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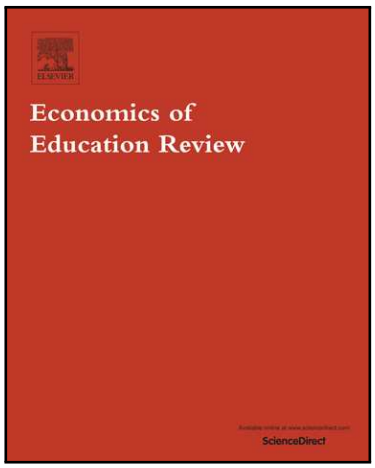

Boosting School Readiness: Should Preschool Teachers Target Skills or the Whole Child?

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PII: S0272-7757(17)30250-9
DOI: 10.1016/j.econedurev.2018.05.001
Reference: ECOEDU 1800

To appear in: *Economics of Education Review*

Received date: 11 April 2017
Revised date: 30 April 2018
Accepted date: 1 May 2018

Please cite this article as: Jade M. Jenkins , Greg J. Duncan , Anamarie Auger , Marianne Bitler , Thurston Domina , Margaret Burchinal , Boosting School Readiness: Should Preschool Teachers Target Skills or the Whole Child?, *Economics of Education Review* (2018), doi: 10.1016/j.econedurev.2018.05.001

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Highlights

- We aggregate data from a multi-site experimental study of preschool curricula
- We compare mandated ñwhole-childò curricula with academic-skill curricula in boosting skills
- Academic-skill curricula boost literacy/math skills; widely used whole-child curricula do not
- Findings show little correspondence between measures of classroom quality and childrenôs skills

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Title: Boosting School Readiness: Should Preschool Teachers Target Skills or the Whole Child?

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JEL codes:
I28, J00, I20

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TITLE: Boosting School Readiness: Should Preschool Teachers Target Skills or the Whole Child?

Abstract: We use experimental data to estimate impacts on school readiness of different kinds of preschool curricula ï a largely neglected preschool input and measure of preschool quality. We find that the widely-used ñwhole-childò curricula found in most Head Start and pre-K classrooms produced higher classroom process quality than did locally-developed curricula, but failed to improve childrenôs school readiness. A curriculum focused on building mathematics skills increased both classroom math activities and childrenôs math achievement relative to the whole-child curricula. Similarly, curricula focused on literacy skills increased literacy achievement relative to whole-child curricula, despite failing to boost measured classroom process quality.

Experimental and quasi-experimental research indicates that exposure to high quality early childhood education can have long-term positive impacts on earnings and health, with the most encouraging evidence coming from early childhood education programs that operated in the 1960s and 1970s ð Abecedarian and Perry Preschool (Campbell et al. 2008, Belfield et al. 2006, Campbell et al. 2014, Heckman et al. 2010, Anderson 2008, Conti, Heckman, and Pinto 2015). Growth in cognitive and noncognitive skills across a preschool academic year depends first and foremost on the amount and quality of the learning experiences in the classroom. Policy approaches to improving these learning experiences include reducing class size (in Kindergarten; Chetty et al. 2011), regulating the health, safety and, increasingly, the ñprocess qualityò of preschool classrooms through state Quality Rating Improvement Systems (QRIS; Sabol et al. 2013), and, less successfully for elementary and secondary education, increasing teacher qualifications and/or pay (Jackson, Rockoff, and Staiger 2014).[1]

1 Correlational studies of early childhood education that resemble counterpart studies in K-12 find no significant associations between teacher qualifications and credentials and growth in child outcomes (see Early et al., 2007).

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We focus on a different and relatively neglected determinant of the quality of learning experiences: the content and style of instruction (known in schools and the education literature as the curriculum). Curricula provide teachers with day-to-day plans on what and how to teach. These include daily lesson plans, project materials, and other pedagogical tools. Instructional materials and the strategies promoted by curricula constitute some of the most direct and policy-relevant connections to learning activities in the classroom. The majority of early childhood education programs use curricula that are developed by publishers and marketed to teachers and schools to guide student learning. In most cases, educators choose among preselected curricular options based federal, state, or local policies, with little scientific guidance, a few popular selections, and substantial costs. Commonly-used preschool curricula range from $1100-$4100 per classroom, making curricula a $100 million investment for the Head Start program alone.

