a full credentialed and permit teacher in the classroom.² The required parent participation portion of the program involves parents in the classroom, exposes parents to school and District standards, and instructs parents in techniques they can use to help their child succeed in school.

Research in early childhood development overwhelmingly supports the conclusion that healthy children have better opportunities to learn. Therefore, ECP provides health services to the children for some of the more common health issues that interfere with learning, such as vision and hearing problems. Nurses provide instruction for the children on topics such as oral hygiene. In addition, some schools provide information to parents on topics such as nutrition and access to free or low-cost health care.

¹ In addition, four Children's Centers within PUSD have Early Childhood Programs.

² Changes related to this program characteristic will be implemented in school year 2001-2002. This will be discussed later in the report.

By targeting at-risk children, ECP attempts to “even the playing field” for participating students so that all children may begin kindergarten with skills and knowledge that will help them to succeed in the formal school setting and beyond.

Through the evaluation process, ECP has the opportunity to learn from its own and others experience in order to potentially benefit participants and their families. The evaluation of ECP also adds to the body of knowledge surrounding the impact of targeted intervention on early childhood development. It is hoped that this and future evaluations will improve the program and contribute to our knowledge of early childhood programs.

Review of Related Literature

While research regarding the short-term effects of early childhood programs is readily available, longitudinal research on the impact of early childhood programs is limited. In part, the scarcity of this research is due to the methodological concerns and considerations that must be taken into account when studying children of a young age over a long period of time. These considerations include student mobility and changes in District assessments. Tracing children over time and comparing results from year-to-year is expensive and time consuming, limiting the number of long-term studies that have been performed.

However, due to recent advances in the understanding of brain development in children and increased interest in early childhood development nationally, greater attention is being paid to this important subject. Some large-scale national studies, such as those conducted at the National Center for Education Statistics, have recently been launched. The past and current evaluation of PUSD’s ECP program are aligned with the types of evaluations that are being conducted of similar early childhood programs around the country.

These studies have centered on examining the benefits of early childhood education among children who live in economically challenged families and/or who have parents with low levels of education as these students are often at-risk for difficulties in school, including grade retention, troubles with literacy, and higher dropout rates. Research suggests that these difficulties in school can be mitigated through exposure to literacy and other academic areas in preschool programs and use of health services. In addition, the instruction of parents in the role they play in the education of their children and specific actions they can take to support their child’s learning are also critical.³

The emphasis on early childhood education can also be traced to the consensus on the importance of brain development between the ages of birth and five. It is now understood that much of the development in a child’s brain occurs during this five-year time period, before children are typically placed in formal instructional settings. This means that preschool programs can have a dramatic impact on the learning of children, particularly with those children who would not otherwise be exposed to enriched educational environments at this age. Studies have shown that participation in preschool programs similar to the Early Childhood Program such as Head Start and Perry Preschool programs

³ *Project Head Start: Models and Strategies for the Twenty First Century*. Washington, V. and U. O. Bailey. Garland Publishing, NY, 1995.

create measurable short-term gains for students in IQ levels, cognitive ability, and self esteem.⁴

Long-term gains are often harder to measure. One reason for this difficulty is families' mobility, which makes children difficult to track. Another is inconsistent testing of some children, which has limited the amount of comparable data. Even with these complicating factors, long-term studies have shown positive benefits many years after participation in preschool programs. These benefits include long-term gains in academic achievement in reading and math, earnings, higher high school graduation rates, and lower grade retention and placement in special education programs.⁵

Despite these findings, it is important to recognize that different studies have reached different conclusions regarding the long-term impact of these programs. Some studies, such as *A Review of Head Start Research Since 1969*, show various academic and cognitive benefits lasting only until the 1st grade⁶ while other studies, such as one done by Frances Campbell and Craig Ramey, show benefits lasting through the 9th grade⁷. Different conclusions depend, in part, on the measures used to assess long-term program benefits. For example, improvement on IQ tests is a positive programmatic impact that declines quickly after completion of a preschool program.

Nonetheless, common sense and multiple studies tell us that the benefits from preschool program participation are likely to be reinforced if the child and/or family receive additional support after preschool. Continued support can turn short-term effects into long-term effects.⁸ By providing academic and social support, disadvantaged children who have participated in early childhood educational programs may be able to experience greater and longer lasting results.

Overview of Past ECP Evaluations

Loyola Marymount 1994-1997

Researchers from Loyola Marymount University (LMU) evaluated PUSD's ECP program from 1994-1997. The research methods used over the years included the analysis of Stanford 9 test score data, site visits, observations of home visits and ECP classrooms, and surveys of teachers, parents and administrators. The LMU evaluation reports included information on the standardized test scores of ECP graduates compared to graduates of Head Start programs⁹ and other students in PUSD. Each report also highlighted specific

⁴ "Significant Benefits: The High/Scope Perry Preschool Study Through Age Twenty-seven." Schweinhart, L.J. and D. Weikart, D. High/Scope Educational Research Foundation, Ypsilanti, Michigan, 1993.

⁵ See for example, "As the Twig is Bent- Lasting Effects of Preschool Programs." Consortium for Longitudinal Studies. Hillsdale, NJ, Erlbaum, 1983.

⁶ *A Review of Head Start Research Since 1969 and an Annotated Bibliography*. Mann, A.J., A. Harrell and M. Hurt. Washington, DC: HEW, 1977. (DHEW Publication No. 78-31102).

⁷ "Effects of Early Intervention on Intellectual and Academic achievement: A Follow-Up Study of Children from Low-Income Families." Campbell, F.A. and C. T. Ramey. *Child Development*, pp. 684-689, v. 65, 1994.

⁸ *Early Care and Education for Children in Poverty: Promises, Programs, and Long-Term Results*. Barnett, W.S. and S.S. Boocock. State University of New York Press, NY, 1998.

⁹ Head Start and ECP use similar socioeconomic factors for qualification.

areas of interest that changed from report to report. Some of the topics considered in past evaluations included articulation between principals, ECP teachers and other teachers; home visits and their efficacy; teaming among ECP teachers; support for parents; the use of technology in the classroom, and bilingual classrooms.

LMU's research yielded a number of positive findings regarding ECP's impact including:

- Higher test scores for ECP graduates compared to graduates of Head Start;
- Test scores near those of other children in the District;
- Effective implementation of the curriculum; and
- Benefits from home visits by teachers with parents of participating children.

In addition, LMU's evaluations highlighted a number of concerns and issues including:

- Communication difficulties between members of some ECP teacher teams;
- Insufficient time for ECP teams to plan curriculum and instruction; and
- Incomplete inclusion of ECP into school's educational mission and operation.

Public Works, Inc. 1998-1999

Public Works, Inc., a non-profit educational consulting firm, was contracted by PUSD to conduct a third party evaluation of the ECP in 1999. Evaluation efforts focused on 1) assessing the social, emotional, and developmental gains of students who attended ECP, 2) studying program effectiveness, and 3) conducting an analysis of the impact of ECP on Stanford 9 scores comparing the performance of students who had been ECP participants to non-ECP students based on their subsequent performance in grades 1-9.

The report was based on data collected during the 1998-99 school year. Data collection methods included site visits of a representative sample of six ECP schools; surveys of kindergarten teachers and parents designed to elicit perspectives on the impact of ECP; and surveys administered to ECP teachers and parents regarding the impact of ECP. In addition, the District provided results from the Emergent Reading/Mathematics Assessment (ERMA), a kindergarten readiness assessment focusing on beginning letter identification, reading and mathematics skills for students who attended ECP at the sample of schools. PUSD also provided 1999 Stanford 9 scores for students who attended ECP, Head Start, and other students in the District in grades 1 through 9.

