Every Child Ready: Exposure to a Comprehensive Instructional Model Improves Students' Growth Trajectories in Multiple Early Learning Domains

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Abstract

The current study investigates the impact of Every Child Ready (ECR), a comprehensive instructional model that includes: *What to teach, how to teach and how to know instruction is effective.* The ECR instructional model is designed to provide high quality instruction to children via a play-based, thematic curriculum. Participants include 1,538 three- and four-year-olds attending 18 different public charter schools in high need neighborhood in an urban setting. Analyses were conducted to examine performance on measures of language and literacy and math for students who attended schools that implemented the ECR instructional model and schools that implemented "business as usual" instruction. Baseline equivalency analyses that use the treatment indicator to predict all pretest measures and background characteristics in a multilevel model were conducted to ensure equivalence between the two groups in this quasi-experimental design. Growth models estimated using Mplus7 indicate that students who participated in the ECR instructional model improved at a greater rate than their non-ECR peers in the areas of math (1.5 months higher over the course of the year), literacy (1.1 months higher over the course of the year), uppercase letter identification (.8 months higher over the course of the year), and name writing (2 months higher over the course of the year). Findings suggest that exposure to the full ECR instructional model result in improved student outcomes across multiple early learning domains.

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Introduction

Preschool as an early academic intervention has long been a focus of research, policy, and practice. Since the early successes of the Perry Preschool Program (Berrueta-Clement et al., 1984) and the Abecedarian Project (Campbell et al., 2002), resources have been devoted to developing and implementing high-quality early childhood programs (Campbell et al., 2014; Campbell, 2012; Campbell & Ramey, 1994). Because achievement trajectories are set early in life (Alexander & Entwisle, 1988), such interventions work best when they occur early in an effort to ameliorate gaps in children's performance before they begin kindergarten. These achievement gaps can be conceptualized as lack of equitable access to opportunity before underserved children begin school (Welner & Carter, 2013). Such gaps appear as early as eighteen months of age and not only persist throughout a child's schooling, but also tend to increase over time (Fernald, Marchman, & Weisleder, 2013). Ultimately, without intervention, the achievement gap leads to higher high school and college drop out rates, a meaningful loss of personal wages, and decreased economic productivity for children from high-risk backgrounds (Leach & Williams, 2007; Reynolds & Temple, 2006; Wald & Losen, 2007). The strong, positive effects of high-quality preschool on the academic outcomes of disadvantaged children have been identified as a potential avenue for intervention (Heckman, 2006).

Many factors go into making a high-quality preschool program, such as curriculum content, professional development to enhance better teacher–student interactions, and even the assessments used to monitor academic growth. Integration and delivery of resources in a single package to support teachers and students is key to successful implementation and outcomes. Many available commercial curricula only target four-year-old children in preschool settings,

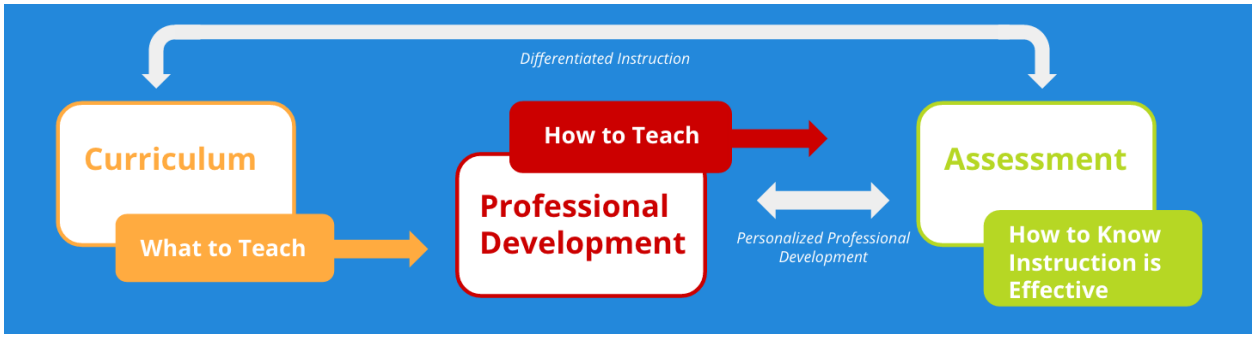
despite a growing availability of three-year-old slots in preschool programs, or focus on the strategies of instruction with little actual content provided (Clements, 2007). The challenges of preschool education can be focused around three central areas:

1. What to teach: a lack of affordable, comprehensive, research-based curricula.
2. How to teach: a shortage of highly-qualified early childhood teachers.
3. How to know instruction is effective: a lack of developmentally appropriate student assessments that can be used to inform instruction.

