November 8, 2010

MEMORANDUM

TO: Legislative Education Study Committee

FR: Craig J. Johnson

RE: STAFF REPORT: NEW MEXICO PRE-K EVALUATION REPORT

In 2005, Legislation endorsed by the Legislative Education Study Committee (LESC) was enacted to establish the *Pre-Kindergarten Act*. Among its provisions, the act:

- provides for a voluntary program of pre-kindergarten services for four-year-old children offered by public schools, tribes or pueblos, Head Start centers, and licensed private providers;
- requires joint administration by the Public Education Department (PED) and the Children, Youth and Families Department (CYFD);
- requires that program efficacy be evaluated and the results reported each year to the Legislature and the Governor; and
- creates two non-reverting funds: (1) the Public Pre-kindergarten Fund administered by PED; and (2) the Children, Youth and Families Pre-kindergarten Fund administered by CYFD.

In FY 11, PED and CYFD together have approved 92 programs serving a total of 4,378 children statewide:

- 51 PED-approved programs in 87 classrooms serving 2,064 children in 26 school districts and three charter schools; and
- 41 CYFD-approved programs at 84 sites serving 2,314 children.

This staff brief outlines:

- New Mexico PreK Funding, and
- New Mexico PreK External Program Evaluations.

New Mexico PreK Funding

The *Pre-Kindergarten Act* creates two non-reverting funds: (1) the Public Pre-kindergarten Fund, administered by PED; and (2) the Children, Youth and Families Pre-kindergarten Fund; administered by CYFD. Another provision allows up to 10 percent of the money in each fund to be used for administrative expenses by the respective departments.

Since 2005, the Legislature has appropriated over $98.75 million to implement New Mexico PreK, including over $6.0 million in federal Temporary Assistance for Needy Families (TANF) funds, and approximately $17 million for classrooms.

- For FY 06, $4.95 million:
  - $4.0 million in a special General Fund appropriation to the Department of Finance and Administration (DFA) to fund a voluntary pre-kindergarten program, which was equally divided between PED and CYFD; and
  - $950,000 (after sanding) from the General Fund to DFA for pre-kindergarten services.
- For FY 07, approximately $13.5 million:
  - $3,995,800 from the General Fund to PED for pre-kindergarten programs in public schools;
  - $1.5 million in a special General Fund appropriation to PED for "one-time prekindergarten start-up costs for developmentally appropriate equipment and classroom safety improvements" in public schools statewide;
  - $4.0 million from severance tax bond (STB) proceeds to PED for pre-kindergarten classrooms in public schools statewide; and
  - $3,995,800 to CYFD from the General Fund for pre-kindergarten programs administered by the department.
- For FY 08, $17.0 million:
  - $7.0 million from the General Fund to PED for pre-kindergarten programs in public schools. According to PED staff, $500,000 was set aside for program startup costs;
  - $3.0 million from STB proceeds and the General Fund to PED for pre-kindergarten classrooms, including portable buildings, in public schools statewide; and
  - $7.0 million from the General Fund to CYFD for pre-kindergarten programs administered by the department. According to CYFD staff, $500,000 was set aside for program startup costs.

- For FY 09, over $23.1 million:

  - $8.5 million from the General Fund to PED for pre-kindergarten programs in public schools;
  - an additional $1.0 million from federal TANF funds to PED for pre-kindergarten programs in public schools;
  - $400,000 in a special General Fund appropriation to PED for pre-kindergarten start-up costs;
  - $3.0 million from STB proceeds to PED for pre-kindergarten classrooms in public schools;
  - $8.5 million from the General Fund to CYFD for pre-kindergarten programs administered by the department;
  - an additional $1.0 million from federal TANF funds to CYFD for pre-kindergarten programs administered by the department;
  - $500,000 to CYFD from reauthorized STB proceeds for pre-kindergarten classrooms; and
  - $200,000 to OEA "to evaluate the kindergarten-three-plus and pre-kindergarten programs."

- For FY 10, approximately $23.2 million:

  - approximately $7.9 million (after appropriation reductions) from the General Fund to PED for pre-kindergarten programs in public schools;
  - an additional $1.5 million from federal TANF funds to PED;
  - $2.0 million from STB proceeds to PED for pre-kindergarten classrooms in public schools statewide;
  - approximately $7.8 million (after appropriation reductions) from the General Fund to CYFD for pre-kindergarten programs administered by the department;
  - an additional $1.5 million from federal TANF funds to CYFD; and
  - $2.5 million from reauthorized STB proceeds to CYFD for pre-kindergarten classrooms.

- For FY 11, approximately $17.0 million:

  - approximately $5.3 million (after appropriation reductions) from the General Fund to PED plus an additional $1.0 million in Pre-K fund balance for pre-kindergarten programs in public schools;
  - an additional $625,000 from federal TANF funds to PED;
  - $2.0 million from STB proceeds to PED for pre-kindergarten classrooms in public schools statewide;
  - approximately $7.7 million (after appropriation reductions) from the General Fund to CYFD for pre-kindergarten programs administered by the department;
  - an additional $416,000 from federal TANF funds to CYFD.

New Mexico PreK External Program Evaluations

To comply with the requirements in law, in 2005, PED and CYFD contracted with the National Institute for Early Education Research (NIEER) at Rutgers University to conduct a

"comprehensive program evaluation" of the New Mexico PreK program. The purpose of the initial contract was to evaluate New Mexico's PreK program for school years 2005-2006, 2006-2007, and 2007-2008.

- During the 2006 interim, NIEER presented its first report which concluded that, although New Mexico's PreK program is still in the developmental stage with room for improvement, the state "has established a promising foundation for building its new PreK initiative."

- During the 2007 interim, the second evaluation presented by NIEER found that New Mexico PreK has made a statistically significant and meaningful impact on children's early language, literacy, and mathematical development. More specifically, the evaluation found increases in:

  - children's vocabulary equivalent to 54 percent more growth;
  - early math skills equivalent to 40 percent more growth; and
  - children's print awareness, more than doubling growth over the year.

- During the 2008 interim, NIEER reported that New Mexico PreK had produced statistically significant gains in children's vocabulary knowledge, math skills, and print awareness. However, based on the assessment instruments used, the evaluators found the overall classroom quality of New Mexico PreK programs to be limited or mediocre.

- During the 2009 interim, NIEER presented results from the initial four years of New Mexico's PreK program in its report. Results of the study show that New Mexico PreK produces consistent benefits for children who participated in PreK, compared to those who did not, across all three years of the study. Findings in literacy and mathematics were statistically significant in analyses for each school year of New Mexico PreK.

In 2009, PED and CYFD contracted with NIEER again for a second series of evaluations to study program results for four more years. In October 2010, NIEER issued a report on the fourth year (school year 2008-2009) of the PreK program. According to OEA, this will be the last report submitted by NIEER as PED and CYFD have decided to terminate the contract for further evaluations effective November 13, 2010 based on budget constraints.