In this report, Public Works, Inc. provided the findings on overall program effectiveness and immediate effect of the program on kindergarten readiness. Findings were divided among three sections: 1) a cross-case analysis of program implementation at different school sites, 2) an analysis of student outcomes, and 3) recommendations for program improvement.¹⁰

¹⁰ This report is available from Public Works, Inc. or the ECP office in the District.

Summary of Findings from Public Works, Inc. Report

Curriculum Expectations

- There is a need for more clarification on what it means to be “kindergarten ready.” Although the District standards communicate a set of expectations of what is required at the kindergarten level and the scholastic curriculum has a set of expectations embedded within its lessons, ECP teachers have their own expectations. Clarifying and streamlining these various expectations so that teachers, parents, and students are all focused on the same outcomes will benefit the students in the long run. The evaluation also pointed to a need for in-services on standards and curriculum for ECP teachers as well as an increase in time for ECP and kindergarten teachers to get together to share expectations and strategies for individual students.

Assessment

- Public Works, Inc. commended the District for administering an assessment to all students at the beginning and end of kindergarten. At the same time, the study noted the limitations of existing assessments. In particular, ERMA did not assess the social development of the children, an essential component in early childhood development. Based on national evaluations, preschool programs such as ECP can positively affect social development such as self-esteem. The study noted the possibility for designing a new, standards-based assessment that could be used at both the preK and kindergarten levels.
- In 1999-2000, the ERMA was not administered. A new kindergarten assessment called the Elementary Reading/Writing Assessment (ERWA) based on the Houghton-Mifflin Literacy series was used to assess early literacy. The mathematics portion of the assessment is called Elementary Mathematics Assessment (EMA) and is similar to the ERMA assessment used previously. The reading and math assessments were administered three times a year during 1999-2000.

Parent Involvement

- Schools reported mixed results on their satisfaction with parent involvement as well as disappointment at the discontinuation of home visits conducted as part of ECP. In addition, there is a correlation between parent involvement and student performance on emergent reading, math skills, and attitudes/behaviors. In other words, kindergarten teachers that rated a child as having a parent “moderately” or “highly” involved also tended to rate that child as performing better than other students in the class perform.
- The study also noted the need for rethinking parent involvement in the context of early childhood education. Because home visits are now voluntary, ECP needs to find ways to increase parent involvement both in school and at home in their child’s education despite licensure limitations. The schools and District need to make a concerted effort to sustain that involvement through the later grades.

Teaming

- The teaming of ECP teachers was noted as a unique characteristic of ECP. Unlike past evaluations, the report found that the teaming of a permit teacher and a credentialed teacher was working well at the sites included in the study. At the same time, the study noted the need for more individualized instruction. While the student to teacher ratios are very favorable in ECP classrooms, regular one-on-one time can only be achieved with additional assistance, such as aides or parent volunteers.
- There were some concerns among ECP teachers that the program is not well integrated with the rest of the school's operations. Those who noted some distance remarked that they had played a part in the separation and that any rifts could be remedied by focusing on better relationships between preK and kindergarten teachers.

District Support

- The study noted several areas where District support would be beneficial including improving the intake process for enrolling new students, increasing parent involvement, supporting technology in the classroom, providing physical improvements to certain classrooms, and orienting new teachers.
- In completing an audit of the District database, Public *Works*, Inc. found that the electronic data in the District database for the most part matches school site records. Therefore, the District's electronic support function through Research, Evaluation and Testing Services appears to be in working order.

Student Outcomes - Kindergarten Readiness

- There is no particular set of skills in the areas of emergent reading, mathematics, and attitudes/behaviors that ECP graduates are lacking by the time they reach kindergarten. No alarming skill gaps were identified and the study noted that the majority of ECP graduates performed as well as or better compared to other students. In some skills, the ECP students excelled. For example, the majority of ECP graduates scored higher on basic, general skills such as: familiarity with books, the reading process, and using pictures as clues to the story line.
- Based on the actual ERMA, students who attended ECP scored comparably, and in some cases better than, students who did not attend ECP on both the pre-test and the post-test. Although the majority of students tended to perform "below grade level" on the pre-test, their scores dramatically improved on the post-test scoring to "above grade level." ECP participants markedly improved over the year in kindergarten readiness skills with scores comparable to students who did not attend ECP.

Student Outcomes - Standardized Test Scores

- The Ordinary-least-square (OLS) regression conducted provided a "snapshot" of the positive effects of ECP on mathematics and reading achievement. However, the study noted the need to conduct a longitudinal analysis of ECP's impact on student achievement. In this way, the previous evaluation recommended that PUSD examine

whether ECP has been successful in providing students with an educational experience that has long-lasting effects throughout elementary and secondary education.

Context for the 2000-2001 Evaluation

In line with the recommendation for a longitudinal examination of the impact of ECP, Public *Works*, Inc. was contracted through the Pasadena Education Foundation and funded through the Rose Hills Foundation to conduct a strictly quantitative analysis of ECP participants. This report examines school achievement of ECP graduates several years after participation in the ECP. The section below provides an overview of the study's methodology, clarifying the differences between the current evaluation report and the previous report prepared by Public *Works*, Inc.

Description of Data Sample and Overall Methodology

The sample provided by the PUSD’s Office of Research, Evaluation and Testing consisted of 13,513 students enrolled in grades 2 through 11 in the Pasadena Unified School District (PUSD) for the school years 1995-1996 to 1999-2000. From this sample, we selected all students for whom there was five years of longitudinal data (i.e., all students in grades 6-11 who took the Stanford 9 test in 2000). In this way, the study would be able to examine the *long-term* impact of ECP on student achievement. In this manner, the number of students included in the analyses for this report 7,182.

As shown in **Table 1** below, the Grade 11 Cohort (Cohort 1) is comprised of students who were in the 11th grade in 2000 (ECP in 1987-88). The Grade 10 Cohort (Cohort 2) consists of students who were in the 10^h grade in 2000 (ECP in 1988-1989). As shown in Table 1 below, working backward, the longitudinal sample under examination includes all students for whom we were able to obtain five years of achievement data between 1996-2000.

Table 1: Definition of Longitudinal Cohorts

Grade	95-96	96-97	97-98	98-99	99-00
2	C6				
3	C5	C6			
4	C4	C5	C6		
5	C3	C4	C5	C6	
6	C2	C3	C4	C5	C6
7	C1	C2	C3	C4	C5
8		C1	C2	C3	C4
9			C1	C2	C3
10				C1	C2
11					C1

The longitudinal nature of the sample is the key difference between this study and the study conducted based on 1998-1999 data. As shown in the **Table 2** below, the 1998-99 ECP study sample included all grades 1-11 PUSD students for the 1998-1999 school year. By contrast, this report includes students in grades 6-11 as of the 1999-2000 school year.

Table 2 : Comparison of Two Studies Conducted by Public Works, Inc.

	1998-99 Study	2001 Study
Data structure	One-time sample	Longitudinal sample
Student Records	15,734	7,182
Grade span	Grades 1-11	Grades 6-11 as of 1999-2000
Years of test scores	1998-99	1995-96, 1996-97, 1997-98, 1998-99 and 1999-2000
Student sample selection	All in the District	Selection based on grade level and availability of test scores
Sample size	15,734	7,182
Test Scores	National Percentile Ranks (NPRs)	Normal Curve Equivalent (NCEs)

For the current study, we worked backwards, examining the historical progress of these students. Fewer student records were included because a) we were interested in only the long-term impact of ECP and thus only included older students who would have been exposed to ECP as young children, and b) because we excluded students lacking five years of Stanford 9 data (i.e., students new to the District).

It is also important to note that this study uses Normal Curve Equivalent (NCE) scores as opposed to the National Percentile Rank (NPRs) used in the earlier study. Before describing the results of the study, it is important to clarify the difference between NCEs and the other widely used statistic used to represent standardized test scores, the National Percentile Rank (NPR).

