Early Learning Research Network: Supporting Early Learning from Preschool through Early Elementary School Grades

IES Annual PI Meeting

Thursday, January 10, 2019
Learning Frontiers: Trajectories and Differences for Children in Nebraska

University of Nebraska-Lincoln Team
Research Questions

Effects of Pre-Kindergarten Attendance

For children who *attended* and those who *did not attend* center-based preschool:

• What is the *trajectory* of growth in expressive vocabulary, social skills, and problem behaviors *across the pre-Kindergarten to Kindergarten transition*?

• What is the *difference*, if any, in expressive vocabulary, social skills, and problem behaviors *at the end of Kindergarten*?
Research Questions

Effects of Geographic Locale

For children in *rural* and *urban Nebraska*:

- What is the *trajectory* of growth in expressive vocabulary, social skills, and problem behaviors *across the pre-Kindergarten to Kindergarten transition*?

- What is the *difference*, if any, in expressive vocabulary, social skills, and problem behaviors *at the end of Kindergarten*?
Analytic Approach

• Cross-classified multilevel modeling accounted for repeated observations nested within children, and children changing classrooms/schools from Year 1 to Year 2 (Pre-K to Kindergarten)

• Model controlled for child age, child race/ethnicity, poverty/low income status, parent education, home language
## Sample Demographics ($N = 357$)

<table>
<thead>
<tr>
<th>Child Race/Ethnicity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Black/Non-Hispanic</td>
<td>12.1</td>
</tr>
<tr>
<td>Hispanic/Any Race</td>
<td>26.4</td>
</tr>
<tr>
<td>White/Non-Hispanic</td>
<td>49.7</td>
</tr>
<tr>
<td>Other</td>
<td>6.0</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Primary Home Language</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Only English</td>
<td>77.7</td>
</tr>
<tr>
<td>Other</td>
<td>22.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parent Education (Highest Degree)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; HS diploma</td>
<td>18.2</td>
</tr>
<tr>
<td>HS diploma/GED</td>
<td>21.8</td>
</tr>
<tr>
<td>Some college/Certificate/2-year degree</td>
<td>39.7</td>
</tr>
<tr>
<td>&gt; 4 year degree</td>
<td>20.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Income Status</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 150% FPL &amp; no support</td>
<td>35.4</td>
</tr>
<tr>
<td>≤ 150% FPL &amp;/or govt support</td>
<td>64.6</td>
</tr>
</tbody>
</table>
Attender v. Non-attender: Expressive Vocabulary (EVT)

The increase in EVT scores from the end of Pre-K to the end of K was significantly greater for non-attenders than attenders.
Attender v. Non-attender: Expressive Vocabulary (EVT)

\( N = 319 \) (223 attenders & 96 non-attenders)

- **Fall, Pre-K**
- **Spring, Pre-K**
- **Spring, K**

- **Attender**
- **Non-Attender**

\( p < .05 \)

\( n.s. \)
Attender v. Non-attender: Social Skills (SSIS-SS)

\[ N = 315 \text{ (223 attenders & 92 non-attenders)} \]
Attender v. Non-attender: Social Skills (SSIS-SS)

$N = 315$ (223 attenders & 92 non-attenders)
Attender v. Non-attender: Problem Behaviors (SSIS-PB)

*N = 315 (223 attenders & 92 non-attendees)*
Attender v. Non-attender: Problem Behaviors (SSIS-PB)

\[ N = 315 \text{ (223 attenders & 92 non-attenders)} \]
Rural v. Urban: Expressive Vocabulary (EVT)

N = 319 (119 rural & 200 urban)
Rural v. Urban: Social Skills (SSIS-SS)

N = 315 (116 rural & 199 urban)
Rural v. Urban: Problem Behaviors (SSIS-PB)

The increase in problem behaviors between the Fall of Pre-K and the Spring of K was significantly greater for rural than urban students.

*Problem Behaviors Standard Score*

*N = 315 (116 rural & 199 urban)*

- Fall, Pre-K
- Spring, Pre-K
- Spring, K
Summary: Attenders v. Non-attenders

In Nebraska:

• Center-based Pre-Kindergarten appears effective at establishing an *early trajectory* of success in *expressive vocabulary* and prepares children to be “school ready” by entry into Kindergarten.

• Kindergarten programs appear to be effectively narrowing the gap (difference) between attenders and non-attenders.

• Social skills and problem behaviors appear in the average range for attenders and non-attenders at each timepoint, and across the Pre-K to Kindergarten trajectory.
Summary: Rural v. Urban

In Nebraska:

• Rural and urban children show highly similar levels and patterns of change in expressive vocabulary and social skills within and across Pre-K to Kindergarten.