An issue that surfaced during the 2009 interim presentation is that the student identification (ID) number that is issued to all New Mexico PreK students enrolled in a PED or CYFD-approved program is among the data stored at the University of New Mexico. Some programs include the student ID in PED's Student Teacher Accountability Reporting System (STARS) and some programs do not. Currently, the student ID, along with demographic information, is being captured in the UniqID system, which is a separate system from STARS. The UniqID system is a proprietary software product owned by eScholar and is housed on PED-owned servers located in the DoIT datacenter. It issues the student ID numbers used by New Mexico public schools (including PreK programs). PreK student ID numbers follow the students into STARS when they go to kindergarten. All PreK students are in the UniqID system. CYFD and the University of New Mexico use the system to assign ID numbers to these children as do public school PreK programs. There are no plans to house all PreK data in STARS; PED

tracks students in grades K-12. There are some exceptions: three- and four-year-old special education students, PreK students receiving Title 1A Preschool Program services, and Title 1B Even Start program services must be reported in STARS.

The October 2010 report includes positive impacts of PreK in each of three content areas important to early academic success – language, literacy, and math. Overall, the findings suggest that New Mexico PreK improves children's readiness for kindergarten in key academic areas, namely that children's:

- vocabulary scores increased by about 5 raw score points,
- math scores increased by about 2 raw score points, and
- early literacy scores increased by about 23 raw score points.

This report also notes that one in four American four-year-old children attends a program that can be classified as state PreK. In school year 2009-2010, about 17 percent of New Mexico's four-year-olds attended PreK.

Presenter

- Dr. Scott Hughes, Director, OEA, will present additional detail about the results of the external evaluation.

Impacts from the Fourth Year of New Mexico's State-Funded PreK Program

Presentation to the Legislative Education Study Committee
November 2010

Overview of Main Topics

- National and state-level contexts for New Mexico PreK Evaluation
- Research questions and methods
- Child impacts: language, math, literacy
- Classroom quality
- Interpreting the results

National Context

- 38 U.S. states fund PreK programs, serving over 1.2 million children
  - 25% of all 4-year-olds in the U.S. enrolled
- State PreK expanding nationwide, with several states committing to voluntary PreK for all 4-year-olds
- High-quality research on effectiveness of state PreK programs is limited

New Mexico Context

- New Mexico PreK began in 2005, with evaluation starting the same year
- Appropriations and numbers of budgeted children grew from 2005-2009
- Only 7 of 13 Western states offer PreK
  - New Mexico second only to Colorado in % of 4-year-olds enrolled (17% vs. 20%)
- New PreK initiatives develop over time

NM Continuous Improvement Cycle

- Child Assessment - teachers use criteria provided by the Early Learning Outcomes in 7 domains of learning to observe, assess, document, plan appropriate curriculum
- Program Assessment - state government personnel monitor program's contract compliance and adherence with NM PreK Program Standards
- System Assessment - NIEER conducts external assessment for policy and continuous improvement

NM Evaluation to Inform Improvement

Standards/ Objectives	Local Level – Program, Classroom, Child	State Level – Policy, Prof. Dev't
	How are individual children, teachers, and programs doing?	How is NM as a whole doing?
NM PreK Program Standards	Structured Classroom Observations	NIEER Classroom Observations
NM Early Learning Outcomes	Essential Indicators Rubric, etc	NIEER Child Assessments

Research Questions

- Compared to children who did not attend, how do PreK participants benefit in:
  * Language development?
  * Math skills?
  * Literacy skills?
- What are the impacts of PED and CYFD programs in each content area?

Estimating Impacts of PreK

- Compare two groups of NM PreK children
- One group of children already attended PreK and the other group now attending
- Child assessments early in school year
- Comparisons rely on statewide cut-off date for kindergarten enrollment
- Children's ages distributed around the cut-off date and differences between groups are calculated

Preschool

Birthday: 9/1/06

Kindergarten

Birthday: 8/31/06

Describing the Sample

- Children's ethnicities:
  * 63.8% Hispanic
  * 20.9% White
  * 10.7% Native American
  * 4.6% Other ethnicities
- Children's home languages:
  * 85.2% spoke English, or English + another language
  * 14.0% spoke Spanish only

Child Assessment Measures

- Vocabulary knowledge: Peabody Picture Vocabulary Test (PPVT-III)
- Math skills: Woodcock-Johnson Tests of Achievement (WJ-III)
- Early literacy: Early Literacy Skills Assessment (ELSA)
- Spanish-language versions, as appropriate

Child Impacts

- Vocabulary: scores increased about 5 points
- Math: scores increased about 2 points
- Early Literacy: overall scores increased about 23 points
- All increases statistically significant for entire sample (*N* = 1,359*)*

Child Impacts for PED and CYFD

Measure	PED (*N* = 696)	CYFD (*N* = 663)	NM PreK Overall
Vocabulary	3.62	6.80*	5.24*
Math	1.83*	1.20	1.58*
Early Literacy	20.17*	26.37*	23.19*