NCE scores are “normalized” standardized scores designed to allow for comparisons of achievement among and across groups of scores. When looking at data from norm-referenced, standardized tests like the Stanford 9, an assumption is made that student achievement resembles a normal (“bell”) curve with the majority of scores falling in the center and then spread equally on both sides of the average or “mean” score. In other words, student performance is judged in relationship to a representative sample of students (the “norm group”) whose performance falls both above and below an average achievement statistic. Very often standardized test scores are presented as National Percentile Ranks (NPRs) which express the percentage of scores in the norm group that fall below a particular score of a student, grade level or school. Thus, a score at the 40th percentile means that the student scored equal to or better than 40% of the students in the national norm group.

However, because most students fall close to the average score represented by the 50th percentile, the distance between percentile ranks differs depending on a given level of achievement. Put another way, the distance from the 45th to the 50th percentile is not the same difference as the distance between the 10th and the 15th percentile in raw scores. NCE scores take these differences into account by “normalizing” scores so that each NCE score is equidistant from the next. The chief advantage of NCEs is that scores can be directly compared to one another to ascertain “true” progress. In particular, NCEs allow scores to be aggregated and averaged. For these reasons, this report uses NCEs throughout.¹¹

¹¹ Note that it is always possible to convert NCEs into NPRs or vice versa. Please consult any reputable statistics or educational research text for further reference.

Statistical Analyses

The chief purpose of evaluating the Early Childhood Program (ECP) is to determine whether the academic achievement of ECP graduates is equal or higher than that of students who did not participate in ECP. Specifically, the study asked several research questions:

1. What are the characteristics of ECP students? Are there significant demographic differences that limit the comparison between ECP participants and other student populations?
2. How do ECP graduates score in reading and mathematics as compared to Head Start students and the other, non-ECP students? What about school day attendance?
3. What is the long-term, independent impact of ECP on academic outcomes? After controlling for demographic characteristics, are there any significant achievement differences attributable to ECP?
4. Does ECP have different effects on students of different ethnic backgrounds?
5. Does ECP have different effects on students at different schools?

What are the Characteristics of ECP Students? (Question 1)

To look at the longitudinal impact of ECP, this report examines achievement data among different cohorts of students who were enrolled in ECP in earlier years.

Through the examination of student achievement data, the study aimed to look at the impact of ECP on each cohort of students and the entire sample collectively to determine whether or not there was a significant impact of ECP on Stanford 9 scores as the students progressed through grade levels. **Table 3** below contains descriptive information on the sample received from PUSD in terms of the different variables analyzed.

Of the 7,182 students in our sample, 18% were enrolled in the ECP, 5% were in the Head Start Programs in Pasadena, and 77% were not in either program. The ethnic makeup of the sample is 49% Hispanic, 31% Black, 15% White, 4% Other (including Asian and Filipino). Nearly one-in-five (18%) of the students were classified as English Language Learners (ELL). The majority of students in the sample (64%) were eligible for federally subsidized free/reduced meal program. Nearly two-thirds (63%) live with both parents.

As shown in **Table 3**, the mean 1996 reading and mathematics achievement scores for the sample were 41.0 and 46.6 and their corresponding standard deviations were 19.7 and 20.7. The **mean** is the same as the average. For example, the average student in the sample displayed in **Table 4** scored 41.0 NCEs on the Total Reading section of the Stanford 9 exam. The **standard deviation** is a measure of spread or range of the data under examination. For the data in **Table 3**, mathematics scores have a larger standard deviation so the scores are more spread out. This means that there is a wider range of “average” scores in mathematics scores than reading scores.

Table 3: Descriptive Sample Statistics on Variables Used in the Analysis (N=7,182)

Variable	Definition	N	Mean	Std Dev
N_READ96	1996 NCE reading score	4,789	41.0	19.7
N_MATH96	1996 NCE mathematics score	4,954	46.6	20.7
N_READ97	1997 NCE reading score	5,486	41.8	19.3
N_MATH97	1997 NCE mathematics score	5,601	46.9	20.5
N_READ98	1998 NCE reading score	6,580	40.2	18.9
N_MATH98	1998 NCE mathematics score	6,680	43.8	19.3
N_READ99	1999 NCE reading score	6,776	41.1	18.6
N_MATH99	1999 NCE mathematics score	6,904	46.0	19.1
N_READ00	2000 NCE reading score	6,720	41.1	18.5
N_MATH00	2000 NCE mathematics score	6,794	46.9	19.0
ATTN	2000 attendance rate (days)	7,182	169.4	22.4
		Count	Percentage	
HEADSTRT	enrolled in Head Start program	342	5%	
ECP	enrolled in Early Childhood program	1,313	18%	
LEP	LEP student=1	1,291	18%	
LUNCH	receiving free or reduced lunch=1	4,611	64%	
GIRL	girl=1	3,658	51%	
PARENT2	from two-parent families	4,514	63%	
PARENT1	from one-parent families	2,301	32%	
HISPANIC	Hispanic student	3,546	49%	
BLACK	Black (non Hispanic) student	2,247	31%	
WHITE	White (non Hispanic) student	1,089	15%	
OTHER	Other ethnicity	300	4%	
GRADE	Grade 6 student	1,430	20%	
	Grade 7 student	1,319	18%	
	Grade 8 student	1,259	18%	
	Grade 9 student	1,269	18%	
	Grade 10 student	985	14%	
	Grade 11 student	920	13%	

Source: PUSD Office of Research, Evaluation and Testing

To aid the reader in making comparisons, **Table 4** below presents information on the students in the sample by their participation in ECP, Head Start or neither of these programs. ECP students are more likely to be Hispanic and less likely to be Black. Compared to other students, ECP graduates are also more likely to be LEP and live with both parents. However, ECP students are less likely to be eligible for Free/Reduced Lunch compared to Head Start participants but more likely than students enrolled in neither early childhood program. There were no gender-related differences by program.

In terms of achievement, ECP graduates outperform Head Start participants in Reading and Math by an average of 3-5 NCEs for all years under examination. There is very little difference between ECP graduates and students who did not participate in either ECP or Head Start. Compared to these students, ECP graduates scored quite similarly.

In terms of regular school day attendance, ECP graduates are slightly more likely to attend school. As shown in **Table 4**, ECP graduates attend an average of 171 days a year (out of 180 possible days). By contrast, Head Start participants attend an average of 4 days less

(167 days) annually and students in neither program also attend less frequently (169 days or 2 days less) compared to ECP graduates.

Table 4: Comparison of Students in ECP, Head Start, and Other Students

Variable	All Students (N = 7,182) Mean	ECP graduates (N = 1,313) Mean	Head Start students (N = 342) Mean	Other students ¹² (N = 5,527) Mean
N_READ96	41	41	36	41
N_MATH96	47	48	43	47
N_READ97	42	41	37	42
N_MATH97	47	47	44	47
N_READ98	40	39	36	41
N_MATH98	44	43	41	44
N_READ99	41	41	37	41
N_MATH99	46	46	43	46
N_READ00	41	41	37	41
N_MATH00	47	48	43	47
ATTN	169	171	167	169
LEP	18%	21%	18%	17%
LUNCH	64%	74%	85%	61%
GIRL	51%	51%	51%	51%
PARENT2	63%	69%	51%	62%
PARENT1	32%	28%	44%	32%
HISPANIC	49%	57%	55%	47%
BLACK	31%	28%	41%	31%
OTHERS	4%	3%	0%	5%
Grade 6	20%	33%	27%	16%
Grade 7	18%	23%	27%	17%
Grade 8	18%	21%	20%	17%
Grade 9	18%	17%	15%	18%
Grade 10	14%	7%	11%	16%
Grade 11	13%	0%	0%	17%

Source: PUSD Office of Research, Evaluation and Testing

¹² “Other” includes students who may have attended pre-school in programs other than ECP or Head Start or were home with a parent with no formal preschool experience.