• Differences between rural and urban children are evident for problem behaviors, such that the difference in problem behaviors from the start of Pre-K to the end of Kindergarten appears more pronounced in rural than urban children.
Thank You

UNL Research Team:
Susan Sheridan, Lisa Knoche, Iheoma Iruka, Amanda Witte,
Natalie Koziol, Mark Dekraai, Jim Bovaird

The Early Learning Network is funded by the Institute of Education Sciences.
PreK Attendance, Academic Skills, Behaviors, and Variation by Race/Ethnicity: Evidence from the Boston Public Schools

JoAnn Hsueh, MDRC
Meghan McCormick, MDRC
Christina Weiland, MDRC
Jason Sachs, Boston Public Schools
Catherine Snow, Harvard Graduate School of Education

The Early Learning Network is funded by the Institute of Education Sciences.
Boston as an Early Childhood Education Research Site

- High-quality public PreK program
  - Substantial short-term impacts on school readiness skills (Weiland & Yoshikawa, 2013)
  - Two evidence-based curricula paired with coaching & training
  - Slots in the PreK program allocated via lottery

- BPS PreK model implemented in CBO PreK programs funded with preschool expansion grant (PEG) funds

- Four-year olds can also access Head Start and other private center-based programs
Research Questions

• Which demographic characteristics (e.g., race/ethnicity, DLL status, and free/reduced price lunch eligibility) predict enrollment in:
  • Public PreK; vs.
  • PEG CBO PreK; vs.
  • Head Start; vs.
  • Other center-based PreK; vs.
  • No enrollment in PreK in 4 year old year (i.e., non-PreK attenders)?

• How do academic skills and behaviors differ between these groups across PreK and Kindergarten?

• How do academic skills and behaviors across PreK and Kindergarten vary by students’ race/ethnicity and family income?
Summary of design and sample

- Students enrolled in PreK and are followed through 3rd grade (non-PreK attenders enrolled in K). Beginning in K, students were only assessed if they showed up in BPS public schools.
- Assessments/teacher reports collected in Fall & Spring of PreK & K.
- Random sampling at school & student-level.

Study Demographics

<table>
<thead>
<tr>
<th>Category</th>
<th>Study sample in PreK &amp; K</th>
<th>All BPS kindergarten students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>White</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Black</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td>Other Race</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Female</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>DLL</td>
<td>70%</td>
<td>70%</td>
</tr>
<tr>
<td>Eligible FRPL</td>
<td>80%</td>
<td>80%</td>
</tr>
</tbody>
</table>
Kindergarten sample composition by PreK attendance
Full sample $N = 571$ students

- Public PreK: 54%
- Head Start: 19%
- Home with parent: 8%
- Home-based childcare: 8%
- PEG CBO PreK: 8%
- Other center PreK: 6%
- Home with other family member: 2%
- Other: 3%
Demographic characteristics by PreK attendance

Source: BPS administrative data & parent report
Language Skills by PreK Attendance Group

Language Skills: PPVT Scores

- Public PreK
- PEG CBO PreK
- Head Start
- Other center care
- Non-PreK attender
- National average

PPVT standard score

Fall of PreK | Spring of PreK | Fall of K | Spring of K
Math Skills by PreK Attendance Group

Math Skills: Woodcock Johnson Applied Problems

WJAP standard scores

Fall of PreK | Spring of PreK | Fall of K | Spring of K
---|---|---|---
Public PreK | PEG CBO | Head Start | Other center care | Non-PreK attender | National average
Externalizing Behaviors by PreK Attendance Group

Externalizing Behaviors: SSIS

<table>
<thead>
<tr>
<th>Teacher Reported SSIS Score (1 - 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
</tr>
<tr>
<td>3.5</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>2.5</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>1.5</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Fall of PreK</th>
<th>Spring of PreK</th>
<th>Fall of K</th>
<th>Spring of K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public PreK</td>
<td>1.5</td>
<td>1.6</td>
<td>1.7</td>
<td>1.8</td>
</tr>
<tr>
<td>PEG CBO</td>
<td>1.4</td>
<td>1.5</td>
<td>1.6</td>
<td>1.7</td>
</tr>
<tr>
<td>Head Start</td>
<td>1.3</td>
<td>1.4</td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Other center care</td>
<td>1.2</td>
<td>1.3</td>
<td>1.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Non-PreK attender</td>
<td>1.1</td>
<td>1.2</td>
<td>1.3</td>
<td>1.4</td>
</tr>
</tbody>
</table>
Variation in Language Skills by Race & Income

Language skills: PPVT

- White
- Black
- Hispanic
- Asian
- Full sample
- National average
- Eligible FRPL
- Not eligible FRPL
Variation in Math Skills by Race & Income

Math skills: Woodcock Johnson Applied Problems

WJAP standard scores

<table>
<thead>
<tr>
<th>Race</th>
<th>Fall of PreK</th>
<th>Spring of PreK</th>
<th>Fall of K</th>
<th>Spring of K</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full sample</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National average</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eligible FRPL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not eligible FRPL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Variation in Behaviors by Race & Income

Externalizing Behaviors: SSIS Teacher-reports

SSIS (scores range from 1-4)

Fall of PreK  |  Spring of PreK  |  Fall of K  |  Spring of K

White  |  Black  |  Hispanic  |  Asian  |  Full sample  |  Eligible FRPL  |  Not eligible FRPL
Summary & next steps

• Public PreK and center-based attenders more likely to be White, not eligible for free lunch, higher parent education, and less likely to be Hispanic or DLLs.

• Enrollees in community-based PreK programs and Head Start more likely to be Black and eligible for free/reduced price lunch.