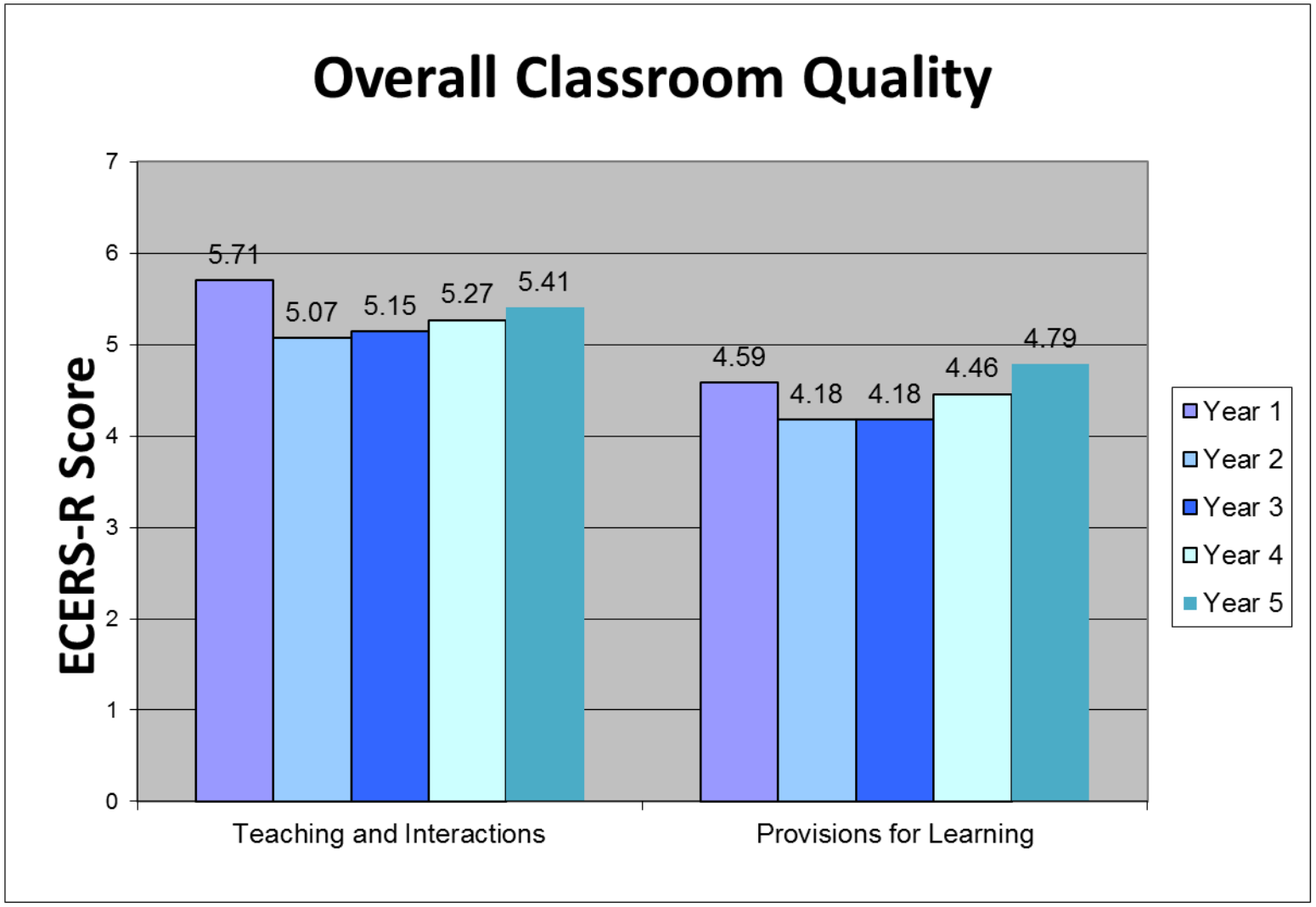
* $p < .05$.

What is the Quality of PreK Classrooms?

Instrument	What's measured?
Early Childhood Environment Rating Scale (ECERS)	Overall classroom quality (e.g. health, safety, all content areas, social-emotional development, daily structure)
Classroom Assessment of Supports for Emergent Bilingual Acquisition (CASEBA)	Practices supporting language and literacy learning (e.g. vocabulary, book study, skill building, writing, letters) with subset of items focusing on dual language learners
Preschool Rating Instrument for Science and Mathematics (PRISM)	Practices supporting math and science learning (e.g. numerical operations, classification, geometry, measurement, scientific inquiry)