How well do ECP Students Perform? (Question 2)

Table 5 presents Stanford 9 achievement reading test results for ECP participants, Head Start participants, and other students who did not participate in either of these programs. As seen in Table 5, ECP participants' scores on Total Reading. This table expands on the information in Table 4 above by showing the performance of the different cohorts of students over time. Graphic charts illustrating Stanford 9 reading progress by cohort are included as an Appendix to this report.

**Table 5: Comparison of Stanford 9 Scores (NCEs) in Total Reading
ECP Participants, Head Start Participants, and Non-ECP Participants**

	1996	1997	1998	1999	2000	Net Change ¹³
ECP Participants						
Cohort 1 (11 th Grade in 2000)	57	71	52	61	61	4
Cohort 2 (10 th Grade in 2000)	50	46	44	47	47	-3
Cohort 3 (9 th Grade in 2000)	48	51	46	49	51	2
Cohort 4 (8 th Grade in 2000)	49	49	51	50	48	0
Cohort 5 (7 th Grade in 2000)	50	48	47	53	48	-2
Cohort 6 (6 th Grade in 2000)	51	52	44	48	53	2
Head Start Participants						
Cohort 1 (11 th Grade in 2000)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Cohort 2 (10 th Grade in 2000)	46	44	40	44	41	-5
Cohort 3 (9 th Grade in 2000)	42	46	38	42	44	2
Cohort 4 (8 th Grade in 2000)	39	42	45	45	42	3
Cohort 5 (7 th Grade in 2000)	48	45	43	49	46	-3
Cohort 6 (6 th Grade in 2000)	47	50	46	46	52	4
Non-ECP Students						
Cohort 1 (11 th Grade in 2000)	48	50	47	46	48	0
Cohort 2 (10 th Grade in 2000)	47	46	44	47	44	-3
Cohort 3 (9 th Grade in 2000)	46	48	43	45	48	2
Cohort 4 (8 th Grade in 2000)	47	48	50	50	50	3
Cohort 5 (7 th Grade in 2000)	51	50	48	53	49	-3
Cohort 6 (6 th Grade in 2000)	53	53	49	53	57	4

Source: PUSD Office of Research, Evaluation and Testing

For all but one cohort of students, ECP graduates tended to achieve at reading levels equal to those with no program, but better than Head Start participants. For example, the Grade 8 cohort of ECP graduates largely remained at the same level (48th NCE) of reading achievement (over the five-year period i.e., from 4th to 8th grade). Although they did not make much progress over time, ECP graduates outperformed their peers in Head Start who, despite improving 3 NCEs over the five-year period. This pattern is true of all but the Grade 6 Cohort where the achievement of Head Start participants comes close to that of ECP graduates.

¹³ Please note that Net Change column compares 1996 to 2000 and reflects rounding of decimals in the annual Stanford 9 scores. As such, net change figures may be "off" +/- 1.

Compared to students not exposed to either the ECP or Head Start programs, ECP patterns of achievement were similar. In sum, ECP graduates do not perform any better (or worse) than students who were never enrolled in an early childhood educational program. These descriptive results suggest that ECP has “leveled the playing field” for students entering school.

Table 6: Comparison of Stanford 9 Scores (NCEs) in Total Math ECP Participants, Head Start Participants, and Non-ECP Participants

	1996	1997	1998	1999	2000	Net Change
ECP Participants						
Cohort 1 (11 th Grade in 2000)	68	71	54	55	62	-6
Cohort 2 (10 th Grade in 2000)	41	42	44	47	47	6
Cohort 3 (9 th Grade in 2000)	42	45	46	49	51	8
Cohort 4 (8 th Grade in 2000)	41	45	51	50	48	7
Cohort 5 (7 th Grade in 2000)	43	42	47	53	48	5
Cohort 6 (6 th Grade in 2000)	45	47	44	48	53	8
Head Start Participants						
Cohort 1 (11 th Grade in 2000)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Cohort 2 (10 th Grade in 2000)	43	39	40	44	41	-2
Cohort 3 (9 th Grade in 2000)	36	39	38	42	44	8
Cohort 4 (8 th Grade in 2000)	33	39	45	45	42	9
Cohort 5 (7 th Grade in 2000)	39	37	43	49	46	6
Cohort 6 (6 th Grade in 2000)	45	48	46	46	52	6
Non-ECP Students						
Cohort 1 (11 th Grade in 2000)	44	47	42	42	45	1
Cohort 2 (10 th Grade in 2000)	41	41	44	47	44	3
Cohort 3 (9 th Grade in 2000)	43	44	43	45	48	5
Cohort 4 (8 th Grade in 2000)	42	46	50	50	50	8
Cohort 5 (7 th Grade in 2000)	46	45	48	53	49	3
Cohort 6 (6 th Grade in 2000)	50	50	49	53	57	7

Source: PUSD Office of Research, Evaluation and Testing

The results for mathematics are similar to that observed for reading. As shown in **Table 6** above, all cohorts with the exception of Grade 6 (Cohort 6) achieved at higher levels compared to Head Start participants and closely approximated the level of math proficiency among students who were not enrolled in early childhood education program. Although their relative rankings are similar to reading, it is important to note that all groups (except Cohort 1) made much more progress in mathematics over time. Nearly all the cohorts of both ECP and Head Start participants increased 5 or more NCEs in mathematics between 1996 and 2000. Graphic charts illustrating Stanford 9 math progress by cohort are included as an Appendix to this report.

What is the Long-Term, Independent Impact of ECP on Student Achievement? (Question 3)

As part of the analysis of student data for this report, we conducted both descriptive and regression analyses. The descriptive analysis above described the achievement trends apparent in the data. The results, however, can't be used to establish or to test whether one variable is related to the other and whether one has an impact on the other. Thus, the descriptive data cannot explain whether poverty or English language proficiency has an impact on achievement. Similarly, the descriptive statistics cannot "prove" whether the impact of ECP on achievement is statistically significant in its own right or bound up in the different characteristics of ECP graduates compared to other students in the sample.

In order to isolate the independent impact of ECP on student achievement, this study utilized a statistical procedure known as Ordinary-least-square (OLS) regression. This method provides regression coefficients that estimate the effect of different variables on the test scores. In order to examine properly whether ECP has a positive effect on its graduates' reading and mathematics achievement, we estimated the impact of ECP after controlling variables that are correlated with student achievement. Specifically, we "held constant" the demographic variables that have historically exerted a strong influence on student achievement: gender, ethnicity, attendance rate, English language proficiency, and family socio-economic status (SES). In this way, we are trying to directly measure the impact of only ECP.

Tables 7 and 8 below presents the regression results on Stanford 9 scores 1995-1996 to 1999-2000 for the longitudinal student sample. In addition to the demographic characteristics listed above, the model controls for students' attendance rates and the impact of grade level on achievement. Grade level is particularly important since test scores tend to be higher in the lower grade levels. Without the addition of a grade level control, our model would attribute more of an impact to ECP than might be warranted since first grade scores tend to be artificially high. Before explaining the results, it is important to define a few of the terms used in the accompanying analysis.

For the analyses below, the **constant** is a statistic generated by the computer that functions as a "base score" against which we are comparing the impact of the different variables in the model. The constant is the mean of the population when the values of all the independent variables are zero. For the case here, the constant stands for the average score for a male White student who did not participate in the ECP and Head Start programs, who was non-ELL, who did not receive free or reduced lunch, and who was in the 6th grade. A great deal of educational research has centered on addressing the "achievement gap" separating the academic performance of White students from that observed in other ethnic student populations. For this reason, White students are often used as the comparison point or base against which to measure progress of ethnic student sub-populations.