Most preschool classrooms in the United States use what are typically described as ñwhole-childò or ñglobalò curricula. Indeed, federal law requires Head Start programs to purchase and utilize instructional materials that adopt the whole-child approach, and many state-funded pre-K programs use whole-child instructional materials as well. Rather than directing teachers in their explicit academic instruction, this model seeks to promote learning by encouraging children to engage independently in a classroom stocked with prescribed toys and materials designed to promote noncognitive and, in some cases, cognitive skills. The whole-child approach, as embodied in an early version of the HighScope curriculum, was used in the very successful Perry Preschool program (Schweinhart and Weikart 1981).

The whole-child approach is grounded in a rich body of research from psychology on child development (Piaget 1976, DeVries and Kohlberg 1987, Weikart and Schweinhart 1987), but typically provides only very general

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guidance for teachersô daily efforts. Given this lack of specific guidance, it requires a great deal of skill on the part of the teacher to translate child-chosen activities into cumulative growth in studentsô cognitive and noncognitive (a.k.a. socioemotional) skills across the school year (Hart, Burts, and Charlesworth 1997). Descriptive studies of whole-child preschool classrooms find that children spend large portions of the day not engaged in learning activities (e.g., lining up, aimless wandering; Fuligni et al. 2012, Early et al. 2010), and this is likely true for all preschool classrooms. Skill-targeted curricula, by contrast with the whole-child curricula, lay out specific activities aimed at building up the targeted skills, while still allowing for child-directed activities.

In this paper, we evaluate the consequences of implemented whole-child versus skills-focused curricula for classroom environments and short-term achievement outcomes. Our analyses take advantage of a large-scale random-assignment evaluation of 14 preschool curricula that the U.S. Department of Educationôs Institute for Education Sciences undertook beginning in 2003. We find that children gain more cognitive skills in early childhood programs that provide supplemental academic instruction in mathematics and literacy content for a small portion of the day, compared with programs that take an exclusive whole-child approach. A math curriculum increased both classroom math activities and childrenôs math achievement relative to the two whole-child curricula found in most Head Start and pre-K classrooms. Also relative to whole-child, literacy curricula increased literacy achievement despite producing no statistically significant gains in measured classroom quality. Whole-child curricula produced better classroom quality as measured by classroom observation than did locally-developed curricula, but failed to improve childrenôs school readiness. This last point seems important for policy given that many states require use of the same classroom observation instrument (ECERS) to measure quality as was used in the study. To the extent our results generalize beyond the

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setting of our experiment, our results suggest that the curricular policies of Head Start and many state pre-K programs may be suboptimal, or at least deserve more study.

In the following section (Section I) we provide additional background information on curricula and preschool effectiveness, describe the data we use in Section II, present our analytic plan and results in Section III and IV. Section V includes tests for robustness, and we conclude in Section VI.

I. BACKGROUND

Over the past 40 years, evidence of the long-term individual and societal benefits of early childhood programs has shifted U.S. public opinion and policy toward investments in public preschool programs (Warner 2007, Barnett 1995). Federal spending on Head Start and the Child Care Development Fund, the federal governmentôs two largest child development programs, totaled $12.8 billion in 2014 (Isaacs et al. 2015), with states spending an additional $5.5 billion on programs like universal pre-K (Barnett et al. 2015). Research has shown highly variable impacts for these programs, with Head Start appearing to produce both short and long-run gains in sibling-based studies (Deming 2009) but small overall and quickly disappearing impacts in the National Head Start Impact Study (Puma et al. 2012). Bitler, Hoynes, and Domina (2014) find that these small average effects after the first year of the experiment mask larger impacts at the bottom of the child skill distribution. Interestingly, Kline and Walters (Kline and Walters 2016), find that the counterfactual is important, with estimates suggesting that positive effects of the HS program are largest for those whose parents would otherwise have kept them at home and for those least likely to participate in the program. Gelber and Isen (2013) also find heterogeneous impacts. Evaluations of pre-K programs return generally positive impacts at the end of the pre-K year

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(Weiland and Yoshikawa 2013, Phillips, Dodge, and Pre-Kindergarten Task Force 2017, Wong et al. 2008).

Perhaps among the most useful strategies for boosting the consistency and effectiveness of early education programs is improving the curricula they use to organize instruction. As an important input into learning, curricula provide teachers with teaching materials to enable them to cultivate their studentsô academic and non-cognitive skills. Curricula set goals for the knowledge and skills that children should acquire in an educational setting, and support educatorsô plans for providing the day-to-day learning experiences to cultivate those skills with items such as such as daily lesson plans, materials, and other pedagogical tools (Gormley 2007, Ritchie and Willer 2008). While social scientists have recently begun to consider the effects of curricula in other settings (Jackson and Makarin 2016, Koedel et al. 2017), there exists little or no evidence about which early childhood curricula are best for whom.