The *Every Child Ready* (ECR) Instruction Model tackles the three challenges listed above. ECR is a data-driven, evidence-based instructional model that integrates three key elements (see Figure 1):

1. Core curriculum: high-quality, research-based content written to be usable by teachers of all experience levels. All content is available online to reduce cost and increase accessibility.
2. Professional development: intensive, targeted professional development designed to support new and experienced teachers.
3. Assessments: reliable and valid assessments tied to early learning standards and supported by linked reporting designed to help teachers differentiate instruction for students.

Figure 1
The Every Child Ready Instructional Model



The current study utilizes a quasi-experimental design to determine the impact of implementing the full ECR preschool model in comparison to a non-ECR preschool experience, or "business-as-usual." The quasi-experimental group was comprised of schools that used ECR formal assessments, but not curriculum, professional development, or informal assessment. The treatment and control groups had similar demographic characteristics, and met standards for baseline equivalence, making them ideal for determining the impact of exposure to the ECR curriculum.

Every Child Ready **Overview**

ECR provides resources and services through a comprehensive instructional model comprised of three key elements:

First, the core ECR curriculum is a play-based, scripted curriculum comprised of 10 thematic units, each three weeks in length. Lessons are built around Chamot and O'Malley's (1994) Cognitive Academic Language Learning Approach and Vygotskian principles are embedded within its Approaches to Learning standards and ongoing instructional activities. The curriculum is designed to support access to content for all classrooms, regardless of teacher experience. The ECR curriculum is built around recognized early learning standards and aligned

to Common Core Kindergarten standards. The ECR curriculum includes a two-year scope and sequence that differentiates instruction for three- and four-year-olds, and provides structured but flexible lesson plans for multiple instructional components throughout a full-length school day. ECR provides teachers with access to high-quality, engaging, and connected learning opportunities, minimizing transitions and maximizing instructional time to support equity for all learners. This enables teachers to address the needs of young learners using a single curricular framework that is systematically sequenced over two program years, and is also connected to the important skills children will need in kindergarten and beyond.

Second, ECR professional development provides teachers and school leaders differentiated professional development that supports them in both curriculum implementation and pedagogical best practices. ECR's blended professional development model is a mixture of: (a) in-person workshops and online modules; (b) targeted virtual and in-class coaching with feedback; and (c) teacher and leader self-guided activities.

Finally, ECR includes a robust system to support low-cost, valid and reliable student assessments aligned to early development standards and the Common Core. Student assessments include formal direct assessment three to five times per year, in addition to daily structured checks for understanding during small group instruction. ECR also incorporates observational tools that measure teacher quality to help support student achievement. These include formal and informal observations of classroom quality. Associated reporting is designed to support differentiated instruction for students and differentiated coaching and support for teachers.

The purpose of the present study was to determine if there might be evidence of ECR effects on preschool children's academic gains. To do so, we addressed the following research questions:

1. Do students in ECR classrooms show faster growth in early math skills than students in non-ECR classrooms?
2. Do students in ECR classrooms show faster growth in early language and literacy skills than students in non-ECR classrooms?

Method

Participants

In the current study, data from 1,538 three- and four-year-olds was used to determine the impact of ECR on students' academic outcomes. The treatment sample was comprised of students attending 18 different schools (n = 1,298) implementing the full ECR model. The control sample was comprised of students attending two schools that did not use the ECR model, but administered the same formal student assessments five times per year (n = 204). Propensity scores were used to establish baseline equivalency between the two groups, ensuring that these were appropriate comparisons for a quasi-experimental design. Student demographic characteristics (see Table 1), as well as information about the number of three- and four-year-old students and the number of new and returning four-year-old students were used as controls in analyses.

Table 1
Demographic Characteristics of Samples

Variable		Non-ECR	ECR
		n = 204	*n* = 1,298
Gender			
	Male	51%	50%
	Female	48%	49%
	Unknown	1%	1%
Lunch Status			
	Free	94%	76%
	Reduced	0%	4%
	Paid	6%	16%
	Unknown	0%	4%
Race			
	Black	98%	84%
	White	0%	9%
	Other	1%	6%
	Unknown	1%	2%
Ethnicity			
	Hispanic	1%	10%
	Non-Hispanic	95%	90%
	Unknown	5%	0%

Measures & Procedure

Teachers administered three direct assessments for children in both ECR and non-ECR classrooms. Student academic progress was measured at five equally spaced time points throughout the academic year over an eight-month time period. Baseline assessments were conducted in September/October and outcome assessments were conducted in May/June. Assessments were done using three measurement instruments across five academic domains.