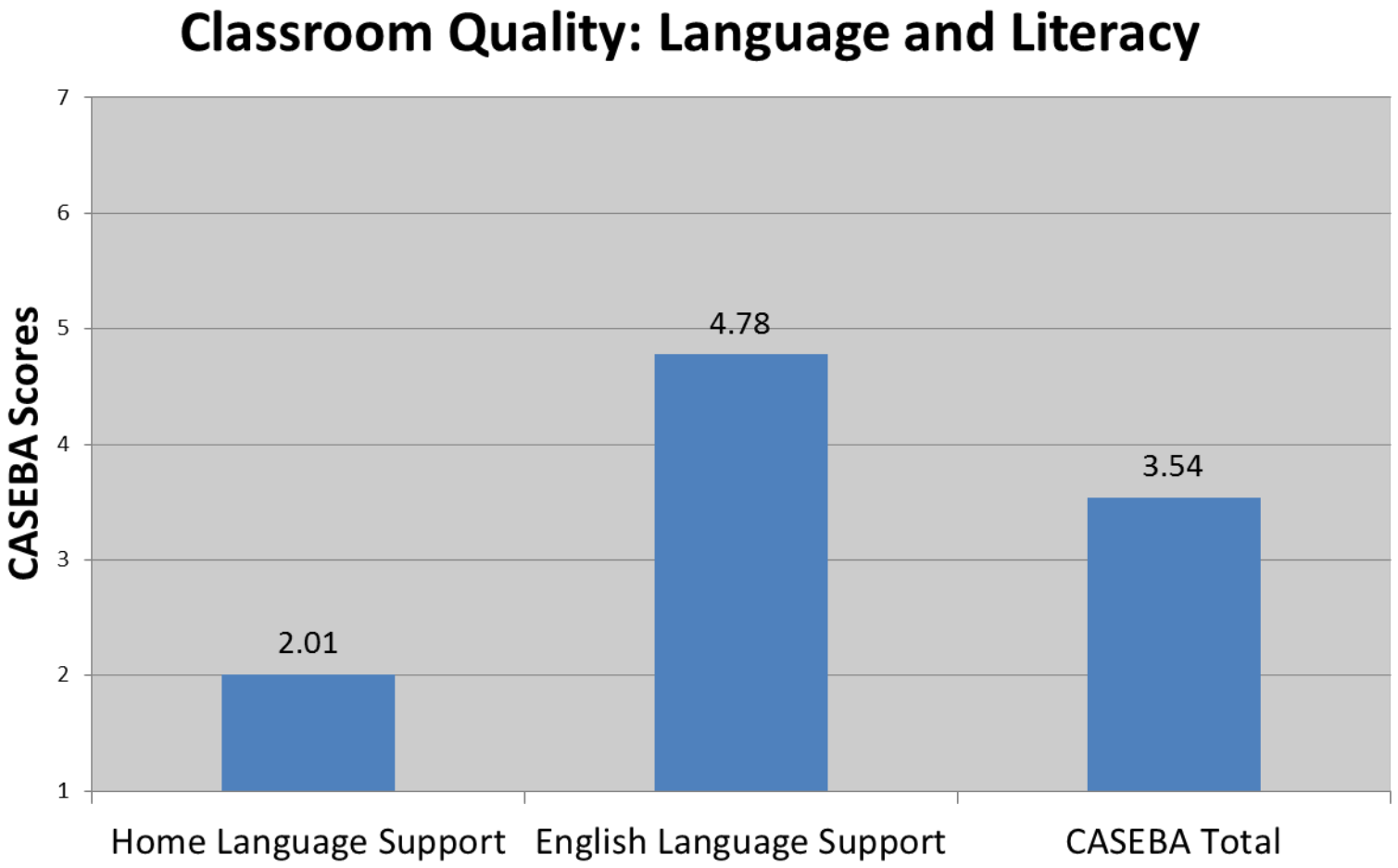
ECERS Scoring

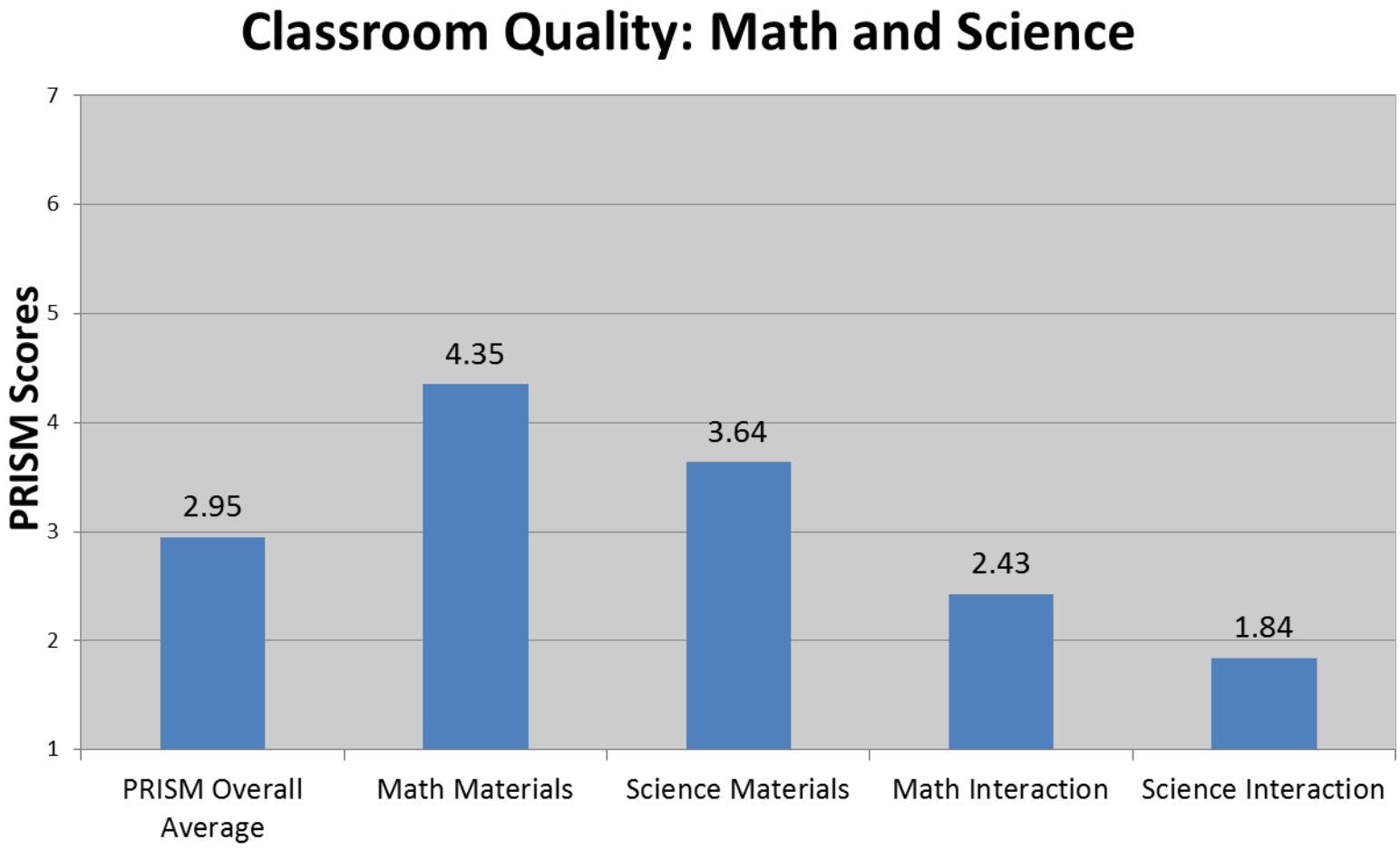
- Instrument used throughout the world to assess basic overall quality.
- *Two Factors:*
  - *Teaching and Interactions* – supervision, using language to develop reasoning and more informally, staff-child interactions and interactions among children
  - *Provisions for Learning* – aspects of the classroom environment such as room arrangement, schedule, gross motor equipment
- 43 items scored on a scale of 1 to 7 with 1 being “inadequate” and 7 being “excellent”


Overall Classroom Quality
ECERS-R Score
7
6
5
4
3
2
1
0
5.71
5.07
5.15
5.27
5.41
4.59
4.18
4.18
4.46
4.79
Teaching and Interactions
Provisions for Learning
Year 1
Year 2
Year 3
Year 4
Year 5

What Do These Results Mean?

- Scores for practices most closely related to preparing children for kindergarten are in the “good” to “excellent” range
- The somewhat lower scores for “provisions for learning” are mostly a result of the program being half-day
- Mean ECERS-R score = 4.62 of a possible 7; a score of 5 indicates good quality


Classroom Quality: Language and Literacy
CASEBA Scores
7
6
5
4
3
2
1
2.01
4.78
3.54
Home Language Support
English Language Support
CASEBA Total


Classroom Quality: Math and Science
PRISM Scores
7
6
5
4
3
2
1
2.95
4.35
3.64
2.43
1.84
PRISM Overall Average
Math Materials
Science Materials
Math Interaction
Science Interaction

Key Findings

- These data allow us to take a closer look at impacts of attending New Mexico PreK during the 2008-2009 school year
- New Mexico PreK continues to produce meaningful impacts on early language, literacy, math development
- Overall classroom quality is good, with some incremental improvements

Interpreting the Results

- Child assessment results are similar in magnitude to those reported in other states
- Some differences in results for PED and CYFD programs, but further research is needed to clarify
- New Mexico PreK is still relatively new, and state contexts may change over time

The New Mexico PreK Evaluation: Impacts From the Fourth Year (2008-2009) of New Mexico's State-Funded PreK Program

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The New Mexico PreK Evaluation: Impacts From the Fourth Year (2008-2009) of New Mexico's State-Funded PreK Program

Executive Summary

The New Mexico PreK initiative has expanded quickly since it began in 2005. During this entire period of rapid growth, New Mexico PreK has participated in an evaluation using a methodologically rigorous design known as the regression-discontinuity approach. This fourth in a series of reports focuses on the impacts of New Mexico PreK on children's vocabulary, math, and literacy skills at the beginning of kindergarten. Children's skills in these key content areas were examined in a total sample of 1,359 children from Public Education Department (PED) and Children, Youth and Families Department (CYFD) PreK sites statewide. Our results from the 2008-2009 school year are consistent with previous findings that New Mexico PreK produces positive impacts for young children that are evident at kindergarten entry.

Specifically, at the beginning of kindergarten:

1. Children's vocabulary scores increased by about 5 raw score points as a result of participating in the New Mexico PreK initiative. These gains represent an improvement of about 24% of the standard deviation for the control group and are attributable to PreK. This finding is important because our vocabulary measure is predictive of children's later success at reading and general cognitive abilities.