Published curricula and teaching materials differ across a number of dimensions ï philosophies, materials, the role of the teacher, small or large group settings, classroom design, and the need for child assessment. In our analyses, we focus on three broad categories of early childhood curricular: Whole-child, content-specific, and locally-developed.

A. Whole-Child Curricula-the Most Common Business-as-Usual Curricula

Whole-child curricula emphasize ñchild-centered active learning,ò cultivated by strategically arranging the classroom environment (Piaget 1976, DeVries and Kohlberg 1987). Rather than explicitly targeting specific academic skills (e.g., math, reading), they seek to promote learning by encouraging children to interact independently with the equipment, materials, and other children in the classroom environment. The most famous example of a program based on a whole-child curriculum is the Perry Preschool study, which used a version of the HighScope curriculum that was very similar to the one evaluated here (Belfield et

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al. 2006, Schweinhart 2005). Whole-child curricula dominate preschool programs, in part because Head Start program standards require centers to adopt them (Advisory Committee on Head Start Research and Evaluation 2012). In addition, whole-child curricula reflect the standards for early childhood education put forth by the National Association for the Education of Young Children ð the leading professional and accrediting organization for early educators (Copple and Bredekamp 2009). We focus our empirical work on the two most common whole-child curricula used by Head Start grantees and other preschool programs, Creative Curriculum and HighScope (Clifford et al., 2005). Some 46 percent of the teachers responding to the national Head Start Family and Child Experiences Survey used Creative Curriculum; 19 used HighScope (Hulsey et al. 2011).

The Department of Educationôs IES What Works Clearinghouse (WWC) describes Creative Curriculum as ñdesigned to foster development of the whole child through teacher-led, small and large group activities centered around 11 interest areas (blocks, dramatic play, toys and games, art, library, discovery, sand and water, music and movement, cooking, computers, and outdoors). The curriculum provides teachers with details on child development, classroom organization, teaching strategies, and engaging families in the learning processò (U.S. Department of Education 2013, 1). Creative Curriculum also allows children a large proportion of free-choice time (Fuligni et al. 2012). HighScope is similar and emphasizes, ñactive participatory learning,ò where students have direct, hands-on experiences and the teacherôs role is to expand childrenôs thinking through scaffolding (Schweinhart and Weikart 1981).

Despite the widespread adoption of these whole-child curricula in preschools, little evidence is available about the impacts of these curricula on childrenôs school readiness. Evidence from the 1960s Perry Preschool experiment suggests that HighScope boosts childrenôs early-grade cognitive scores and reduces early adult outcomes like crime. But we lack methodologically strong,

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large-scale evaluations of recent versions of the curriculum as a stand-alone intervention. Since the children in the Perry study were extremely disadvantaged (Schweinhart & Weikart 1981), and the counterfactual in the Perry study was typically in-home care (Duncan and Magnuson 2013), the extent to which these results generalize to the present is unclear. Further, the only evaluation of Creative Curriculum that meets minimal standards of empirical rigor by the Institute for Education Sciences What Works Clearinghouse reveals that Creative Curriculum is no more effective than locally-developed curricula at improving childrenôs oral language, print knowledge, phonological processing, or math skills (U.S. Department of Education 2013).

B. Content-Specific Curricula

Supporters of curricula that target specific academic or behavioral skills argue that preschool children benefit most from sequenced, explicit instruction, where instructional content is strategically focused on those skills. Content-specific curricula often supplement a classroomôs regular curriculum (e.g., Creative Curriculum or a teacher or locally-developed curriculum) and provide instruction through developmentally-sound ñfree playò and exploration activities in small or large groups, or individually (Wasik and Hindman 2011). Random-assignment evaluations of content-specific curricula focusing on language, mathematics, and socioemotional skills often find positive impacts on their targeted sets of skills (Bierman, Nix, et al. 2008, Bierman, Domitrovich, et al. 2008, Clements and Sarama 2008, Fantuzzo, Gadsden, and McDermott 2011, Klein et al. 2008, Diamond et al. 2007, Morris et al. 2014). For example, children who received a curriculum targeting literacy showed improvements in their literacy and language skills (Justice et al. 2010, Lonigan et al. 2011). Clements & Sarama (2007; 2008) found large gains in math achievement relative to business-as-usual regular curricula from a targeted preschool mathematics curriculum.

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Such curricula range in cost, but effective packages like Clements & Saramaôs *Building Blocks*, cost $650 per classroom.