Statistical significance is an inference, based on a statistical test, indicating that the results obtained for a research sample can be generalized to the population that the sample represents. Put another way, a value is statistically significant when its probability that a finding is not the result of a sampling error but reflects the characteristics of the population

from which the sample was drawn. Statistical significance, therefore, means that the result is not random and that we would be likely to get the sample result a high percentage of the time if the same procedures were used. Typically, 0.95 is the threshold used to determine whether or not a result is statistically significant. At this threshold, we would predict the same result 95% of the time.

The **regression coefficients** represent the “effect” of the variable under consideration. These coefficients, therefore, indicate how much impact each variable has on student achievement in reading and math. For example, the impact of Grade on student reading is -0.85 in 1996. This means that being a 7th grader “deducts” approximately 1 NCE from your reading score, compared to a student in 6th grade sharing the same demographic characteristics.

Lastly, to test statistical significance, we calculated a **t-value**. The t-value is used to test the significance of the regression coefficient and to see whether it is significantly different from zero. For the sample size here, anything larger than 1.96, with the significance level at 0.95, signals the coefficient is significant. We have noted statistical significance at this level with an asterisk (*) throughout the report.

The Impact of ECP on Student Reading Achievement

As shown in **Table 7**, there is no statistically significant effect of ECP on reading achievement in four of the five years under examination. In other words, there is no statistically significant difference between the scores of ECP students and other, non-ECP students in the sample in all but one year. Similarly, there is no statistically significant effect of Head Start participation on reading achievement in any of the years analyzed.

Table 7: Regression Results for Total Reading

Year	1996	1997	1998	1999	2000
Variables	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
R-square	20%	20%	20%	23%	23%
(Constant)	44.91	45.50	45.55 *	42.75	43.71
GRADE_6	-0.85 *	-0.60 *	-1.09 *	-1.73 *	-1.92 *
LEP	-18.17 *	-18.47 *	-17.94 *	-17.31 *	-15.88 *
LUNCH	-8.06 *	-8.08 *	-7.67 *	-7.20 *	-7.41 *
GIRL	-2.32 *	-2.60 *	-2.35 *	-2.53 *	-2.13 *
PARENT2	4.74 *	3.63 *	3.10 *	3.44 *	2.68 *
PARENT1	3.75 *	2.88	2.21	2.35	2.58
ECP	-1.23	-0.40	-1.45	-1.05	-1.72 *
HDST	-2.23	-1.32	-1.89	-1.54	-2.51
HISPANIC	-7.87 *	-7.06 *	-6.73 *	-7.08 *	-7.38 *
BLACK	-11.18 *	-10.83 *	-10.46 *	-11.32 *	-12.44 *
OTHER	-12.89	-21.20	-12.38	-7.69	-9.44
ATTN	0.06 *	0.07 *	0.07 *	0.10 *	0.10 *

*Indicates statistical significance at .05 level

Source: Public Works, Inc.

Demographic variables exerted a bigger impact than any programmatic effect. For example, living with both parents exerted a statistically significant positive impact of 3-5 NCEs on reading scores. Similarly, each day of extra attendance resulted in a small, but positive impact on reading scores (each extra day of attendance yielded about 0.1 NCE increase). Other demographic variables were associated with lower student achievement. For example, LEP status tended to lower student reading scores an average of 16-18 NCEs. Family poverty also had a statistically negative impact, lowering reading scores 7-8 NCEs. Student ethnicity also had a statistically significant impact, with Hispanic and Black students tending to score 7-8 and 11-12 NCEs lower than White students.¹⁴ Grade was a statistically significant variable, lowering reading scores 1-2 NCEs with each successive grade. Gender was also a statistically significant predictor of reading achievement with females scoring about 2-3 NCEs lower than male students in reading.

Impact of ECP on Student Math Achievement

The results for math largely mirror those reported for reading. As shown in **Table 8**, there is no statistically significant effect of ECP or Head Start participation on math achievement in any of the five years under examination. As in the case of Reading, demographic variables exerted a much larger impact than any programmatic effect. For example, living with both parents exerts a statistically significant positive impact of 4-7 NCEs on math scores. Similarly, each day of extra attendance exerts a small but positive impact on math scores (each extra day of attendance yields about 0.1 NCE increase).

Table 8: Regression Results for Total Math

Year	1996	1997	1998	1999	2000
Variables	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
R-square	19%	19%	19%	20%	20%
(Constant)	47.49 *	47.13	46.17 *	46.20	69.53
GRADE_6	-1.09 *	-0.85 *	-0.82 *	-1.56 *	-1.61 *
LEP	-15.86 *	-16.42 *	-14.22 *	-14.31 *	-11.88 *
LUNCH	-5.74 *	-6.77 *	-7.26 *	-6.14 *	-6.24 *
GIRL	1.40 *	0.80	0.74 *	0.82	0.68
PARENT2	7.00 *	5.78 *	3.71 *	4.91 *	3.73 *
PARENT1	4.20 *	3.12	1.30	2.11	1.71
ECP	0.22	0.46	-0.18	-0.23	-0.63
HDST	0.00	0.35	0.25	-0.29	-0.22
HISPANIC	-9.70 *	-8.93 *	-8.92 *	-8.75 *	-9.38 *
BLACK	-15.32 *	-14.20 *	-13.75 *	-13.47 *	-14.91 *
OTHER	-15.64	-19.64 *	-13.34	-10.46	-16.02
ATTN	0.07 *	0.08 *	0.08 *	0.09 *	0.10 *

*Indicates statistical significance at .05 level

Source: Public Works, Inc.

¹⁴ It is important to note, however, that ethnicity and poverty tend to be highly correlated with one another. As such, ethnicity is not the driving force behind student scores. Rather, this study's results highlight the achievement gap which persists in PUSD.

Other demographic variables were associated with lower student achievement in mathematics. For example, LEP status tended to lower student math scores 12-16 NCEs. Family poverty also had a statistically negative impact, lowering reading scores 6-7 NCEs. Hispanic and Black students tended to score 9-10 and 14-15 NCEs lower, respectively, than White students. Grade also was a statistically significant variable, lowering math scores 1-2 NCEs with each successive grade. Gender was a statistically significant predictor of math achievement in only two of the five years analyzed.

Does the Impact of ECP Vary with Student Ethnicity? (Question 4)

Although the data above suggest that Hispanic and Black students tend to score lower in reading and math, it is important to examine whether or not these students receive a benefit or “boost” by participating in ECP. In the section below, we examine whether the benefits of ECP apply equally to all students regardless of ethnicity by looking more closely at the scores of ECP graduates from different ethnic groups.

Table 9: ECP Graduates’ Reading Scores by Grade Level Cohort and Ethnicity

Grade Level Cohort	Ethnicity	1996	1997	1998	1999	2000	Net Change
GRADE 6	All	45	47	44	44	48	3
	Hispanic	45	49	43	44	48	3
	White	53	56	52	50	56	2
	Black	42	41	41	42	44	3
GRADE 7	All	43	42	44	47	45	2
	Hispanic	44	43	45	46	43	-1
	White	50	46	47	53	54	4
	Black	38	38	41	44	42	4
GRADE 8	All	41	45	45	45	46	5
	Hispanic	38	44	44	44	45	7
	White	45	49	50	51	49	4
	Black	40	44	42	43	43	3
GRADE 9	All	42	45	43	47	42	0
	Hispanic	41	44	43	47	41	1
	White	48	50	48	51	50	2
	Black	40	41	39	43	38	-2
GRADE 10	All	41	42	43	42	39	-2
	Hispanic	40	39	43	41	38	-1
	White	46	49	48	50	47	1
	Black	39	40	39	37	33	-6

As can be seen in **Table 9** above, there are few differences in achievement patterns of ECP graduates based on ethnicity. The exceptions include the Grade 7 Cohort, where Hispanic ECP graduates made less progress over time in terms of their Stanford 9 reading scores. Likewise, Black students in the Grade 9 and Grade 10 cohorts achieved at lower rates compared to other ECP graduates. Overall, however, there are no dramatic differences among ECP graduates of different ethnicities in terms of reading achievement.