2. Children's early math scores increased by about 2 raw score points as a result of participating in the New Mexico PreK initiative. These gains represent an improvement of about 37% of the standard deviation for the control group and are attributable to PreK. This reflects greater success in important skills such as addition, subtraction, and telling time.

3. Children's greatest gains were in the area of early literacy. Their early literacy scores increased by about 23 raw score points as a result of participating in the New Mexico PreK initiative. These gains represent an improvement of about 130% of the standard deviation for the control group and are attributable to PreK. This reflects greater knowledge in areas such as print concepts and phonological awareness.

Each of these findings is both statistically significant and practically meaningful, because these are important content areas related to children's success in kindergarten and beyond. As a result, New Mexico PreK is meeting a common objective of state prekindergarten initiatives nationally, in helping prepare young children for later school success.

At the same time, state policies regarding the availability and areas of emphasis of prekindergarten initiatives tend to vary widely from state to state. Some states have committed to making state pre-K available to all 4-year-olds whose parents would like them to attend – specifically, Florida, Georgia, Illinois, Iowa, New York, Oklahoma, and West Virginia (Barnett, Friedman, Hustedt, & Stevenson Boyd, 2009). To date, Oklahoma has come closest to meeting this goal, with 71% of the state's 4-year-olds currently attending state-funded pre-K programs and an additional 16% enrolled in federally funded Head Start programs (Barnett, Epstein, et al., 2009). During the 2008-2009 school year, twelve other states did not offer any form of statewide pre-K initiative. This group of states included Alaska, Hawaii, Idaho, Indiana, Mississippi, Montana, New Hampshire, North Dakota, Rhode Island, South Dakota, Utah, and Wyoming (although Alaska and Rhode Island developed pilot programs that started the following school year). A number of states that have not yet developed pre-K programs are in the Western U.S.

Although state pre-K initiatives have been growing rapidly for the past two decades, the body of research on their effectiveness is still relatively small. Among the state pre-K evaluations that do exist, even fewer are methodologically rigorous (Gilliam & Zigler, 2000, 2004). Previous research with model preschool initiatives shows that high-quality and well-funded programs can make valuable contributions to children's learning and development (Barnett, 2002). Studies of well-known initiatives including the High/Scope Perry Preschool program, the Abecedarian Early Childhood Intervention program, and the Chicago Child-Parent Centers show that these types of programs produce economic benefits that greatly outweigh their costs (Barnett, 1996; Masse & Barnett, 2002; Reynolds, Temple, Robertson, & Mann, 2002). Benefits include higher achievement test scores and lower rates of special education placements and grade repetition, as well as long-term effects such as improved high school graduation rates and reduced crime and delinquency rates.

State pre-K programs typically operate on a larger scale than many of the model programs that have been intensively studied, and are not as well funded. However, a number of states now offer prekindergarten programs that are both high in quality and widely available. Results from a widely cited and methodologically rigorous study of state pre-K participants in Tulsa, Oklahoma (Gormley, Gayer, Phillips, & Dawson, 2005; Gormley, Phillips, & Gayer, 2008) show that high-quality state pre-K programs can generate statistically significant short-term impacts on a range of academic content areas, for children across a range of racial and ethnic groups, and for children from both low- and middle-income backgrounds.

State-Funded Prekindergarten in New Mexico

New Mexico PreK began serving children during the 2005-2006 school year. This statewide initiative offers voluntary center-based prekindergarten to 4-year-olds across New Mexico. Funds to operate PreK classrooms are provided by the state through CYFD and PED; in order to receive these funds, sites submit proposals that are "... evaluated on the percentage and number of public elementary schools in the community that are not meeting the proficiency component required for calculating adequate yearly progress and that are serving children, at least sixty-six percent of whom live within the attendance zone of a Title 1 elementary school" (Pre-Kindergarten Act, NMSA 1978 § 32A-23-6, 2005). Additional criteria used to prioritize

Table 2. Funding and Enrollment Levels for New Mexico PreK Since 2005

School Year	State Appropriation	Children Budgeted (Number of 4-Year-Olds)
2005-2006	$4,950,000	1,540
2006-2007	$7,990,000	2,194
2007-2008	$13,998,886	3,570
2008-2009	$19,290,300	4,745
2009-2010	$19,842,400	4,963
2010-2011	$15,331,380	4,435

This annual report on the impacts of New Mexico PreK on young children's language, literacy, and mathematics skills builds upon three previous reports using a common methodology (Hustedt, Barnett, & Jung, 2007; Hustedt, Barnett, Jung, & Figueras, 2008; Hustedt, Barnett, Jung, & Figueras-Daniel, 2009). Each of these previous reports presents statistically significant and meaningful impacts of the PreK initiative on skills important to children's school readiness. Again, the current report focuses on the effects of New Mexico PreK programs on children who attended PreK during the 2008-2009 school year, and then entered kindergarten in fall 2009.

Methods

The Regression-Discontinuity Approach

Given the interest in ensuring that scarce state resources are invested effectively, it is important that evaluations of state prekindergarten programs use methodologically rigorous designs. A common evaluation approach involves estimating the effects of an initiative by comparing test scores of children who attended the initiative with the scores of similar children who did not. However, there would be two major problems related to selection bias if this approach was used in the context of evaluating large-scale public prekindergarten initiatives. First, as these types of programs become more widely available, it becomes increasingly difficult to find a comparable group of children who did not attend. Second, even where programs target only a subset of children (such as those from low-income families or Title I schools), the children who attend preschool are different from children who do not. Preschool programs contribute to these differences by targeting different groups of children, but differences also come about because only some eligible families choose to enroll their children. In sum, selection bias can be a problem because programs select children, and also because families select programs. This can lead to differences between preschool participants and non-participants,

that list. Children were tracked to their current elementary schools using information about their anticipated kindergarten destinations collected at the end of the previous school year by PED and CYFD, and compiled by the state Office of Education Accountability. Current kindergarten students were then assessed at their elementary schools.

All child assessments were conducted by New Mexico-based data collectors who received training from NIEER and then worked under the day-to-day supervision of researchers from New Mexico State University. These child assessors visited each sampled PreK site as well as kindergarten sites where former PreK participants had enrolled. Research staff conducted child assessments as early as possible during the school year.

The Fall 2009 Sample

The RDD approach allows us to compare two groups of children who participated in New Mexico PreK:

1. The *Preschool* group, or experimental group, is made up of kindergartners who completed New Mexico PreK the previous school year (2008-2009). Our Preschool group does not include children who participated in other forms of early care or education at age 4, rather than enrolling in New Mexico PreK.