C. Locally-Developed Curricula-The Rest of Business-as-Usual

Many states allow early childhood education providers not otherwise subjected to curriculum requirements to develop their own lesson plans or curriculum rather than purchasing a published curriculum. Local districts or teachers design these themselves, but may incorporate components of various commercial curricula.

There are large negative gaps in achievement and behavior between low- and higher-income children at school entry. Because of these gaps, it is crucial for policy to be based on evaluations of whether children exposed to achievement-focused or locally-developed curricula systematically outperform children receiving the most commonly used preschool curricula ï Creative Curriculum and HighScope ï across cognitive and noncognitive domains of school readiness as well as the type of classroom observations that are increasingly mandated to measure preschool quality. Our article undertakes such a comparison.

II. DATA

We draw on data from the Preschool Curriculum Evaluation Research (PCER) Initiative Study (2008). The PCER study, funded by the Institute of Education Sciences, began in 2003 and provided evaluations of 14 early childhood education curricula. A total of 12 grantees were selected to conduct independent evaluations of one or more curricula; all, however, used common measures of child outcomes, classroom processes, and implementation quality. The 14 curricula were evaluated at 18 different locations, and 2,911 children were included in the evaluations. Each of the grantees independently selected their early childhood education centers, randomly assigned whole classrooms to either treatment or control curricula and managed their own evaluation with assistance

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from Mathematica and RTI. The centers included in the PCER study were public preschools, Head Start programs, and private child care; all primarily served children from low-income families.

The analyses in the PCER final report (2008) provide 14 sets of grantee-specific estimates of the standardized outcome differences between the treatment curricula and the counterfactual control ñbusiness as usualò curricula. Our study is the first to pool data across grantees. Specifically, we pooled data across all grantees that implemented: i) a math or literacy curriculum where the comparison control condition was Creative Curriculum or HighScope; ii) a literacy curriculum where the comparison control condition was a locally-developed curriculum (not enough math sites included a locally-developed comparison); or iii) the Creative Curriculum where the comparison control condition was a locally-developed curriculum. Note that while for the first two comparisons, Creative Curriculum is among the business as usual control group curricula; for two of the PCER grantees, the Creative Curriculum was the assigned treatment curriculum, with locally-developed curricula as the control. This third comparison provides us the experimental estimate of the impacts of the Creative Curriculum relative to the locally-developed ones.

Our inclusion criteria led us to drop four grantees and a total of 1,070 children from the study. Three of the four grantees were omitted because they evaluated a whole-child curriculum other than Creative Curriculum or HighScope (the Wisconsin, Missouri and three Success For All locations), while a fourth (New Hampshire) evaluated a literacy-enhanced version of Creative Curriculum with Creative Curriculum as the comparison condition. These sample deletions enable us to provide a focused evaluation of whole-child approaches that are most often found in large-scale preschool programs.

A. Randomization

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We next describe the randomization implemented by the 11 grantees included in our curricula comparisons. Grantees are groups according to our 4 sets of curricula comparisons discussed below. Table 1 describes the grantee (column 1), geographic location of the classrooms (column 2), treatment (column 3) and control (column 4) curricula. Columns 5 -7 describe the randomization. Columns 5 and 6 are mutually exclusive and describe whether all classrooms in the study within a given preschool were assigned to the same treatment status (Column 5 is yes, ñWhole school randomized to same treatmentò), or whether there was the potential for randomization of classroom within schools (Column 6 is yes, ñSome within-school randomization to treatmentò). Seven of the 11 grantee/curricula comparisons used whole school randomization. Generally, for these comparisons, preschools were blocked based on characteristics of the neighboring elementary schools and the population they served, and then schools were randomly assigned within blocks. For the 4 remaining comparisons, there was at least some within-school randomization of classrooms. Importantly, a condition for participation in the experiment was that preschools and teachers had no say over which curricula they were assigned to. Column 7 reports whether classrooms were randomly assigned within schools. Column 8 reports the total number of schools in each aggregate comparison (school is the level at which we cluster the standard errors for the main results). Finally, Columns 9 to 12 report the number of schools (if relevant), classrooms, and children in the treatment and control groups. Columns 9 and 10 report the number of schools, classrooms, and children in the treatment and control conditions when randomization was at the school level, while Columns 11 and 12 report the number of treatment and control classrooms and children when there was within-school randomization.

B. *Curricula Categories: Literacy, Mathematics, Whole-Child, and Locally-Developed*

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We coded each of the treatment curricula in the PCER study into one of four mutually exclusive categories: literacy, mathematics, whole-child, and locally-developed. All literacy curricula focused on a so-called literacy domain, which could have included phonological skills (e.g., sounds that letters make), prewriting skills, or any other early literacy skill, and which differed widely. By contrast, the PCER study included only one math-focused preschool curriculum.

