



THE OHIO STATE UNIVERSITY

CRANE CENTER FOR EARLY CHILDHOOD
RESEARCH AND POLICY

Identifying and Helping Preschoolers in Columbus Needing Extra Literacy Support

Supplementary Material

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Measures

The measures in the table below were used to assess children's emergent and conventional literacy skills throughout the NBS! study. Further details on the measures can be found in Piasta, Logan, Zettler-Greeley, Bailet, Lewis, and Thomas (2021) and through the respective citations.

Table 1

Measures Used to Assess Emergent and Conventional Literacy Skills and their Citations

Name of Measure	Citation(s)
Woodcock-Johnson Tests of Achievement III	Woodcock, R., McGrew, K. S., & Mather, N. (2001, 2007). <i>Woodcock-Johnson Tests of Achievement (3rd ed., normative update)</i> . Riverside.
Narrative Assessment Protocol-2	Bowles, R. P., Justice, L. M., Khan, K. S., Piasta, S. B., Skibbe, L. E., & Foster, T. D. (2020). Development of the Narrative Assessment Protocol-2: A tool for examining young children's narrative skill. <i>Language, Speech, and Hearing Services in Schools, 51</i> (2), 390-404. https://doi.org/doi:10.1044/2019_LSHSS-19-00038
Individual Growth and Development Indicators of Early Literacy	McConnell, S. R., Bradfield, T., Wackerle-Hollman, A. K., & Rodriguez, M. (2012). <i>Individual growth and development indicators of early literacy</i> (2nd ed.). Regents of the University of Minnesota.
Gerde Writing Measure	Gerde, H. K., Bingham, G. E., & Pendergast, M. L. (2015). Reliability and validity of the Writing Resources and Interactions in Teaching Environments (WRITE) for preschool classrooms. <i>Early Childhood Research Quarterly, 31</i> , 34-46. https://doi.org/10.1016/j.ecresq.2014.12.008 Thomas, L. J. G., Gerde, H. K., Piasta, S. B., Logan, J. A. R., Bailet, L. L., & Zettler-Greeley, C. M. (2020). The early writing skills of children identified as at-risk for literacy difficulties. <i>Early Childhood Research Quarterly, 51</i> , 392-402. https://doi.org/https://doi.org/10.1016/j.ecresq.2020.01.003
Test of Preschool Early Literacy	Lonigan, C. J., Wagner, R. K., & Torgesen, J. K. (2007). <i>Test of Preschool Early Literacy</i> . Pro-Ed.
Quick Letter Name Knowledge Assessment	Tortorelli, L. S., Bowles, R. P., & Skibbe, L. E. (2017). Easy as AchGzrjq: The quick letter name knowledge assessment. <i>The Reading Teacher, 71</i> (2), 145-156. https://doi.org/10.1002/trtr.1608
Letter Sound Short Forms	Piasta, S. B., Phillips, B. M., Williams, J. M., Bowles, R. P., & Anthony, J. L. (2016). Measuring young children's alphabet knowledge: Development and validation of brief letter-sound knowledge assessments. <i>The Elementary School Journal, 116</i> (4), 523-548. https://doi.org/10.1086/686222
Ohio Kindergarten Readiness Assessment	Ohio Department of Education (2014). <i>Kindergarten Readiness Assessment</i> . http://education.ohio.gov/Topics/Early-Learning/Kindergarten/Ohios-Kindergarten-Readiness-Assessment (language and literacy subscores only)

Who was eligible to receive NBS!?

In this study, we compared children identified as at-risk for reading difficulties and selected to receive NBS! with a group of peers who were not identified as at-risk for reading difficulties. Table 2 presents the number and percent of peer children and those at-risk for reading difficulties in each category, and the results of Chi-square analyses or ANOVAs used to examine the differences between the children selected to receive the NBS! intervention and the group of their peers not at risk for reading difficulties.