The results for math are similar. As shown in **Table 10** below, Hispanic and Black students (the vast majority of ECP graduates in the sample) tended to achieve at similar rates of growth. The only notable exceptions include the Grade 7 cohort of Hispanic students and the Grade 9 cohort of Black students.

Table 10: ECP Graduates' MathScores by Grade Level Cohort and Ethnicity

Grade Level Cohort	Ethnicity	1996	1997	1998	1999	2000	Net Change
GRADE 6	All	51	52	44	48	53	2
	Hispanic	51	52	45	48	54	3
	White	62	63	57	61	63	1
	Black	46	46	39	43	49	3
GRADE 7	All	50	48	47	53	48	-2
	Hispanic	47	45	46	50	47	0
	White	61	58	57	61	58	-3
	Black	47	45	43	51	44	-3
GRADE 8	All	49	49	51	50	48	0
	Hispanic	48	48	53	49	48	0
	White	57	62	60	59	57	0
	Black	42	41	43	44	43	1
GRADE 9	All	48	51	46	49	51	2
	Hispanic	47	49	43	47	49	1
	White	59	58	55	57	61	2
	Black	40	46	41	44	46	5
GRADE 10	All	50	46	44	47	47	-3
	Hispanic	52	48	42	46	48	-4
	White	52	49	47	55	51	-1
	Black	43	37	40	40	40	-3

While the descriptive statistics above showed few differences based on ethnicity, this study also used regression analyses to examine whether any statistically significant outcomes existed. As shown in **Table 11** below which displays the results of these regressions for reading, and **Table 12** for mathematics, demographic factors such as English language proficiency, socioeconomic status, and whether students live with both parents tended to exert the most influence on student scores. When we looked at the reading results of ECP and Head Start participants by ethnicity, the data revealed very little in the way of statistical significance. While the results suggest an ECP impact (note positive coefficients for both ECP participants who were Hispanic, Black, and Other) very few of the results were statistically significant. The only exceptions to the lack of statistical significance occur in 1997 and 1998 where ECP “added” 4-5 NCEs to Hispanic reading scores and the negative impact of Head Start participation for Black students in 1997. In short, there were very few statistically significant results linked to student ethnicity after controlling for other demographic factors.

Table 11: Regression Results for Total Reading by Ethnicity

Variables	1996 Coeff.	1997 Coeff.	1998 Coeff.	1999 Coeff.	2000 Coeff.
R-square	20%	20%	21%	23%	23%
(Constant)	45.50	45.89	45.84	42.97	43.92
GRADE_6	-0.82 *	-0.55 *	-1.05 *	-1.71 *	-1.91 *
LEP	-18.06 *	-18.29 *	-17.80 *	-17.19 *	-15.81 *
LUNCH	-7.92 *	-7.92 *	-7.53 *	-7.08 *	-7.28 *
GIRL	-2.30 *	-2.61 *	-2.35 *	-2.52 *	-2.12 *
PARENT2	4.80 *	3.68 *	3.14 *	3.49 *	2.72 *
PARENT1	3.77 *	2.89 *	2.24	2.39	2.63
ECP	-4.09 *	-3.12	-3.77 *	-3.23	-3.60 *
HDST	-3.69	5.18	2.74	1.99	-2.26
HISPANIC	-9.23	-8.46	-7.81 *	-7.95 *	-8.13 *
BLACK	-11.69 *	-10.64 *	-10.26 *	-11.21 *	-12.38 *
AOTHER	-2.44	-1.26	-0.70	-0.04	-0.30
ATTN	0.06 *	0.07 *	0.07 *	0.10 *	0.10 *
ECP_HSP	4.00	5.12 *	4.04 *	3.54	2.45
ECP_BLK	2.56	1.21	1.35	1.77	2.06
ECP_AOTH	5.43	2.76	2.95	1.49	2.65
HS_HSP	6.14	-0.07	1.32	1.56	6.03
HS_BLK	-2.58	-13.07 *	-10.56	-8.44	-5.95
HS_AOTH	1.95	-12.62	-11.08	-12.46	-2.71

*Indicates statistical significance at .05 level

Source: Public Works, Inc.

Table 12: Regression Results for Total Math by Ethnicity

Variables	1996 Coeff.	1997 Coeff.	1998 Coeff.	1999 Coeff.	2000 Coeff.
R-square	20%	19%	20%	20%	20%
(Constant)	47.17	46.70	45.57	45.48	46.91
GRADE_6	-1.10 *	-0.86 *	-0.84 *	-1.60 *	-1.64 *
LEP	-15.79 *	-16.34 *	-14.14 *	-14.30 *	-11.83 *
LUNCH	-5.57 *	-6.61 *	-7.13 *	-6.01 *	-6.08 *
GIRL	1.40 *	0.78	0.72	0.81	0.68
PARENT2	7.03 *	5.80 *	3.72 *	4.92 *	3.77 *
PARENT1	4.26 *	3.16 *	1.35	2.18	1.79
ECP	-0.83	0.03	-0.49	0.15	-1.28
HDST	-4.84	0.19	3.81	-1.99	-5.28
HISPANIC	-9.37	-8.62 *	-8.28 *	-7.78 *	-8.62 *
BLACK	-14.35 *	-12.88 *	-12.25 *	-11.95 *	-13.70 *
AOTHER	3.19 *	3.36 *	4.25 *	5.02 *	5.05 *
ATTN	0.07 *	0.08 *	0.08 *	0.09 *	0.10 *
ECP_HSP	1.70	1.35	1.23	-0.47	0.93
ECP_BLK	0.46	-0.57	-0.77	-0.46	0.71
ECP_AOTH	3.28	0.88	0.89	-0.47	-0.05
HS_HSP	8.51	5.72	0.43	6.98	9.07
HS_BLK	1.94	-5.08	-7.77	-3.07	2.10
HS_AOTH	14.44	7.85	-0.08	8.47	3.87

*Indicates statistical significance at .05 level

Source: Public Works, Inc.

The results for mathematics achievement indicate even less in the way of statistical significance based on ethnicity. In none of the five years under examination was there a statistically significant mathematics achievement difference between ECP or Head Start participants based on ethnicity. In sum, there is little evidence to suggest that either Black, Hispanic, or other non-White students are disproportionately benefiting from participation in ECP or Head Start.

Does the Impact of ECP Vary by School? (Question 5)

The final research question addressed by this study aimed to examine whether the achievement of ECP students varied depending on the school that these students attended. This question goes to the heart of ECP implementation where site-level differences in staffing, degree of program implementation, and other factors like parent involvement might play a role in making ECP more effective.

To examine school level differences, separate regression analyses were conducted for each of 21 elementary schools and two K-8 schools.¹⁵ The analyses were based on students who were in Grades 4-8 in 1999-2000 in terms of reading and math achievement on the Stanford 9 exam 1998-2000. In looking at the school level results, student achievement of ECP graduates was compared to students without prior involvement in an early childhood educational program.

Table 13: Summary of School Level Results of ECP Graduates

Group	Impact of ECP	Schools
1	Negative	<ul style="list-style-type: none"> • Burbank • Sierra Madre • Norma Coombs
2	Mixed (both positive and negative)	<ul style="list-style-type: none"> • Altadena • Don Benito • Field • Franklin • Hamilton • Jackson • Jefferson • Linda Vista • Madison • Noyes • San Rafael • Washington • Webster
3	Positive but not statistically significant	<ul style="list-style-type: none"> • Allendale • Edison • Longfellow • Roosevelt
4	Positive and statistically significant	<ul style="list-style-type: none"> • Cleveland • Loma Alta • Willard

As shown in **Table 13** above which summarizes the record of the schools, the effectiveness of ECP varied somewhat across schools.¹⁶ Only three schools (Group 1) had consistently lower reading and math scores among ECP graduates. For most schools, the record of ECP graduates was mixed (Group 2, 13 schools). In some years, ECP students did better compared to other students in reading and math, and did worse in other years. An

¹⁵ Although 21 elementary schools include ECP programs, the analysis was conducted in the 23 schools which include elementary level students. Data from PUSD indicates only current and previous year's school of attendance. Thus, students may have attended an ECP program at one of the 21 schools, but then attended one of the two schools without at ECP program.