• Significant mean differences across time in academic skills and behaviors by type of PreK attendance.
  • Growth patterns during the academic year look more similar with non-attenders showing faster growth in math skills in kindergarten.
  • White students maintain or gain in academic skills during summer between PreK and K. Other groups are less likely to maintain or gain.

• Substantial variation in academic skills by race/ethnicity and income.

• Additional analysis suggests that Public PreK attenders experience the highest quality kindergarten experiences.
  • Selection is a key issue to better understand why students do or do not enroll in public PreK.
Preliminary Findings from Early Learning Ohio

Jessica Logan
The Ohio State University

The Early Learning Network is funded by the Institute of Education Sciences.
Early Learning Ohio

Principal Investigator:  
Dr. Laura Justice

Co-Investigators:  
Dr. Tzu-Jung Lin  
Dr. Jessica Logan  
Dr. Kelly Purtell

Key Project Staff:  
Jennifer Bostic  
Allie Hamilton  
Janelle Williamson  
Katie Filibeck  
Lauren Barnes  
Anna Rhoad-Drogalis  
Hui Jiang  
Jing Chen
Early Learning Ohio

Outline:

1) Descriptive information about the sample
2) Differences between PreK Attenders and Non-Attenders
   • Demographics
   • Academic and Social Outcomes
3) Moderators of those differences:
   • Do the impacts of PreK on outcomes vary by demographic characteristics?
Transition from PreK to K: Sample Descriptive Information

• Our longitudinal sample = 796 children in 64 classrooms
  • 539 PreK Attenders
  • 157 PreK Non-Attenders

• Most demographics did not vary by group:
  • 88% spoke English at home; 51% Male
  • 77% White, 15% Black, 15% Asian, AK, Other;
  • 15% Latinx
  • Median household income 30-40k
Transition from PreK to K: Sample Descriptive Information

- Non-Attenders had significantly lower levels of mother’s education:

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Attender</th>
<th>Non-Attender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than high school diploma</td>
<td>13%</td>
<td>17%</td>
</tr>
<tr>
<td>High school diploma or GED</td>
<td>43%</td>
<td>52%</td>
</tr>
<tr>
<td>AA/AS 2 year degree</td>
<td>17%</td>
<td>18%</td>
</tr>
<tr>
<td>Bachelor's degree</td>
<td>19%</td>
<td>11%</td>
</tr>
<tr>
<td>Master's degree</td>
<td>9%</td>
<td>2%</td>
</tr>
</tbody>
</table>
Pre-K attenders and non-attenders:

• Examined a comprehensive set of ways children who did and did not attend PreK might differ:
  
  • **Academic outcomes**: *Woodcock Johnson* Applied Problems, Letter Word ID, Picture Vocab, Head-to-Toes
  
  • **Social outcomes**: *Teacher-Child Rating Scale*: Behavior control and Social skills. *Ladd School Liking, Disliking, and loneliness.*
  
  • **Kindergarten Transition**: Developed a new measure
  
• Analyzed using Hierarchical Linear Models in SAS Proc Mixed, controlling for Income, Mom Ed, Gender, & Race.
Pre-K attenders and non-attenders: Academic outcomes

- Scores from fall of K:

<table>
<thead>
<tr>
<th></th>
<th>Applied Problems SS</th>
<th>Letter-Word ID SS</th>
<th>Picture Vocabulary SS</th>
<th>Head-to-Toes Raw Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-Attender</strong></td>
<td>Mean 97.55</td>
<td>94.77</td>
<td>94.77</td>
<td>28.05</td>
</tr>
<tr>
<td></td>
<td>SD 12.47</td>
<td>11.75</td>
<td>11.73</td>
<td>16.76</td>
</tr>
<tr>
<td><strong>Attender</strong></td>
<td>Mean 100.60</td>
<td>98.21</td>
<td>97.40</td>
<td>30.60</td>
</tr>
<tr>
<td></td>
<td>SD 12.73</td>
<td>12.43</td>
<td>9.52</td>
<td>16.65</td>
</tr>
</tbody>
</table>

Effect Size: Attender vs. Non Attender

|                  | d        | 0.24  | 0.28* | 0.26* | 0.15 |

*significantly different from zero, p<.05, in hierarchical linear models
Pre-K attenders and non-attenders: Child outcomes

- Scores from fall of K:

<table>
<thead>
<tr>
<th></th>
<th>Behavior Control Raw Score</th>
<th>Social Skills Raw Score</th>
<th>School Liking</th>
<th>School Dislike</th>
<th>Loneliness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Attender</td>
<td>Mean</td>
<td>22.03</td>
<td>22.76</td>
<td>5.29</td>
<td>1.84</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>6.35</td>
<td>6.92</td>
<td>1.31</td>
<td>1.72</td>
</tr>
<tr>
<td>Attender</td>
<td>Mean</td>
<td>20.65</td>
<td>22.73</td>
<td>5.04</td>
<td>2.06</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>7.31</td>
<td>6.97</td>
<td>1.45</td>
<td>1.73</td>
</tr>
<tr>
<td>Effect Size:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attender vs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Attender</td>
<td>$d$</td>
<td>-0.18*</td>
<td>0.00</td>
<td>-0.18</td>
<td>0.13</td>
</tr>
</tbody>
</table>

*significantly different from zero, $p<.05$, in hierarchical linear models
Measuring the Kindergarten Transition: Teacher Report

• Developed a New Measure of the Kindergarten Transition.