Table 2

Results of Chi-Square Analyses and ANOVAs Comparing Children At-Risk for Reading Difficulties and Those Not-At-Risk (Peers)

Variable of Interest	Total <i>N</i>	Peer		At-Risk		Chi-Square/ANOVA Results		
		<i>n</i>	%	<i>n</i>	%	Chi-Square/ <i>F</i>	<i>df</i>	<i>p</i>
Gender						2.13	1	0.144
Male	275	131	47.60%	144	52.40%			
Race						6.346	5	0.274
Black/African American	297	144	48.50%	152	51.50%			
White/Caucasian	137	81	59.10%	56	40.90%			
Asian	20	11	55.00%	9	45.00%			
Other	27	11	42.30%	16	57.70%			
Multiracial	68	34	50.00%	34	50.00%			
Ethnicity						6.062	1	0.014
Hispanic or Latinx	58	21	36.20%	37	63.80%			
Disability status						0.573	1	0.449
No IEP or 504 plan	561	286	51.00%	275	49.00%			
Primary Language						2.31	1	0.128
Not English	43	17	39.50%	26	60.50%			
Highest Level of Education						22.583	4	<.0001
Some High School	43	13	30.20%	30	69.80%			
High School Diploma /GED	327	155	47.40%	172	52.60%			
Associates Degree	66	32	48.50%	34	51.50%			
Bachelor's Degree	79	52	65.80%	27	34.20%			
Graduate Degree	56	38	67.90%	18	32.10%			
Income						29.44	1	<.0001
\$5000 or less	75	26	34.70%	49	65.30%			
\$5001-\$15,000	185	77	41.60%	108	58.40%			
\$15,001-\$45,000	160	87	54.40%	73	45.60%			
\$45,001-\$75,000	68	43	63.20%	25	36.80%			
\$75,001-\$105,000	39	29	74.50%	10	25.50%			
\$105,000 or more	30	22	73.30%	8	26.70%			

Note. *p* values <.05 are considered statistically significant. IEP=individualized education plan.

Did NBS! improve children’s literacy learning in preschool?

Results for children's literacy learning in preschool were analyzed following the preregistration [10.17605/OSF.IO/UWNR](https://doi.org/10.17605/OSF.IO/UWNR). Full results are available in Piasta, Logan, Zettler-Greeley, Bailet, Lewis, and Thomas (2021) or from the second author of this paper, Dr. Shayne Piasta.

Did NBS! improve children’s literacy learning 1 and 2 years later?

Results for children’s emergent and conventional literacy learning 1 and 2 years after participating in NBS! were analyzed per the preregistration [10.17605/OSF.IO/CG9MB](https://doi.org/10.17605/OSF.IO/CG9MB), using multilevel modeling and 30 imputed data sets while controlling for children's pretest scores. Emergent and Conventional literacy skills were measured at either follow-up 1 (F1), follow-up 2 (F2), or both, depending on the measure's developmental appropriateness.

Full results comparing the NBS! conditions to the control condition at follow-up time points one (F1) and two (F2) are included in Table 3 below. F1 and F2 scores serve as dependent variables, with pretest (preschool; P1) scores on the same or an aligned measure(s) included as covariates. Variables representing the teacher-implemented or community-aide implemented intervention were the independent variables of interest. Models were estimated separately for each outcome, contrasting the two NBS! conditions (teacher-implemented and community aide-implemented) with the control.

Full results of the analyses comparing the two NBS! conditions at F1 and F2 are shown in Table 4. Analyses matched those described above; however, for this aim, the NBS! conditions teacher-implemented and community aide-implemented were contrasted.

Table 3

Comparisons Between Teacher-Implemented, CA-Implemented, and Control Conditions on Child Outcomes at Follow-up 1 and 2

Outcome of interest	Follow-Up 1 (F1)				Follow-Up 2 (F2)			
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Print knowledge								
Print knowledge								
Intercept	19.26	1.32	14.56	<.0001				
Pretest	0.93	0.12	6.60	<.0001				
T condition	-1.46	1.49	-0.98	0.3280				
CA condition	0.08	1.50	0.05	0.9570				
Phonological awareness								
Phonological awareness								
Intercept	11.11	0.77	14.50	<.0001	470.99	1.69	278.48	<.0001
Pretest	0.54	0.06	8.99	<.0001	0.62	0.14	4.51	<.0001
T condition	-0.81	0.73	-1.10	0.2700	-2.52	1.52	-1.66	0.0970
CA condition	0.05	0.49	0.13	0.8980	-1.18	1.61	-0.74	0.4620

Table 3 (continued).