Teachers comply with rigorous reliability standards, including attending an in-person summer assessment training, completing online checks for understanding before every

assessment window, and as subset of teachers co-scoring with instructional leaders during each wave.

Early math (0-100) and language and literacy (0-55) skills were evaluated using the ECR: Math (ECR:M; AppleTree Institute, 2010) and ECR: Language & Literacy (ECR:LL; AppleTree Institute, 2011) assessments. These are criterion-referenced tools created and validated by AppleTree Institute, the publishers of *Every Child Ready*. Although these instruments were designed by the same group as who made the curriculum, the instruments themselves are curriculum-agnostic. The ECR:M and ECR:LL assessments are designed to capture skills associated with being ready for kindergarten, and not simply skills that are taught in the ECR curriculum. These instruments have been validated using the Test of Early Mathematics Ability – 3d Edition (TEMA-3; Ginsburg & Baroody, 2003), Peabody Picture Vocabulary Test (PPVT-4; Dunn & Dunn, 2007), and Test of Preschool Early Literacy (TOPEL; Lonigan, Wagner, Torgesen, & Rashotte, 2007) and determined to be reliable and valid measures of early math and language and literacy performance.

In addition the Phonological Awareness Literacy Screener (PALS-PreK; Invernizzi, Sullivan, Meier, & Swank, 2004) was used to measure Letter Identification (0-26), Letter Sound Knowledge (0-26), and Name Writing (0-7).

Results

Baseline Equivalence

Baseline equivalency analyses that use the treatment indicator to predict all pretest measures and background characteristics in a multilevel model were conducted to further ensure equivalence between the two groups. The difference between treatment and control groups at

baseline was quantified as a standardized coefficient. Standardized differences at baseline for four of the five outcomes were small enough (range .08 - .16) to meet the threshold indicating equivalent groups ($d < 0.25$) as outlined by What Works Clearinghouse and the Institute for Education Sciences. However, PALS Name Writing had a standardized difference of .29, suggesting that at baseline, fewer children in the ECR group had the ability to fully write their names.

Data Analysis

Having five measurement points throughout the year allowed for growth analyses, which estimated a starting point and a linear slope for each student. Importantly, if ECR were a more effective curriculum than the business as usual, we would expect that the slope would be steeper for children who receive ECR. This is fundamentally what these analyses tested. ECR exposure (dichotomous no or yes) was used as a predictor for the intercept (beginning of year) and slope. If ECR was a significant predictor of the intercept, this indicated children at ECR and non-ECR schools started out the year with different levels of that variable. If ECR was a positive predictor of the slope, this indicates that children at ECR schools grew faster than children at non-ECR schools.

All models were estimated using Mplus 7. Missing data and non-normality was accounted for using Full Information Maximum Likelihood with robust standard errors (ESTIMATOR = MLR). In addition, the standard errors were adjusted for the fact that children were nested within Campus using the TYPE = COMPLEX command. This was done because our variable of interest (ECR) is assigned at that level. Our models accounted for the fact that children were nested within different school campuses. Although the schools are very similar, we

also included a variety of control variables to statistically adjust for any differences based on child age as of September 1, 2015, gender, free/reduced-price lunch status, race (Black v. non-Black), ethnicity (Hispanic v. non-Hispanic), grade (pre-K v. preschool), and whether or not the student was returning from the prior year. Furthermore, because we were comparing schools that were similar, but not randomly assigned, we constructed propensity scores for each child. Propensity scores reflect the probability for each individual of being at an ECR school based on their demographic characteristics, the two-way interactions between the demographic characteristics, and their beginning of year test scores. Visual inspection of the propensity scores indicated a large degree of overlap in probability between the two distributions. These propensity scores were used as covariates along with children's demographic characteristics. Results were highly similar when propensity scores were not used.

For the growth models, many of the variables had ceiling effects where the distribution was truncated at the higher end. To provide less-biased estimates, outcome variables in the measurement part of the growth model were treated as censored. Intercepts and slopes were allowed to correlate.