• Teachers answered five questions about children’s transition to Kindergarten:

  1. Difficulty making friends and interacting with classmates
  2. Difficulty following schedule and routine
  3. Difficulty adjusting to academic demands
  4. Difficulty working in groups in the classroom
  5. Difficulty being organized

• Overall:
  • 29% of students had no difficulty in any of the domains.
  • 30% of student have some difficulty in all five domains.
Pre-K to K transition: Attenders vs. Non-Attenders

- Mean number of difficulties across the five items did not differ by attender status:

<table>
<thead>
<tr>
<th></th>
<th>Making friends</th>
<th>Following routines</th>
<th>Academic demands</th>
<th>Working within groups</th>
<th>Being organized</th>
</tr>
</thead>
<tbody>
<tr>
<td>NonAttender</td>
<td>0.95</td>
<td>0.65</td>
<td>1.05</td>
<td>0.94</td>
<td>1.01</td>
</tr>
<tr>
<td>Attender</td>
<td>0.93</td>
<td>0.71</td>
<td>1.12</td>
<td>1.06</td>
<td>1.15</td>
</tr>
<tr>
<td>Effect Size</td>
<td>-0.02</td>
<td>0.06</td>
<td>0.05</td>
<td>0.10</td>
<td>0.10</td>
</tr>
</tbody>
</table>
Other Meaningful Differences in Academic Outcomes

• Are the observed effects of attender status moderated by other demographic characteristics?

• In other words, is there difference in the importance of PreK attendance for different groups of children?
Moderators of PK Attendance on Outcomes:

- **Gender**: Only found effects for Letter Word ID
  - No difference between girls and boys who attended PreK
  - Girls outperform boys without PreK.

- **Race**: Only found differences for the HTKS
  - The gap between white and non-white students is smaller for PK Attenders than non-attenders

- **Mother’s Education**
  - Gaps between PreK attenders and non-attenders narrowed for Picture Vocabulary, Social Skills, School liking, and Transition Problems
Gap narrowing example:

<table>
<thead>
<tr>
<th></th>
<th>Estimated Picture Vocabulary Standard Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>94</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>NonAttender</th>
<th>Attender</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;HS Education</td>
<td>85</td>
<td>90</td>
</tr>
<tr>
<td>Bachelors Degree</td>
<td>93</td>
<td>93</td>
</tr>
</tbody>
</table>

Bachelor’s Degree

< High School Degree
Conclusions: Other potential moderators to consider

• The district has very limited public PreK

• Characteristics of the child’s *preschool* classroom may be important.
  • 30% in Head Start
  • 27% in Public Pre-K
  • 36% in Private Center-based care

• Dose of the PreK experience; Days and Hours in PreK varied considerably
  • 43% in care 5 or more days per week
  • 19% in care 4 days per week
  • 13% in care 3 days per week
  • Hours per week distributed evenly from 1-> 41 hours per week
UNC ELN: Early Education in Rural NC

Margaret Burchinal, Mary Bratsch-Hines, Lora Cohen-Vogel, Ellen Peisner-Feinberg, Ximena Franco, & Rose Byrnes
Frank Porter Graham Child Development Institute & School of Education
UNC-Chapel Hill

The Early Learning Network is funded by the Institute of Education Sciences.

January 10, 2019
Educational Practices and Child Outcomes in Pre-K

• Early childhood education (ECE) can reduce achievement gap
  • Led to state and federal preschool programs

• Mixed evidence regarding how quality is measured and shorter- and longer-term impacts
  • Very modest associations between “process” quality measures and child outcomes
  • Raises questions about which child outcomes are promoted by which aspects of preschool and early elementary education
ECE Quality Dimensions

• Current models: focus on quality of teacher-child interactions and curriculum
  • Measured at classroom level

• Alternative measures of “process” quality: describing child’s experiences in preschool
  • Measured at child level:
    - Quality of language exchanges with teacher
    - Instructional time in content areas
    - Instructional format
Research Question

• Are gains in child outcomes related to different ECE quality dimensions for different outcomes in pre-K and kindergarten?
Study Sample: Pre-K Attenders

• 6 rural NC counties
• 45 early childhood education programs
  • 62% public school
  • 22% private for-profit
  • 9% Head Start
  • 7% private nonprofit
• 63 randomly-selected NC Pre-K classrooms
  • 455 randomly-selected children
  • 36% Spanish-English English Learners (ELs)
Study Sample: Pre-K Attenders and Non-Attenders

- Followed children into 182 K classrooms
- Recruited 249 children without preschool experience (non-attenders)
- Demographics – a few differences between attenders and non-attenders
  - Non-attenders > Attenders
    - Maternal education
    - Family incomes
    - Smaller household sizes
    - Proportionately fewer ELs
Outcomes Measures (Fall/Spring)

- **Mathematics**
  - Applied Problems (WJ AP)