Each of the included PCER curricula and its designated category are also described in Table 1. Eight curricula that targeted language/literacy but with diverse content and foci were included in our study.[2] Despite these differences and with a goal of attaining some degree of generalizability, we included all of these in our ñliteracyò group. The one math curriculum combined Pre-K Mathematics with software from the DLM Early Childhood Express Math to focus on sequenced instruction in numeracy and geometry. Our ñwhole-childò category included only HighScope and Creative Curriculum, which we have already described.

Our final category, ñlocally-developed curricula,ò included curricula that were developed either by teachers in the classrooms or by the local school district, or were a combination of several of these types of curricula. We lack information on the general content of the locally-developed curricula used in some of the PCER study control classrooms and suspect they likely vary widely. Nonetheless, they characterize the kinds of settings experienced by a substantial share of preschoolers and serve as a useful counterfactual in some of our comparisons. Our

2 One curriculum focused solely on language ï the Language-Focused Curriculum, and sought to improve language skills through enhancing the language stimulation techniques used in the classroom. The other seven focused primarily on literacy instruction, but varied in terms of structure and sequence. The least structured literacy curriculum appeared to be Bright Beginnings, which focused on child-centered curriculum units. In the middle are Ladders to Literacy and Doors to Discovery, which provided skill-building activities designed to improve language and basic literacy skills. The remaining four curricula were the most structured; explicitly focusing on sequenced instruction in oral language, phonological and phonemic awareness and letter knowledge.

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Appendix Table 3. Math and Creative Curriculum and control group summary statistics (Comparisons III and IV) on child and family background and demographic characteristics, classroom observations, and child school readiness skills