2. The *No Preschool* group, or control group, is made up of New Mexico PreK students at the outset of their PreK year. This group is referred to as the No Preschool group even though these children were currently enrolled in PreK during 2009-2010 – at the time of our child assessments they had just begun the school year and had not experienced the preschool "treatment" yet.

By comparing these groups based on data collected in fall 2009, we are able to estimate the effects of attending PreK during the 2008-2009 school year. In fall 2009, the No Preschool group included 706 children from New Mexico PreK classrooms across the state. The Preschool group included 653 children from kindergarten classrooms across the state. The total New Mexico sample size was 1,359 children.

The total fall 2009 sample was 48.7% female. Children's home languages were: English only, or English plus another language, 85.2%; Spanish only, 14.0%; and other languages, 0.8%. The percentage of children in each ethnic category was: Hispanic, 63.8%; White, 20.9%; Native American, 10.7%; Black, 2.2%; Asian, 0.9%; and Other, 1.5%.

Ethnicities of participants in our study generally reflect those of the population of children who attended the New Mexico PreK program. During the 2009-2010 school year, the percentage of all New Mexico PreK children in each ethnic category was: Hispanic, 62.8%; Caucasian, 20.6%; American Indian and Alaska Native, 13.3%; Black, 2.0%; Asian, 1.2%; and Unknown, 0.1%.

Ethnicities of participants in our study also generally reflect those of the population of children in the State of New Mexico. For comparison purposes, New Mexico-specific estimates

Table 3. Statistical Description of the Sample by Group, for Children Entering PreK and Children Entering Kindergarten from PreK in Fall 2009

	Entering PreK	Entering Kindergarten
Number in group	706	653
Girls (%)	52.0	46.0
Ethnicity (%)		
White	21.5	20.2
Hispanic	61.8	66.0
Native American	10.8	10.7
Other/missing	6.0	3.1
Home Language		
English, or English + another language	84.8	85.6
Spanish only	14.3	13.6
Other	0.8	0.8
Assessment conducted only in English (%)	86.1	89.7
Age (in months) when assessed (Mean/*SD*)	54.86	67.40
	3.47	3.49

Note: *SD* = Standard Deviation

Math Skills. Also consistent with previous years of the study, children's early math skills were measured using the Woodcock-Johnson Tests of Achievement, 3rd Edition (WJ-III; Woodcock, McGrew & Mather, 2001) Applied Problems subtest. For children whose best testing language was Spanish, the *Bateria III Woodcock-Munoz* (Woodcock, Munoz-Sandoval, McGrew, & Mather, 2005) *Problemas Aplicados* subtest was used. Subtests of the Woodcock-Johnson are reported to have good reliability. Raw scores are used in this study.

Early Literacy. Children's early literacy skills were measured with the *Early Literacy Skills Assessment* (ELSA; DeBruin-Parecki, 2005). The ELSA is a child assessment that measures four key principles of early literacy – comprehension, phonological awareness, alphabetic principle, and concepts about print. It has 23 items and appears to be a children's storybook. There are two ELSA protocols that are both available in Spanish and English. An

Table 5 shows linear, quadratic, and cubic estimates for each of our child outcome measures, using fall 2009 data. We found that linear models generally provided the best estimates of relationships between participating in the New Mexico PreK initiative and children's scores on each the three measures. The only exception was that the cubic model provided the best estimate for the Comprehension raw score of the ELSA. For the remainder of this report, we will focus on the linear estimates when reporting fall 2009 data for the PPVT-III, WJ-III, and all subscales of the ELSA except Comprehension. For the Comprehension subscale of the ELSA, we will focus only on the cubic estimate.

Also, in presenting RDD findings we prefer to emphasize the results using one year as the margin around the kindergarten cut-off date, as this allows us to use the largest sample size. However, we also conduct separate linear regressions restricting the sample to children born within 3- and 6-month spans before and after the cut-off date. Restricting the sample to observations closest to the cut-point should reduce any potential bias, though the smaller sample sizes also increase the standard errors. As shown in Table 5, linear estimates using 3-, 6-, and 12-month margins are similar for this sample of New Mexico PreK participants.

The primary RDD analyses used in this report are intent to treat (ITT) estimates, which allow us to examine the effect of the PreK and kindergarten entry policy as actually implemented, using our entire sample. However, we also conducted an additional set of analyses with treatment on treated (TOT) estimates. The TOT estimates exclude children whose birthdates are inconsistent with birth-date cut-off requirements for their PreK or kindergarten programs, and are the types of estimates that we emphasized in our previous reports. The two sets of results were very similar. Here, we focus on the ITT results because they are most conservative, and best address policymakers' interest in testing the effects of policies as actually implemented (Wong et al., 2008).

Child Outcomes from the Fourth Year of New Mexico PreK

The effects of New Mexico PreK on children's receptive vocabulary, mathematics, and early literacy skills are summarized below, and are also shown in graphical form in Appendix A.

The estimated effect of state-funded preschool on children's receptive vocabulary was statistically significant ($p < .05$). Attending New Mexico PreK during the 2008-2009 school year was estimated to increase PPVT scores by about 5.24 raw score points at kindergarten entry. This represents an improvement of about 24% of the standard deviation for the control (No Preschool) group.

The estimated effect of New Mexico PreK on children's early math skills was statistically significant for the 2008-2009 school year ($p < .05$). The increase in Woodcock-Johnson-III Applied Problems subtest scores for New Mexico PreK children is about 1.58 raw score points. This represents an improvement of about 37% of the standard deviation for the control group.

Receptive Vocabulary, Math, and Early Literacy Results for CYFD and PED

A parallel set of analyses was conducted to separately examine the impacts of participating in New Mexico PreK sites offered through PED and those offered through CYFD. These analyses were based on the subgroups of 696 children who attended PED sites and 663 children who attended CYFD sites.

Before presenting the results of these analyses, it is important to emphasize that PED and CYFD PreK sites appear to serve different populations of children. There were statistically significant differences between the PED and CYFD subsamples in terms of both children's ethnicities ($p < .001$) and home languages ($p < .01$). These differences were found among both the Preschool and No Preschool groups. Related to the finding for home languages, there were also statistically significant differences between the PED and CYFD subsamples in terms of the language used for child assessments in this study ($p < .001$ for the Preschool Group and $p < .05$ for the No Preschool Group). A number of additional statistically significant differences were found between children tested in the Preschool Group compared to the No Preschool group within CYFD sites. More results from these demographic analyses are provided in Appendix B.