- **Language and Literacy**
  - Picture Vocabulary (WJ PV)
  - Letter-Word Identification (WJ LW)
  - First Sound Fluency (DIBELS FSF)
  - Phoneme Segmentation Fluency (DIBELS PSF)

- **Executive Functions**
  - Flanker Inhibitory Control and Attention Test (NIH Toolbox Inhibitory Control)
  - Dimensional Change Card Sort (NIH Toolbox Cognitive Flexibility)
ECE Quality Measures

• Teacher-Child Interactions: CLASS
• Instructional Format:
  • Language Interaction Snapshot (LISn) – time child observed in whole and small group
• Content Instruction:
  • LISn – time child observed in reading and math activities/instruction
• Teacher Complex Language:
  • LISn – time teacher used decontextualized language or multi-turn conversation with target child
• Curriculum:
  • Teacher report (PK 80% Creative Curriculum, K – Not used)
ECE Quality: T-C Interactions

<table>
<thead>
<tr>
<th>Category</th>
<th>Pre-K</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASS Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional Support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructional Support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom Organization</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ECE Quality-Child Level Measures

Proportion of Time

- T-C Language
- Literacy Instruction
- Math Instruction
- Whole Group
- Small Group
- Free Choice

Pre-K vs K
ECE Quality and Child Outcomes (HLM Analysis)

• Gain scores analyzed

• PK Model
  • Level 1: $Y_{ijk} = d_{ojk} + d_{1jk} <\text{child covariates}> + e_{ijk}$
  • Level 2: $d_{ojk} = B_o + B_1 \text{CLASS}_{jk} + B_2 T \text{Complex Language}_{jk}$
    + $B_3 \text{Content Activities}_{jk} + B_4 \text{Small Group}_{jk}$
    + $B_5 \text{Whole Group}_{jk} + B_6 \text{Creative Curriculum}_{jk} + e_{jk}$

• K Model – adds Pre-K attender and crosses attender status with ECE quality dimensions
## Pre-K HLM Results: ECE Quality and Gains in Child Outcomes

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>CLASS</td>
<td></td>
<td>.20**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.14**</td>
</tr>
<tr>
<td>T Complex Talk</td>
<td>.16* / .13*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction:</td>
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</tr>
<tr>
<td>Literacy</td>
<td></td>
<td></td>
<td>.13**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math</td>
<td></td>
<td></td>
<td>.13**</td>
<td>.12*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.13*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Group</td>
<td>/ -.20*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.19*</td>
<td></td>
</tr>
<tr>
<td>Creative Curriculum</td>
<td>.12*/ - .17**</td>
<td>-.17**</td>
<td>-.17**</td>
<td>-.13**</td>
<td></td>
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* p<.05; ** p<.01
## Kindergarten HLM Results: ECE Quality and Gains in Child Outcomes

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>CLASS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T Complex Talk</td>
<td></td>
<td>PK -.13*</td>
<td>.10+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non .10</td>
<td></td>
<td></td>
<td></td>
<td>PK -.12</td>
<td>.10+</td>
<td></td>
</tr>
<tr>
<td><strong>Instruction:</strong></td>
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<td>PK .15**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literacy Math</td>
<td>Non .10</td>
<td></td>
<td></td>
<td></td>
<td>PK .12+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math</td>
<td>Non -.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Small Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.12*</td>
</tr>
<tr>
<td>Whole Group</td>
<td>PK .17+</td>
<td>Non -.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: + .10 > p < .05; * p < .05; ** p < .01. Interactions listed if < .10.*
Summary

• No “silver bullet”
  • No single dimension related to most outcomes
  • Different pattern of associations in pre-K and kindergarten

• Some evidence supports focusing on child-level assessments

• Some evidence supports different predictors for different outcomes
  • Time in literacy activities – gains in PK & K literacy skills
  • Teacher complex talk – gains in PK Language but mixed results in K
  • Whole group instruction – smaller gains in PK but mixed results in K
Research Team

Robert Pianta
Jessica Whittaker
Ginny Vitiello
Erik Ruzek
Marcia Kraft-Sayer
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Laura Helferstay
Marianna Lyulchenko
Arya Ansari
Tara Hofkens
Tutrang Nguyen

Partners: School district, IES, ELN
Motivation

• With pre-K now a regular part of the educational landscape, there has been increasing interest in whether scaled-up programs in different localities contribute to children’s early learning

• There has also been growing interest in identifying the conditions contributing to variation in program benefits and which children benefit most from program enrollment
Study Context

• Large urban county: 186,000 students in public schools
• Economically, racially, and linguistically diverse
• Over 15 years experience operating pre-K
  • Classrooms in public schools (72%)
  • Classrooms in community centers (28%)
• Experienced teaching staff
  • Mean years of education: 16.8
  • Mean years teaching experience: 15.6
• Classroom quality (CLASS): 4.4
Research Questions

1. How well are children in this community doing in terms of school readiness in the fall of kindergarten?

2. Are there differences in school readiness skills between pre-K attenders and non-attenders?

3. To what extent do the benefits of pre-K vary by children’s background characteristics (i.e., home language and income) and pre-K experiences (i.e., classroom type and quality)?
## Procedures