	III. Math Curriculum Compared With HighScope and Creative Curricula							IV. Creative Curriculum Compared with Locally Developed Curricula						
	Math Curriculum (Treat)			HighScope-Creative Curricula Comparison			Diff	Creative Curriculum (Treat)			Locally Developed Curricula			Diff
	N	Mean	SD	N	Mean	SD	P-value	N	Mean	SD	N	Mean	SD	P-value
Covariates at Baseline (Fall 2003)														
Child Gender - Female	110	0.58		100	0.46		0.05	170	0.50	0.50	180	0.52	0.50	0.50
Child Race - Black	110	0.40		100	0.34		0.61	170	0.41	0.49	180	0.38	0.49	0.69
Child Race - Asian	110	0.06		100	0.01		0.33	170	0.01	0.08	180	0.00	0.00	0.33
Child Race - Hispanic	110	0.24		100	0.29		0.58	170	0.10	0.31	180	0.09	0.28	0.54
Child Race - Other	110	0.05		100	0.14		0.15	170	0.03	0.18	180	0.02	0.15	0.44
Parent Education (years)	110	13.08	1.78	100	12.46	1.85	0.05	170	12.54	1.54	180	12.70	1.45	0.30
Parent Working	110	0.57		100	0.43		0.13	170	0.45	0.50	180	0.48	0.50	0.58
Parent Age (years)	110	32.94	9.12	100	31.79	7.18	0.31	170	30.80	6.56	180	32.06	7.93	0.15
Child Age (months)	110	53.20	3.26	100	52.73	3.30	0.35	170	54.26	3.79	180	54.02	3.48	0.48
Annual Household Income (thousands)	110	29.51	17.51	100	24.54	13.60	0.06	170	22.27	14.47	180	25.14	16.06	0.30
Receiving Welfare	110	0.16		100	0.17		0.81	170	0.10	0.31	180	0.13	0.33	0.47
Missing any baseline covariates	108	0.10		100	0.11		0.92	174	0.20		180	0.18		0.56
Classroom Observations - Fall 2003														
CIS Arnett Total	100	3.15	0.37	100	3.18	0.59	0.66	170	3.20	0.66	180	2.88	0.66	0.19
ECERS Total	100	3.48	0.67	100	3.80	0.84	0.22	170	4.06	0.88	180	3.29	0.96	0.06
ECERS Provisions	100	3.50	0.62	100	3.83	0.87	0.25	170	4.14	0.99	180	3.21	0.94	0.04
ECERS Interaction	100	4.04	1.06	100	4.45	1.41	0.34	170	4.94	1.42	180	3.78	1.40	0.06
Teacher Characteristics														
No college (T)	110	0.19		100	0.08			170	0.11	0.31	180	0.28	0.45	
Associates (T)	110	0.19		100	0.30		0.71	170	0.34	0.47	180	0.15	0.36	0.10
College + (T)	110	0.62		100	0.62			170	0.55	0.50	180	0.56	0.50	
Annual salary (T)	90	35831.42	10605.56	100	40965.06	18510.18	0.39	170	32743.28	13856.61	170	35052.85	11695.57	0.98
Yrs. teaching experience	110	17.46	10.92	100	17.92	7.56	0.88	170	11.68	7.81	180	10.13	6.63	0.57
Classroom Observations - Spring 2004														
TBRS Math Quality	100	1.21	0.94	100	0.72	0.46	0.22	160	1.43	0.80	170	0.91	0.46	0.02
TBRS Math Quantity	100	1.26	0.69	100	0.95	0.33	0.28	160	1.42	0.67	170	1.00	0.35	0.06
TBRS Literacy Quality	100	1.12	0.33	100	1.13	0.39	0.96	160	1.53	0.36	170	1.18	0.26	0.04
TBRS Literacy Quantity	100	1.01	0.35	100	0.93	0.42	0.56	160	1.47	0.40	170	0.92	0.27	0.00
CIS Arnett Total	100	3.06	0.63	100	2.93	0.60	0.79	160	3.35	0.31	180	2.93	0.54	0.11
ECERS Total	110	3.81	0.95	100	3.61	0.86	0.98	170	4.21	0.58	180	3.50	0.80	0.06
ECERS Provisions	110	3.67	1.03	100	3.53	0.75	0.90	170	4.19	0.72	180	3.35	0.77	0.03
ECERS Interaction	110	4.66	1.44	100	4.33	1.40	0.81	170	5.33	0.83	180	4.06	1.26	0.02
Child Outcomes - Fall 2003														
PPVT	110	89.28	12.60	100	92.23	14.68	0.31	170	86.57	16.21	180	87.00	16.37	0.88
WJ Letter Word	110	102.86	17.40	100	101.98	13.86	0.81	170	94.69	15.39	180	92.90	16.49	0.52
WJ Spelling	110	95.30	14.09	100	92.28	11.85	0.32	170	89.48	12.43	180	89.22	13.12	0.92
WJ Applied Problems	110	99.78	12.84	100	96.68	13.70	0.21	170	92.67	13.55	180	90.93	16.41	0.27
CMAA Composite	110	0.44	0.24	100	0.45	0.24	0.83	170	0.33	0.23	180	0.32	0.22	0.70
Social Skills (teacher report)	110	106.06	13.46	100	107.70	14.52	0.62	170	99.61	16.97	180	99.75	20.64	0.85
Behavior Problems (teacher report)	110	96.00	12.10	100	95.91	13.45	0.97	170	101.35	13.78	180	102.50	15.62	0.76
Missing any academic prescore	108	0.00		100	0.00		-	170	0.00		180	0.00		-
Missing any socio-emotional prescore	108	0.02		100	0.04		0.49	170	0.01		180	0.01		1.00

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Child Outcomes - Spring 2004														
PPVT	110	94.84	13.02	100	93.41	15.28	0.66	170	92.19	15.08	180	90.02	15.12	0.05
WJ Letter Word	110	101.46	14.15	100	101.31	14.33	0.96	170	99.75	11.32	180	99.03	13.23	0.66
WJ Spelling	110	95.90	13.27	100	93.11	11.84	0.29	170	91.45	13.08	180	91.26	12.99	0.84
WJ Applied Problems	110	98.81	13.43	100	94.48	12.96	0.15	170	94.98	12.73	180	93.30	15.85	0.20
CMAA Composite	110	0.66	0.21	100	0.55	0.21	0.01	170	0.49	0.26	180	0.49	0.28	0.85
Social Skills (teacher report)	110	113.37	12.08	100	108.93	14.84	0.23	170	108.36	15.42	180	108.70	13.45	0.99
Behavior Problems (teacher report)	110	96.15	12.77	100	98.98	13.92	0.40	170	99.08	13.24	180	99.38	12.90	0.90
Literacy composite score	110	0.05	0.96	100	-0.08	0.95	0.55	170	-0.22	0.94	180	-0.31	0.98	0.38
Math composite score	110	0.34	0.89	100	-0.10	0.86	0.02	170	-0.22	1.01	180	-0.29	1.18	0.48
Academic composite score	110	0.24	0.91	100	-0.10	0.88	0.09	170	-0.24	0.96	180	-0.32	1.11	0.44
Social skills composite score	110	0.41	0.91	100	0.13	1.03	0.29	170	0.11	1.01	180	0.11	0.89	0.94
Missing any academic outcome	108	0.00		100	0.02		0.29	170	0.02		176	0.03		0.43
Missing any socio-emotional outcome	108	0.00		100	0.00		0.25	170	0.01		176	0.00		0.28