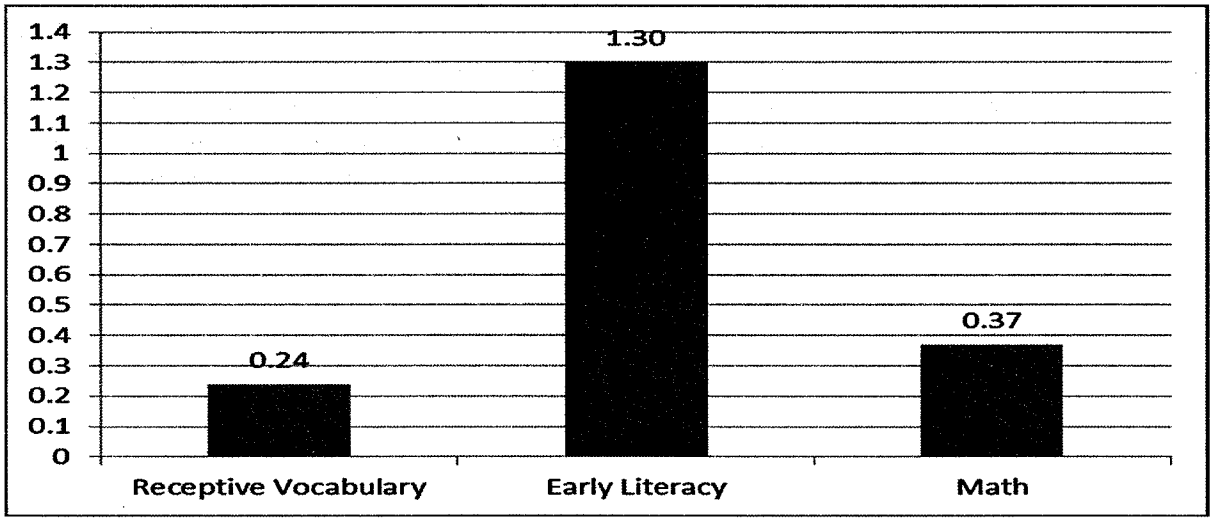
Table 6. Estimated Effects Disaggregated for PED and CYFD Sites and Overall, Fall 2009

Measure	PED	CYFD	All NM PreK
Receptive Vocabulary			
Linear	3.62	6.80*	5.24*
Math			
Linear	1.83*	1.20	1.58*
Comprehension			
Linear	0.38	-0.004	0.13
Phonological Awareness			
Linear	1.92*	3.58*	2.77*
Alphabetic Principle			
Linear	15.53*	21.20*	18.29*
Concepts About Print			
Linear	2.33*	1.59*	2.01*
ELSA Total			
Linear	20.17*	26.37*	23.19*

Note: Receptive vocabulary data represent PPVT raw score point increases. Math data represent WJ-III Applied Problems subtest raw score point increases. Comprehension, Phonological Awareness, Alphabetic Principle, and Concepts About Print represent raw score point increases on the ELSA subtests. Raw score point increases are also used for the ELSA total score.

*$p < .05$.

Figure 1. The Effect of New Mexico PreK on Children's Scores across Measures



New Mexico PreK is still a new initiative, and was growing at a fast pace during the time period of this study. As the program matures, the statewide context in which it operates may begin to change. For example, educational requirements for lead and assistant teachers in PreK classrooms come with a 5-year phase-in period. When data in this report were collected, New Mexico PreK had not yet existed for 5 years, so the effects of those requirements remain to be seen. Also, PreK sites were being prioritized for state funding based on proximity to Title I schools as well as schools' annual progress on No Child Left Behind (Barnett, Epstein, et al., 2009; Pre-Kindergarten Act, NMSA 1978 § 32A-23-6, 2005). These priorities have led to a current emphasis on serving disadvantaged children and communities, but with further expansion, New Mexico PreK would be more accessible to populations of children who are less disadvantaged.

As part of our two most recent data collection cycles, we collected additional data in CYFD and PED classrooms in an effort to better understand the separate impacts of PreK classrooms administered in each of these types of settings. Data from the 2007-2008 school year (Hustedt, Barnett, Jung, & Figueras-Daniel, 2009) showed consistent results across CYFD and PED programs, also reflecting the pattern of results for the entire sample. Data from the 2008-2009 school year are more difficult to interpret. Although CYFD and PED programs produced similar results for children's early literacy, only CYFD programs produced statistically significant results for receptive vocabulary, and only PED programs produced statistically significant impacts for mathematics. Again, it is important to point out that PED and CYFD PreK programs appear to serve different populations of children. Those demographic differences may contribute to the differences between impacts produced by PED and CYFD programs during the 2008-2009 school year. Additional data would be needed to clarify the inconsistent findings between the 2007-2008 and 2008-2009 school years.

In our fall 2009 final report from the previous evaluation cycle (Hustedt, Barnett, Jung, & Goetze, 2009), we recommended further expansion of New Mexico PreK on the basis of strong results in terms of children's language, literacy, and early math skills. The child outcomes for

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kindergarten. The discontinuity in the regression line at the cut-off date shows the estimated effect of New Mexico PreK.

Next, we run a series of regressions to obtain parametric estimates of the treatment effect. In order to describe the effect of PreK participation on child outcomes, we model children's vocabulary, math, and early literacy scores. For the *i*th child in classroom *j*, the relevant equation is:

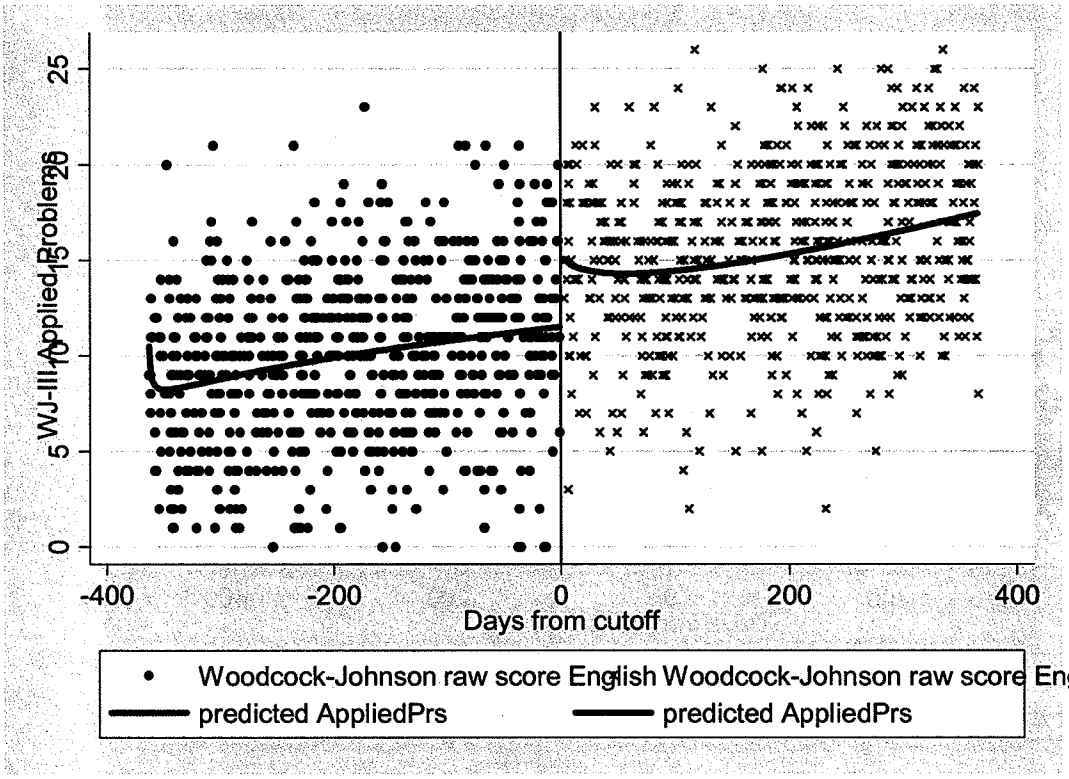
$$Y_{ij} = a + BX_{ij} + \beta_1(\text{Pre-K})_{ij} + g(AV)_{ij} + \varepsilon_i$$