<table>
<thead>
<tr>
<th>Pre-K Attenders ( (n = 1,333) )</th>
<th>Non-Attenders ( (n = 1,249) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-K</td>
<td>K</td>
</tr>
<tr>
<td></td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
Sample Demographics Stratified by Pre-K Enrollment

<table>
<thead>
<tr>
<th>Variable</th>
<th>Non-Attender Mean/Percent</th>
<th>Pre-K Attender Mean/Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child male</td>
<td>48%</td>
<td>50%</td>
</tr>
<tr>
<td>Child Hispanic</td>
<td>63%</td>
<td>62%</td>
</tr>
<tr>
<td>Child Black</td>
<td>8%</td>
<td>16%</td>
</tr>
<tr>
<td>Child Asian/other</td>
<td>16%</td>
<td>12%</td>
</tr>
<tr>
<td>Child White</td>
<td>12%</td>
<td>10%</td>
</tr>
<tr>
<td>Child English language</td>
<td>15%</td>
<td>20%</td>
</tr>
<tr>
<td>Child Spanish language</td>
<td>61%</td>
<td>57%</td>
</tr>
<tr>
<td>Child Other language</td>
<td>25%</td>
<td>23%</td>
</tr>
<tr>
<td>Parent years of education</td>
<td>11.79</td>
<td>11.74</td>
</tr>
<tr>
<td>Household income to needs</td>
<td>1.14</td>
<td>1.07</td>
</tr>
</tbody>
</table>
Methods

- Children’s school readiness was assessed at kindergarten entry
  - Academic achievement: Woodcock Johnson
  - Executive function: Pencil Tap Task, Backward Digit Span Task, Head-Toes-Knees-Shoulder Task
  - Social competence: Teacher-Child Rating Scale
- Descriptive statistics (research question 1)
- Regression models that control for a full set of child and family covariates (research questions 2 and 3)
How well are children in this community doing in terms of school readiness in the fall of kindergarten?
## Academic Performance at Kindergarten Entry

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter-Word Identification</td>
<td>93.09</td>
<td>14.38</td>
</tr>
<tr>
<td>Picture Vocabulary</td>
<td>93.41</td>
<td>14.78</td>
</tr>
<tr>
<td>Applied Problems</td>
<td>84.49</td>
<td>17.55</td>
</tr>
<tr>
<td>Quantitative Concepts</td>
<td>88.95</td>
<td>14.41</td>
</tr>
<tr>
<td>Academic Knowledge</td>
<td>82.90</td>
<td>16.44</td>
</tr>
</tbody>
</table>

Children in this study sample are ~75% of a standard deviation **below** national norms academically.
### Executive Function and Social Behavioral Performance at Kindergarten Entry

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pencil Tap</td>
<td>0.82</td>
<td>0.27</td>
<td>0-1</td>
</tr>
<tr>
<td>Backward Digit Span</td>
<td>1.56</td>
<td>0.85</td>
<td>1-5</td>
</tr>
<tr>
<td>Head Toes Knees Shoulders</td>
<td>40.76</td>
<td>27.81</td>
<td>0-94</td>
</tr>
<tr>
<td>Frustration Tolerance</td>
<td>3.37</td>
<td>0.96</td>
<td>1-5</td>
</tr>
<tr>
<td>Task Orientation</td>
<td>3.25</td>
<td>1.05</td>
<td>1-5</td>
</tr>
<tr>
<td>Peer Social Skills</td>
<td>3.90</td>
<td>0.87</td>
<td>1-5</td>
</tr>
<tr>
<td>Conduct Problems</td>
<td>1.79</td>
<td>0.88</td>
<td>1-5</td>
</tr>
</tbody>
</table>

Children in this study sample are doing **moderately well** on these measures of social behavior and executive functioning.
Are there differences in school readiness skills between pre-K attenders and non-attenders?
Academic Benefits of Pre-K

Children who attended pre-K at age 4 demonstrated **stronger** academic skills than children who did not attend these programs.

- Letter-Word Identification: $0.55 ***$
- Picture Vocabulary: $0.46 ***$
- Applied Problems: $0.50 ***$
- Quantitative Concepts: $0.37 ***$
- Academic Knowledge: $0.48 ***$

*Notes.* *** $p < .001.$
Executive Function and Social Behavioral Benefits of Pre-K

Pre-K graduates demonstrated stronger executive function skills than non-attenders, but few differences emerged in their social-behavior.

Effect Size

<table>
<thead>
<tr>
<th>Task</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pencil Tap</td>
<td>0.38 ***</td>
</tr>
<tr>
<td>Backward Digit Span</td>
<td>0.19 ***</td>
</tr>
<tr>
<td>Head Toes Knees Shoulders</td>
<td>0.30 ***</td>
</tr>
<tr>
<td>Frustration Tolerance</td>
<td>-0.02</td>
</tr>
<tr>
<td>Task Orientation</td>
<td>0.15 **</td>
</tr>
<tr>
<td>Peer Social Skills</td>
<td>0.00</td>
</tr>
<tr>
<td>Conduct Problems</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Notes. *** p < .001. * p < .01.
To what extent do the benefits of pre-K vary by children’s background characteristics and pre-K experiences?
Differential Effects of Pre-K

Which children benefited most from pre-K?