¹⁶ In interpreting these results, however, it is important to keep in mind that this study was only able to examine student test results by school for two years (1999 and 2000). Ascertaining the long-term school effect on student achievement is also difficult to pinpoint given high student mobility rates within PUSD.

additional 4 schools (Group 3) had ECP scores that compared favorably to those of non-ECP students, but the results were not statistically significant. In only three of the twenty-three schools was the performance ECP graduates consistently higher and statistically significant compared to their non-ECP peers. Complete results by school are included in the Appendix to this report.

Summary

In the section below, we return to each of the study's research questions to summarize our findings.

Question 1: What are the characteristics of ECP students?

In looking at the entire sample of data, the following differences are apparent:

- **Demographic Characteristics.** ECP students are more likely to be Hispanic and less likely to be Black. Compared to other students, ECP graduates are also more likely to be LEP and live with both parents. However, ECP students are less likely to be eligible for Free/Reduced Lunch compared to Head Start participants but more likely than students enrolled in neither early childhood program. There were no gender-related differences by program.
- **Achievement.** ECP graduates outperform Head Start participants in Reading and Math for all years under examination. ECP graduates tend to score 3-5 NCEs higher on average. There is very little difference between ECP graduates and students who did not participate in either ECP or Head Start. Compared to these students, ECP graduates scored quite similarly. Please note, however, that these descriptive results do not imply statistical significance between the performance of ECP graduates and other students.
- **School Attendance.** ECP graduates are slightly more likely to attend school on a regular basis. ECP graduates attend an average of 171 days a year (out of 180 possible days). By contrast, Head Start participants attend an average of 4 days less (167 days) annually and students in neither program also attend less frequently (169 days or 2 days less) compared to ECP graduates.

Question 2: How Well do ECP Graduate Perform?

For all but one cohort of students, ECP graduates tended to achieve at levels equal to those with no program but better than Head Start participants. Compared to students not exposed to either the ECP or Head Start programs, ECP patterns of achievement were similar. ECP graduates do not perform any better or worse than students never enrolled in early childhood educational programs. In sum, the descriptive results in this study suggest that ECP has "leveled the playing field" for students entering school.

Question 3: What is the Long-Term, Independent Impact of ECP on Student Achievement?

Regression analyses conducted to examine the long-term, independent impact of ECP on student achievement controlling for demographic variables indicate that there is no statistically significant long-term effect of ECP on reading or math achievement. Demographic variables such as English language proficiency, socioeconomic status, and parental living arrangements exerted a bigger impact than any programmatic effect. In other words, there was no statistically significant difference between the scores of ECP students and other, non-ECP students. Similarly, there was no statistically significant effect of Head Start participation on reading or math achievement.

Question 4: Does the Impact of ECP Vary Based on Ethnicity?

The regression analyses conducted for this study revealed few differences in achievement patterns of ECP graduates based on ethnicity. Overall, Hispanic and Black students (the vast majority of ECP graduates in the sample) tended to achieve at similar rates of growth. In sum, there is little evidence to suggest that either Black, Hispanic or other non-White students are disproportionately benefiting from participation in ECP or Head Start.

Question 5: Does the Impact of ECP Vary from School to School?

The effectiveness of ECP varied somewhat across schools. For most (N=13) schools, the record of ECP graduates was mixed. In some years, ECP students did better compared to other students in reading and math, and did worse in other years. Only three schools had consistently lower reading and math scores among ECP graduates. Four schools had ECP scores that compared favorably to those of non-ECP students but the results were not statistically significant (i.e., the results could be random). In only three of the twenty-three schools was the performance ECP graduates consistently higher and statistically significant compared to their non-ECP peers (i.e., we are confident that 95% of the time, our results would confirm to these findings). However, these results should be interpreted with caution given possible student mobility among schools.

Comparing Results of 2001 ECP Study to 1998-99 ECP Study

Before concluding the report, it is important to compare the results of this report to that of the report conducted in 1998-1999. As shown in the summary comparison **Table 14** below, we found a stronger ECP effect in 1998-1999 study than in the current five-year longitudinal study.

Table 14: Summary Impact of ECP, Comparison of Two Studies

	1998-99 Study	2001 Study
ECP effect	ECP participants have higher test scores than students with no prior program history	ECP participants score similarly as students with no prior program history in both reading and mathematics.
ECP effect by ethnicity	Attending an early childhood program, either ECP or Head Start, improves Hispanic and Black students' test scores more than White students' scores in the short-term.	Hispanic and Black ECP students do not benefit more from attending ECP program than White students in the long-term.
ECP students vs. Head Start Students	ECP participants have higher test scores than Head Start students.	ECP participants have higher test scores than Head Start students.

There are at least two possible reasons for this difference. First of all, the data used for these two studies are totally different. The earlier study included all students in the District and there is some sample selection in our current study. Students had to be in grades 6-11 in 2000 (i.e., grades 2-7 in 1996) to be included in our 5-year cohort study. This sample selection might very well attenuate the ECP effect by excluding Grade 1 students and those students with missing test score data. Earlier research has consistently shown that the positive effect of early childhood program usually disappears after the program ends, if it is found at all.

Secondly, it is difficult to keep track of students for five years when students change schools during the transition from elementary to middle school or from middle school to high school. We also "lose" students who don't meet our data requirement due to their departure from the District during the study period. It is quite common to analyze the program effect based on the students who have all years of data during the study period. However, students with missing data could be different from students with complete data in some significant ways. It is difficult to say with any certainty whether these departed students were higher achieving and whether including these "missing" students would have increased the measure of ECP effectiveness.

Despite the methodological caveats above, the conclusions of this current study of ECP's impact on student outcomes are clear. Adequate quantitative analysis has been conducted to document the short- and long-term (or lack thereof) impact of ECP on student achievement in reading and mathematics.

The section below describes the implications of the current ECP evaluation, paying special attention to how the current report's findings ought to shape future examinations of ECP. In particular, we make the case for expanding the qualitative aspect of the evaluation of ECP now that the quantitative dimension has been thoroughly explored.

Next Steps: Policy and Practice Implications

Different populations are served by Head Start and ECP: Examining recruitment procedures, program eligibility, and potential curricular modifications. Previous evaluation studies comparing the achievement of ECP and Head Start participants have assumed that the demographics of these students are the same (although regression analyses controlled for demographic factors to present the independent effect of both programs) since the program eligibility requirements for both programs are the same.

However, ECP and Head Start graduates are slightly different from one another in terms of several demographic indicators. For example, Head Start students are more likely to be African-American (41%) than ECP students (28%). ECP students are more likely to be Hispanic, limited English Proficient (LEP) and live with both parents. Also, ECP students are less likely to be eligible for Free/Reduced Lunch (74%) compared to Head Start (85%). It is unclear why these differences exist. It may be that ECP or Head Start appeals to different “types” of families. On the other hand, recruitment policies and practices may be shaping the enrollment of different student populations. At this point, all we know is that these differences exist and that demographic factors have proven more explanatory than program in accounting for achievement differences.