Early Math Skills

Results of the ECR:M model indicated that the non-ECR group started the year with a score of 47.05, whereas children in the ECR classrooms were estimated to start the year 1.76 units lower, but this was a non-significant difference. Children in non-ECR classrooms grew at a rate of 4.68 units per month, whereas children in ECR grew at .87 units/month faster rate than children in the non-ECR classroom (Table 2). Beyond the standardized coefficients, to determine an estimate of the effect size, we looked at the estimated difference over the course of

a year. We took the growth difference (.87 units/month), multiplied it by the number of months in the academic year (8 months) and divided it by the non-ECR growth rate (4.68 units/month). Thus, we determined that the ECR group grew by an additional 1.5 months on this measure over the course of the year.

Early Language and Literacy Skills

Results of the ECR:LL model indicated that non-ECR students started the year with a baseline score of 21.28 units. ECR children started the year .87 units lower at baseline. Non-ECR children grew 2.74 units/month on average, but ECR children grew at an additional 0.36 units/month faster (Table 2). By the end of the year, ECR students were estimated to be 1.1 months ahead of the non-ECR group.

Results of the PALS Letter–Word Identification subtest indicated that non-ECR children started the year at 18.45, whereas ECR children were estimated to have started the year .94 points lower, but this difference was non-significant. Non-ECR children grew at a rate of 2.48 units/month whereas ECR children were estimated to grow at an additional rate of .24 units/month faster (Table 2). This corresponds to the ECR group ending the year .8 months ahead of the non-ECR group.

Results of the PALS Letter–Sounds subtest indicated that the non-ECR group started the year at 8.65 and grew at a rate of 1.97. The ECR group was estimated to have started the year 1.24 units lower, and grow at a rate .11 units/month faster, but these differences were non-significant (Table 2).

Results of the PALS Name Writing subtest indicated that non-ECR children started the year with a score of 4.24 whereas ECR children were estimated to have started the year .71 units

lower. Non-ECR children grew at a rate of .60 units/month, but ECR children grew at a rate .15 units/month faster. Over the course of the year, this corresponds to the ECR group gaining an additional 2 months of growth.

Table 2
Linear Growth Models Accounting for Ceiling Effects and Campus

		ECR Predictor	
Outcome	Mean	b	beta
ECR Math Intercept	47.05***	-1.76	-.08
ECR Math Slope/Month	4.68***	0.87**	.47**
ECR Language & Literacy Intercept	21.28***	-0.87*	-.09*
ECR Language & Literacy Slope/Month	2.74***	0.36*	.44*
PALS Letter-Word Intercept	18.45***	-0.94	-.08
PALS Letter-Word Slope/Month	2.48***	0.24**	.20**
PALS Letter-Sounds Intercept	8.65***	-1.24	-.16
PALS Letter-Sounds Slope/Month	1.97***	0.11	.12
PALS Name Writing Intercept	4.24***	-0.71***	-.29***
PALS Name Writing Slope/Month	.599***	0.15***	.49***

* $p < .05$, ** $p < .01$, *** $p < .001$

Summary and Conclusions

Despite the large number of 3- and 4-year-olds enrolled in some form of early care (Barnett, 2010) and the increased focus on preschool as an early intervention for children, it remains difficult to find an instructional model that addresses the varied challenges of teaching this age group. *Every Child Ready* (ECR) was designed to meet educators' needs in the domains of content, professional development, and assessment.

Students in classrooms using the ECR instructional model experienced greater growth from fall to spring in early math, language and literacy, letter identification, and name writing performance. These additional gains resulted in one and two months of additional growth for ECR students. There were no significant differences between ECR and non-ECR students in letter sound knowledge. These findings suggest that access to ECR improves student outcomes in multiple domains. Use of a comprehensive core curriculum coupled with targeted professional development and differentiated data reporting derived from frequent student assessments appears to result in greater student outcomes than those seen as a result of other curricula used by the comparison group.

Analyses suggest that the success of ECR is due to the comprehensive nature of the program. Increased skill acquisition results from exposure to an integrated curriculum, professional development, and assessment and reporting framework. These three elements work together to support teachers in delivering rich content to students, while using student data to drive differentiated instructional practices on a daily basis. Future research will focus on a more nuanced understanding of what specific elements of ECR are most impactful for student outcomes and teacher quality.

80% of the sample served here is comprised of students who qualify for free or reduced price lunch. This is a common proxy for socioeconomic status, and highlights ECR's focus on enhancing outcomes for high-risk populations in an effort to address the achievement gap. This is a primary goal of many early childhood programs, with the goal of improving student outcomes before children enter kindergarten, which may allow for greater academic access in elementary school.

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