• Few differential effects emerged in terms of children’s social-behavior and executive functioning

• In terms of academics, the lowest income children (~30% of a standard deviation) and dual language learners (~45% of a standard deviation) benefited most from pre-K
Which pre-K programs conferred the greatest benefit?

• Few differences emerged academically as a function of auspice or quality

• Community-based (~25% of a standard deviation) and low quality (~15% of a standard deviation) programs were linked with less optimal social skills, but not school-based and high quality programs
Conclusions

• Children in the study sample scored below national norms on achievement at kindergarten entry, but pre-K enrollment minimized the gap

• Consistent with a number of state-level evaluations, academic benefits of pre-K were larger for the most disadvantaged children and dual language learners

• As children make their way through subsequent grades, we will examine the extent to which the benefits of pre-K fade or persist, and the conditions under which these shifts may take place
Optimizing Learning Opportunities for Students

Carol M. Connor
Ashley Adams
Deborah Vandell
University of California, Irvine

The Early Learning Network is funded by the Institute of Education Sciences.
Acknowledgements

• NICHD, OIT and IES Grants: R305N160050, R305B070074, and R305A160399
• Parents and teachers
• ISI lab and collaborators
• Dr. Connor has an equity interest in Learning Ovations, a company that may potentially benefit from the research results. The terms of this arrangement have been reviewed and approved by the University of California, Irvine in accordance with its conflict of interest policies.
Overview

• Describe the OLOS observational system and component parts
• Brief presentation of Findings and Measurement
OLOS combines 3 different valid observations systems: Pre-kindergarten through 3rd Grade

- Children bring widely varying skills and other characteristics to the classroom and may experience different learning opportunities – even when they share the same classroom
- OLOS focuses on the observation of individual students within the classroom
A2i Classroom View
OLOS beta
Observation Protocol

- **Cycle A1**: Child A, B, C (15 min) → Teacher (5 min) → Child A, B, C (15 min) → Teacher (5 min)
- **Cycle A2**: Child A, B, C (15 min) → Teacher (5 min) → Child A, B, C (15 min) → Teacher (5 min)
- **Cycle B1**: Child D, E, F (15 min) → Teacher (5 min) → Child D, E, F (15 min) → Teacher (5 min)
- **Cycle B2**: Child D, E, F (15 min) → Teacher (5 min) → Child D, E, F (15 min) → Teacher (5 min)
- **Cycle C1**: etc.
Reports (Proto-type)

Student Name
Grade 2

Choose A Context
WC  SG  IND

Choose A Management
TM  PM  CM

Content

Literacy
Out of 4 minutes
2 minutes
Meaning-focused

Math
Out of 4 minutes
2 minutes
Applied

Number
Out of 4 minutes
Code-focused

View Participation

View Participation
Online Adaptive Assessments
3rd Grade TCM Small-group Meaning-focused DFR - ISI


First Grade: Distance from Recommendation Predicting Reading standard scores

COLT/OLOS child talk in 2nd and 3rd Grade

Teacher’s Talk

Classmates’ General Talk

Classmates’ Participating Talk

Students’ General Talk

Students’ Generative talk

Student’s Spring Reading Comprehension

Total Fall Reading Comprehension

0.41
0.33
0.12
0.05
0.92
0.10
OLOS feasibility in PreK

Each bar represents the total number of minutes/30 minutes each child spent in literacy learning opportunities. Students sorted by classroom, program, and time in literacy learning opportunity.

Each bar represents the frequency of Child Talk per 30 minutes for an individual child, sorted by classroom, program and frequency of Child Talk.
Summary

• Observing classroom with OLOS is feasible based on our PK-3rd Grade studies
  • Live
  • Video

• Measurement studies of components – ISI, Q-CLE, and COLT – Observation data is complex
  • Multi-level bi-variate factor analysis
  • Multi-level SEM

• Predictive Validity Study is ongoing
# Child Talk Codes – 2nd and 3rd Grade

<table>
<thead>
<tr>
<th>Student Talk Type</th>
<th>Frequency of talk</th>
<th>Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Main</td>
</tr>
<tr>
<td><strong>Participating</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-verbal responding (raising hand, thumbs up/down, shaking head yes/no)</td>
<td>4.99 (5.92)</td>
<td>1</td>
</tr>
<tr>
<td>Verbally answering simple “wh”, yes/no, and choice questions (single child)</td>
<td>1.90 (4.29)</td>
<td>0.94</td>
</tr>
<tr>
<td>Reading text aloud</td>
<td>0.59 (1.72)</td>
<td>0.76</td>
</tr>
<tr>
<td><strong>Generative</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Answering questions that require thinking or reasoning</td>
<td>0.35 (.90)</td>
<td>1.54</td>
</tr>
<tr>
<td>Asking simple, on-topic questions</td>
<td>0.09 (0.40)</td>
<td>1.33</td>
</tr>
<tr>
<td>Using text to justify a response</td>
<td>0.03 (0.25)</td>
<td>1.81</td>
</tr>
<tr>
<td>Off-topic generative participation</td>
<td>0.07 (0.36)</td>
<td>1.95</td>
</tr>
<tr>
<td>Participating in a discussion</td>
<td>0.08 (0.35)</td>
<td>1.55</td>
</tr>
<tr>
<td>Voicing a disagreement</td>
<td>0.00 (0.07)</td>
<td>2.60</td>
</tr>
<tr>
<td><strong>TOTAL Mean Frequency Score (unscaled)</strong></td>
<td>8.55 (0.22)</td>
<td></td>
</tr>
<tr>
<td><strong>Factor variance</strong></td>
<td></td>
<td>0.26</td>
</tr>
</tbody>
</table>
Thank You