After acknowledging these differences in populations served, it is also important to consider possible adjustments to the curriculum that derive from the student populations served by the two programs. For example, if ECP has (and continues to have) more LEP students, the District may want to consider explicitly embedding curricular strategies and teaching methods that target English language acquisition. Given that our data on the long-term impact of ECP indicated that nearly one-in-five of all secondary (grades 6-11 in 2000) ECP graduates were still classified as LEP, increasing the emphasis on services for these students during an early childhood educational experience may be appropriate.

Short-Term versus Long-Term Impact of ECP: Providing on-going support and intervention for at-risk students. Based on national research and the two evaluations conducted by Public Works, Inc., it appears that the short-term effects of participation of ECP do not continue over the longer-term. Put another way, ECP may be an effective program from the standpoint of preparing students for kindergarten and leveling the playing field for students from disadvantaged backgrounds. However, we were unable to highlight any long-term benefit of ECP participation among graduates now in middle and high school.

Expecting the impact of a preK experience to last through middle and high school years may be an unrealistic goal. Instead, the District may need to consider how best to support students and provide other kinds of intervention programs for students in the upper elementary grades and during secondary school. At this point in time, there is not a clear menu of intervention and support services designed for this purpose.

Other studies have noted that 4th grade is an important benchmark in terms of standardized test scores. This is due to the fact that 4th grade skills prioritize reading comprehension within content areas as opposed to generalized reading and decoding skills. As a result,

student scores on standardized tests often decline in the later elementary grades. This phenomena as well as the data of the ECP evaluations suggest a need for designing a different kind of intervention program or menu of instructional support services for older students. In sum, an articulated strategy for prevention and intervention may be needed at key grade levels.

Examining Qualitative Factors: Incorporating differences in programmatic design and school conditions into future evaluation efforts. Although this evaluation study noted some school level variation in the impact of ECP, we were unable to link these differences to school level implementation strategies because the study did not include a set of qualitative data collection strategies. Thus, we are currently unable to determine which factors may be more conducive to positive student outcomes. For example, school conditions such as low teacher turnover or more effective classroom management policies could be “driving” the effectiveness of the program. Moreover, factors such as the degree of curricular alignment to standards and strong articulation among teachers might exercise a positive influence on student performance.

This study’s focus on the long-term impact of ECP also served to de-prioritize analysis of these qualitative factors. By design, the study examined the results of students in grades 6-11 in 2000. With the focus on past ECP graduates, our study was limited in its ability to “capture” school level implementation differences. It is virtually impossible to describe the differences in programmatic design and school design which occurred in the past. In fact, given student mobility rates in PUSD, students in our sample could have changed schools between the time they were in ECP and enrollment in an elementary school. For example, Norma Coombs has ECP students, but does not have an ECP program.

In order to answer lingering questions about the linkage between program and outcome, we need to collect data that will allow us to describe differences in program design and school conditions. Consideration of qualitative factors will become more important in the near future as there are plans for modifying ECP during 2001-2002. Originally, ECP contained three distinct program elements that served to differentiate it from other early childhood programs:

6. ECP is located on the school campus where the child will attend kindergarten;
7. ECP included both a credentialed and permit teacher; and
8. ECP included home visits.

Next year, PUSD will implement changes that will alter program staffing (removing the full-time crentialed teacher requirement) and modifying the parent involvement component of the program. As ECP will be operating in a new environment, 2001-2002 is an ideal time to document programmatic and school differences in order to explain the relationship between these factors and student performance.

APPENDIX

School Level Impact of ECP

Allendale

- ECP students score 7-9 points higher in mathematics. In reading, ECP students have higher score in all three years, 4 points in 1998. However, none of the difference is statistically significant.

Altadena

- ECP students score 1.5 points lower in 1999 and 2 points higher in 2000 in mathematics. They follow the same pattern for reading, lower in 1999 and higher in 2000. However, none of the difference is statistically significant.

Burbank

- ECP students score a range of 1 to 4 points lower in mathematics and reading, except that in 1998 there is no difference in reading. However, none of the difference is statistically significant.

Cleveland

- ECP students score 5-12 points higher in mathematics, the difference is statistically significant in 1998 and 1999. In reading, ECP students score and the difference is statistically significant for 1998 and 1999.

Edison

- ECP students score 2-4 points higher in mathematics and 1-6 points higher in reading. However, none of the difference is statistically significant.

Field

- ECP students score 3 points higher in 1998 and 1999, 0.5 point lower in 2000, in mathematics. In reading, 1 point lower in 1998, 3 points higher in 1999, and no difference in 2000. However, none of the difference is statistically significant.

Franklin

- ECP students score 0.3-5 points higher in mathematics. In reading, they score 2 points higher in 1998, 2 points lower in 1999, and 3 points lower in 2000. However, none of the difference is statistically significant.

Hamilton

- For 1998 and 1999, ECP students score 2-3 points higher in both mathematics and reading. In 2000, they score 2 points lower in mathematics and 1 point lower in reading. However, none of the difference is statistically significant.

Jackson

- ECP students score 1-2 points lower in mathematics. In reading, they score 2 point lower for 1998, 2 point higher in 1999, and 3 points lower in 2000 reading. However, none of the difference is statistically significant.

Jefferson

- ECP students score 1-2 points higher in mathematics. In reading, they score 1 point lower for 1998, 1 point higher in 1999 and 2000. However, none of the difference is statistically significant.

Linda Vista

- ECP students score 1-6 points higher in mathematics. In reading, ECP students score lower in 1998 and 1999, 5 points higher in 2000. However, none of the difference is statistically significant.

Loma Alta

- ECP students score 2-9 points higher in mathematics. In reading, they score 2 points higher for 1998 and 3 points higher for 1999. There is no difference in 2000 reading. None of the difference is statistically significant except for 1999 mathematics. In 1999, ECP students score 9 points higher in mathematics and it is significant.

Longfellow

- ECP students score 0.2-1 point higher in reading, they score 3 points higher for 1999 mathematics. None of the difference is statistically significant

Madison

- ECP students have mixed results in scores, higher for the first two years in math and the first year of reading. None of the difference is statistically significant.

Noyes

- ECP has a mixed effect on student achievement. It is negative for 1998 reading, 1998 mathematics, and 2000 mathematics. It is positive for 1999 mathematics, 1999 and 2000 in reading. However, none of the difference is statistically significant.

Roosevelt

- ECP students score 3-8 points higher in mathematics. In reading, ECP students score 4-6 points higher. However, none of the difference is statistically significant.

San Rafael

- ECP students score 1-4 points lower in mathematics. In reading, Ecp students have lower score in 1998, and higher scores for the next two years. However, none of the difference is statistically significant.

Sierra Madre

- ECP students score 1-4 points lower in both mathematics and reading. However, none of the difference is statistically significant.

Webster

- ECP students score 1-3 points higher in mathematics. In reading, ECP students score 3 points higher in 1998, 1 point higher in 1999, and 1 point lower in 2000. And none of the difference is statistically significant.

Willard

- ECP students score 2-4 points higher in reading, 2-8 points higher in mathematics. None of the difference is statistically significant except for 1998 and 1999 mathematics. In 1998, ECP students score 8 points higher in mathematics and it is significant. In 1999, ECP students score 7 points higher in mathematics and it is significant.

Norma Coombs

- ECP students score 3-6 points lower in mathematics. In reading, ECP students score 4-9 points lower. None of the difference is statistically significant except for 1998 reading. In 1998, ECP students score 9 points lower in reading and it is significant.

Don Benito

- ECP has a mixed effect on student achievement. It is negative for 1998 reading, 1999 reading, 2000 reading, and 2000 mathematics. It is positive for 1998 and 1999 mathematics. However, none of the difference is statistically significant except in 2000, ECP students score significantly lower, 9 points lower, in reading.

Washington

- ECP students score 1-3 points higher in mathematics. In reading, ECP students score 1.5 points higher in 1998, 0.1 point higher in 1999, and 0.8 point lower for 2000, respectively. However, none of the difference is statistically significant.