Note. TBRS = Teacher Behavior Rating Scale. TBRS Literacy variables are composites of oral language, book reading, written expression, and print and letter knowledge. Further detail on classroom observational measures is available in Appendix Tables 1a & b. *p*-values account for clustering by random assignment site and date of classroom observational assessment (for classroom observation t-tests only). Ns are rounded to the nearest 10 in accordance with NCES data policies.

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Appendix Table 4. Effects of treatment curricula on classroom observational measures at the end of preschool

	ECERS total score	ECERS Provisions	ECERS Interactions	TBRS Math Quality	TBRS Math Quantity	TBRS Literacy Quality	TBRS Literacy Quantity	Arnett total score
I. Literacy vs. HighScope and Creative Curriculum	0.24	0.21	0.13	-0.16	-0.12	0.08	0.04	0.16
	(0.15)	(0.16)	(0.15)	(0.19)	(0.21)	(0.19)	(0.20)	(0.17)
N	860	860	860	840	840	840	840	850
Classroom N= 100								
II. Literacy vs. Locally-Developed Curricula	0.56	0.59	0.48	0.56	0.37	0.74	0.82	0.28
	(0.27)	(0.30)	(0.27)	(0.39)	(0.35)	(0.45)	(0.43)	(0.25)
N	430	430	430	410	410	410	410	410
Classroom N=60								
III. Math vs. HighScope and Creative Curriculum	0.21	0.23	0.33	1.28	1.10	0.43	0.34	0.67
	(0.32)	(0.26)	(0.40)	(0.52)	(0.54)	(0.27)	(0.35)	(0.52)
N	200	200	200	200	200	200	200	200
Classroom N=30								
IV. Creative vs. Locally-Developed Curricula	0.62	0.45	0.84	0.50	0.50	0.74	0.67	1.00
	(0.32)	(0.28)	(0.38)	(0.21)	(0.31)	(0.22)	(0.27)	(0.64)
	340	340	340	320	320	320	320	330

Note. Each entry represents results from a separate regression. Standard errors clustered at the school-level are in parentheses. Fixed effects at the random assignment site level are included in all analyses. Child and family controls included child gender, race, age (months), baseline achievement and social skills; parent/primary caregiver education (years), whether working, age (years), annual household income (thousands), and whether receiving welfare. Classroom observational measures at baseline, time in days from the start of the preschool year and the date of the observational assessment, a quadratic version of this time in days, and the time in days between a classroom's fall and spring observational assessment were also included in all models (Arnett and ECERS). Duration of TBRS observation in minutes was included in TBRS Math and Literacy models. TBRS Math is composite of quantity and quality of math activities, and TBRS Literacy is a composite of literacy (oral language, book reading, written expression, and print and letter knowledge) quantity and quality activities. TBRS = Teacher Behavior Rating Scale. Further detail on classroom observational measures is available in Appendix Table 1. Missing dummy variables were included in the analyses to account for missing independent variables. Outcomes were standardized to have a mean of 0 and standard deviation of 1. Ns are rounded to the nearest 10 in accordance with NCES data policies.

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Appendix Table 5. Effect of treatment curricula on child school readiness skills at the end of preschool, by outcome component measures

	PPVT	WJ Letter-Word	WJ Spelling	WJ Applied Problems	CMAA	Social Skills	Problem Behaviors
I. Literacy vs. HighScope and Creative Curriculum	0.05	0.07	0.17	0.07	-0.10	-0.25	-0.00
	(0.04)	(0.06)	(0.06)	(0.06)	(0.07)	(0.09)	(0.08)
N	860	850	800	840	850	850	860
II. Literacy vs. Locally-Developed Curricula	0.09	0.10	0.14	0.05	0.20	-0.26	0.17
	(0.08)	(0.13)	(0.09)	(0.10)	(0.09)	(0.20)	(0.19)
N	440	440	440	440	440	440	440
III. Math vs. HighScope and Creative Curriculum	0.16	-0.11	0.08	0.27	0.35	0.29	-0.15
	(0.10)	(0.12)	(0.11)	(0.14)	(0.11)	(0.20)	(0.17)
N	220	220	220	220	220	210	210
IV. Creative Curriculum vs. Locally-Developed Curricula	0.12	-0.01	-0.04	0.09	-0.08	-0.03	0.01
	(0.07)	(0.07)	(0.09)	(0.07)	(0.15)	(0.21)	(0.25)
N	360	360	360	360	360	350	350