The Early Learning Network is funded by the Institute of Education Sciences.
For questions only

• Next slides are included to answer potential questions -
NC Pre-K

• NC Pre-K is an established high quality state-funded pre-k program (Friedman et al., 2018)
• Serves approximately 30,000 children across NC
• Child eligibility criteria:
  • Primary criteria:
    • Year before kindergarten (four-year-olds)
    • Gross income <= 75% of the state median income level
  • Secondary criteria:
    • Includes Limited English Proficiency
• Programs must meet performance standards
Pre-K –
Gains in Child Outcomes During PK

Standardized Child Outcomes

Note: * p<.05; ** p<.01; *** p<.001
RQ1: Pre-k Attender/Non-Attender x EL Differences at Kindergarten Entry

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Picture Vocabulary</th>
<th>Applied Problems</th>
<th>Letter-Word Identification</th>
<th>First Sound Fluency</th>
<th>Phoneme Segmentation Fluency</th>
<th>Inhibitory Control</th>
<th>Cognitive Flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>91.36*** (0.46)</td>
<td>95.96*** (0.49)</td>
<td>97.27*** (0.50)</td>
<td>21.37*** (0.60)</td>
<td>13.68*** (0.54)</td>
<td>31.53*** (0.45)</td>
<td>23.53*** (0.60)</td>
</tr>
<tr>
<td>NCPK</td>
<td>3.65*** (0.96)</td>
<td>3.57*** (1.01)</td>
<td>2.18* (1.04)</td>
<td>0.98 (1.25)</td>
<td>1.13 (1.12)</td>
<td>0.62 (0.93)</td>
<td>2.34 (1.24)</td>
</tr>
<tr>
<td>EL</td>
<td>-12.67*** (1.09)</td>
<td>-4.20*** (1.15)</td>
<td>-0.96 (1.18)</td>
<td>-0.35 (1.42)</td>
<td>0.35 (1.27)</td>
<td>0.73 (1.06)</td>
<td>0.07 (1.41)</td>
</tr>
<tr>
<td>NCPK*EL</td>
<td>4.54* (1.93)</td>
<td>9.29*** (2.04)</td>
<td>3.11 (2.10)</td>
<td>4.47 (2.52)</td>
<td>4.81* (2.26)</td>
<td>1.98 (1.88)</td>
<td>3.30 (2.49)</td>
</tr>
<tr>
<td>Mat Ed</td>
<td>1.60*** (0.22)</td>
<td>1.28*** (0.23)</td>
<td>1.36*** (0.24)</td>
<td>0.70* (0.28)</td>
<td>1.02*** (0.25)</td>
<td>0.11 (0.21)</td>
<td>0.16 (0.28)</td>
</tr>
<tr>
<td>Male</td>
<td>1.20 (0.93)</td>
<td>0.05 (0.98)</td>
<td>-0.05 (1.01)</td>
<td>-0.67 (1.21)</td>
<td>-1.50 (1.08)</td>
<td>-0.77 (0.90)</td>
<td>-1.75 (1.20)</td>
</tr>
<tr>
<td>Age</td>
<td>-3.37* (1.41)</td>
<td>-8.17*** (1.50)</td>
<td>-11.3*** (1.54)</td>
<td>9.78*** (1.84)</td>
<td>5.21** (1.65)</td>
<td>5.80*** (1.37)</td>
<td>6.48*** (1.86)</td>
</tr>
</tbody>
</table>
Figure 1: Fall Scores by Attender and EL Status

- WJ Picture Vocabulary PK*** & PLxEL***
- WJ Letter Word PK*
- WJ Applied Problems PK*** & PKxEL***
- DIBELS Phoneme Segmentation Fluency PKxEL*

Legend:
- Non-Attender (non-EL)
- Pre-K Attender (non-EL)
- Non-Attender (EL)
- Pre-K Attender (EL)
RQ1: Pre-k Attender/Non-Attender x EL Differences at Kindergarten End

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Picture Vocabulary</th>
<th>Applied Problems</th>
<th>Letter-Word Identification</th>
<th>First Sound Fluency</th>
<th>Phoneme Segmentation Fluency</th>
<th>Inhibitory Control</th>
<th>Cognitive Flexibility</th>
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<td>99.65***</td>
<td>115.78***</td>
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<td>(4.66)</td>
<td>(6.34)</td>
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<td>(1.55)</td>
<td>(2.03)</td>
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Figure 2: Spring Scores by Attender and EL Status

- Non-Attender (non-EL)
- Pre-K Attender (non-EL)
- Non-attender (EL)
- Pre-K Attender (EL)