In this equation, Y_{ij} is child *i*'s outcome, X_{ij} is a vector of child characteristics, Pre-K_{ij} is a dichotomous indicator variable such that T=1 for the PreK "treatment" and T=0 for no treatment, and $g(AV)_{ij}$ is a smooth function of the continuous assignment variable. We check the robustness of our estimates by considering alternative specifications for $g(AV)_{ij}$, including polynomials and interaction terms. We determine the order of the polynomial approximation to the $g(AV)_{ij}$ function by examining the statistical significance of the higher order and interaction terms.

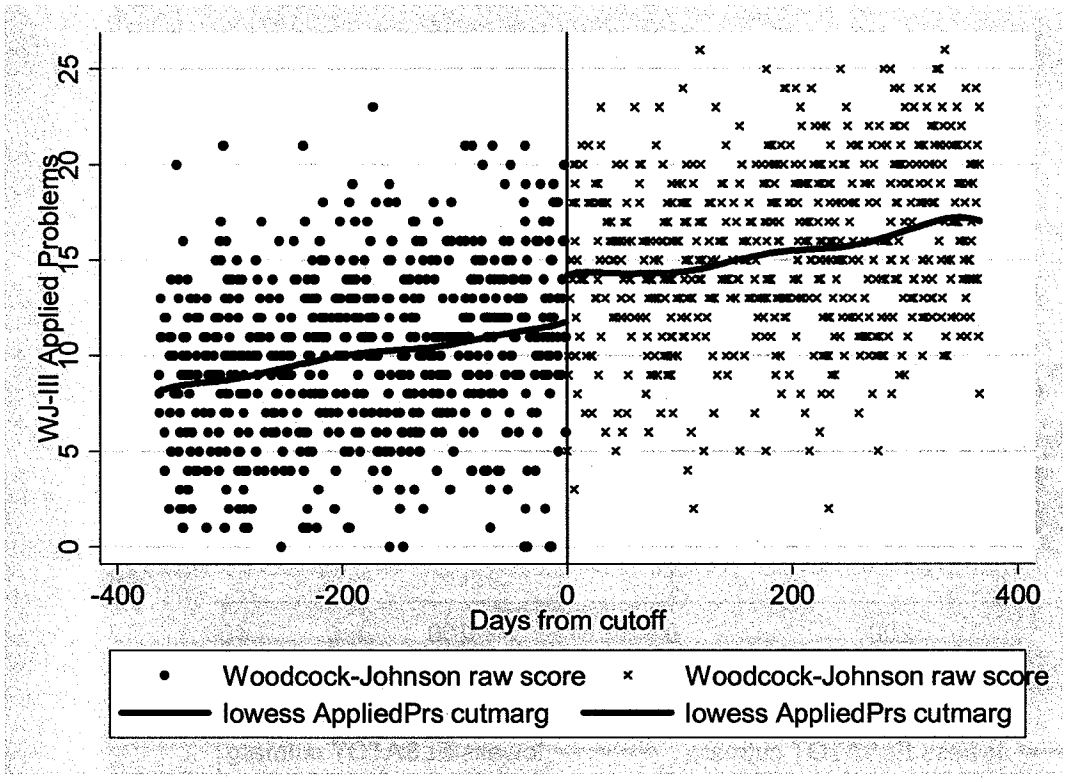
Following Trochim (1984), when the functional form of the regression model is ambiguous, we overfit the model by including more polynomial and interaction terms than needed, yielding unbiased but less efficient estimates. In all the parametric analyses we use Huber-White standard errors adjusted for clustered data at the classroom level. As a final parametric check on functional form, we truncate the dataset to include only observations near the cut-off. In placing greater weight on these observations, we eliminate the influence of extreme assignment variable values that often play a disproportionate role in mis-specifying functional form. We rerun the parametric analyses including only children who have birthdates within 6 and then 3 months on either side of the enrollment cut-off.

Graphical and parametric analyses provide evidence that the response function was linear for receptive vocabulary, quadratic for early literacy outcomes, and cubic for mathematics outcomes. Estimates were robust with respect to narrowing the time window around the birthdate cut-off to 6 and 3 months.

Figure A2. Linear and Lowess Plots of WJ-III Applied Problems Results



(1) Linear Plot



(2) Lowess Plot

Appendix B: Demographic Comparisons for PED and CYFD Children

Below we present demographic comparisons of children attending PED PreK sites and CYFD PreK sites. Table B1 focuses on comparing PED with CYFD children at PreK entry and again at kindergarten entry. Statistically significant differences between PED and CYFD are noted. Table B2 focuses on comparisons of children at PreK entry and kindergarten entry *within* the individual PED and CYFD subgroups. Statistically significant differences between the groups of children at PreK entry and the groups of children at kindergarten entry (within either the PED or CYFD subgroup) are noted.

Table B1. Comparisons between PED and CYFD at PreK Entry and Again at Kindergarten Entry

	Entering PreK		Entering Kindergarten	
	PED	CYFD	PED	CYFD
Number in group	359	347	337	316
Girls (%)	48.7	54.5	49.0	42.1
Ethnicity (%)***				
White	17.5	25.6	11.9	29.1
Hispanic	65.5	57.9	70.0	61.7
Native American	15.3	6.1	16.3	4.7
Other/missing	1.7	10.4	1.8	4.4
Home Language**				
English, or English + another language	83.0	87.0	80.4	90.8
Spanish only	17.0	11.2	18.7	8.5
Other	0	1.7	0.9	0.6
Assessment conducted only in English (%)	83.0	89.6*	83.1	96.5***
Age (in months) when assessed (Mean/*SD*)	54.88	54.89	67.49	67.23
	3.45	3.57	3.62	3.49

Note: *SD* = Standard Deviation
*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.