Note. Each entry represents results from a separate regression. Standard errors clustered at the school-level are in parentheses. Fixed effects at the random assignment site level are included in all analyses. Standard errors are clustered at the classroom level. Models include fixed effects for the unit of random assignment (i.e. grantee, school). Child and family controls included child gender, race, age (months), baseline achievement and social skills; parent/primary caregiver education (years), whether working, age (years), annual household income (thousands), and whether receiving welfare. Missing dummy variables were included in the analyses to account for missing independent variables. Outcomes were standardized to have a mean of 0 and standard deviation of 1. Ns are rounded to the nearest 10 in accordance with NCES data policies.

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Appendix Table 6. Alternate constructions of the math control group in the New York site: effects on composite outcomes

	Literacy composite	Math composite	Academic composite	Social skills composite
NY Math treatment group with NY control group that includes Head Start classrooms implementing High/Scope and Creative Curriculum, excluding NY Pre-k control classrooms (Same as second row in Table 4)	0.05	0.35	0.25	0.21
	(0.10)	(0.11)	(0.11)	(0.27)
N	220	220	220	210
NY Math treatment group included, all NY control classrooms excluded	0.11	0.35	0.27	-0.04
	(0.13)	(0.18)	(0.16)	(0.37)
N	210	210	210	200
Only CA math site	0.06	0.30	0.23	-0.01
	(0.13)	(0.17)	(0.16)	(0.31)
N	150	150	150	150

Note. Each entry represents results from a separate regression. Standard errors clustered at the school level are in parentheses. Fixed effects at the random assignment site level are included in all analyses. Reference group is Creative Curriculum or High/Scope. Standard errors are clustered at the classroom level. Literacy composite included PPVT, WJ Letter Word and WJ Spelling. Math composite included WJ Applied Problems, and CMAA. Academic composite weights the math and literacy composites equally. The social skills composite included teacher rated social skills and behavior problems (reverse coded). Models include fixed effects for the unit of random assignment (i.e. grantee, school). Child and family controls included child gender, race, age (months), baseline achievement and social skills; parent/primary caregiver education (years), whether working, age (years), annual household income (thousands), and whether receiving welfare. Missing dummy variables were included in the analyses to account for missing independent variables. Outcomes were standardized to have a mean of 0 and standard deviation of 1. Ns are rounded to the nearest 10 in accordance with NCES data policies.

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Appendix Table 7. Effects of PCER treatment curricula on raw outcome scores: Effect sizes calculated based on national standard deviation

	PPVT	WJ Letter-Word	WJ Spelling	WJ Applied Problems	CMAA	Social Skills	Problem Behaviors
I. Literacy vs. HighScope and Creative Curriculum	0.06	0.10	0.18	0.09	-0.09	-0.25	-0.001
	(0.04)	(0.05)	(0.06)	(0.06)	(0.06)	(0.10)	(0.10)
N	890	880	830	870	890	850	860
II. Literacy vs. Locally-Developed Curricula	0.06	0.14	0.16	0.06	0.18	-0.27	0.18
	(0.08)	(0.11)	(0.07)	(0.08)	(0.07)	(0.19)	(0.19)
N	480	480	480	480	480	450	450
III. Math vs. HighScope and Creative Curriculum	0.16	-0.09	0.07	0.27	0.35	0.29	-0.15
	(0.09)	(0.10)	(0.10)	(0.12)	(0.10)	(0.18)	(0.16)
N	220	220	220	220	220	210	210
IV. Creative Curriculum vs. Locally-Developed Curricula	0.12	-0.04	-0.05	0.10	-0.07	-0.05	0.05
	(0.07)	(0.06)	(0.09)	(0.06)	(0.09)	(0.21)	(0.19)
N	360	360	360	360	360	350	350

Note. Each entry represents results from a separate regression. Standard errors clustered at the school level are in parentheses. Models include fixed effects for the unit of random assignment (i.e. grantee, school). Child and family controls included child gender, race, age (months), baseline achievement and social skills; parent/primary caregiver education (years), whether working, age (years), annual household income (thousands), and whether receiving welfare. Missing dummy variables were included in the analyses to account for missing independent variables. Outcomes were standardized to have a mean of 0 and standard deviation of 1. Ns are rounded to the nearest 10 in accordance with NCES data policies.

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