Outcome of interest	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Language and comprehension								
Oral Comprehension								
Intercept	228.56	24.43	9.35	<.0001	244.32	29.46	8.29	<.0001
Pretest	0.52	0.06	9.30	<.0001	0.51	0.07	7.68	<.0001
T condition	-2.59	2.07	-1.25	0.2110	-2.70	1.97	-1.37	0.1720
CA condition	0.27	2.08	0.08	0.9340	-0.89	2.04	-0.43	0.6640
Reading Comprehension								
Intercept	402.18	2.64	152.36	<.0001	412.00	3.76	109.38	<.0001
Print Knowledge	0.73	0.23	3.18	0.0017	1.21	0.29	4.19	<.0001
Phonological Awareness	0.28	0.23	1.19	0.2330	0.91	0.33	2.79	0.0056
T condition	-1.15	2.34	-0.49	0.6254	-1.42	3.30	-0.43	0.6671
CA condition	-0.71	2.36	-0.30	0.7628	0.20	3.39	0.06	0.9533
Emergent writing								
Name writing								
Intercept	2.94	0.13	22.70	<.0001				
Pretest	0.29	0.05	6.02	<.0001				
T condition	-0.19	0.12	-1.45	0.1480				
CA condition	-0.10	0.13	-0.79	0.4310				
Invented Spelling								
Intercept	1.38	0.23	5.92	<.0001	3.18	0.28	11.27	<.0001
Pretest	0.74	0.19	3.91	0.0040	0.01	0.04	2.52	0.0120
T condition	-0.10	0.16	-0.61	0.5410	-0.27	0.19	-1.43	0.1540
CA condition	-0.07	0.16	-0.45	0.6530	-0.21	0.19	-1.07	0.2820
Letter Writing								
Intercept	1.91	0.17	11.17	<.0001				
Pretest	0.71	0.10	7.51	<.0001				
T condition	-0.08	0.14	-0.58	0.5600				
CA condition	0.10	0.14	0.70	0.4860				
Spelling								
Intercept	372.53	6.31	59.03	<.0001	405.85	6.91	58.70	<.0001
Pretest	14.14	5.07	2.79	0.0050	15.61	5.35	2.92	0.0040
T condition	-6.80	4.35	-1.56	0.1180	-5.77	4.59	-1.26	0.2090
CA condition	-2.41	4.45	-0.54	0.5870	-3.47	4.65	-0.75	0.4560
Story Composition								
Intercept					1.70	0.23	7.49	<.0001
Pretest					1.55	3.53	0.44	0.6610
T condition					-0.19	0.29	-0.63	0.5270
CA condition					0.10	0.31	0.32	0.7460
Word Reading								
Letter-Word ID								
Intercept	331.88	3.98	83.46	<.0001	365.86	6.00	60.97	<.0001
Print Knowledge	1.30	0.33	3.79	0.0001	1.73	0.51	3.43	0.0007

Table 3 (continued).

Outcome of interest	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Phonological Awareness	1.86	0.34	5.52	<.0001	2.38	0.42	5.62	<.0001
T condition	-5.78	3.50	-1.65	0.0990	-4.76	4.88	-0.98	0.3300
CA condition	0.28	3.63	0.08	0.9400	-1.10	5.02	-0.22	0.8260
Word Attack								
Intercept	377.32	4.02	93.84	<.0001	410.97	5.60	73.43	<.0001
Print Knowledge	1.53	0.34	4.51	<.0001	2.28	0.47	4.89	<.0001
Phonological Awareness	1.30	0.33	3.91	0.0001	1.48	0.44	3.40	0.0008
T condition	-2.80	3.62	-0.77	0.4400	-5.58	4.93	-1.13	0.2580
CA condition	2.72	3.59	0.76	0.4500	-1.16	4.92	-0.24	0.8140

Note. The intercept represents the control condition. Pretest=a child's score on the same measure at the start of preschool. For measures without an equivalent pretest, measures used as pretest scores are listed. T condition=teacher condition, preschool children taught the NBS! program by preschool teachers. CA condition=Community aide condition, preschool children taught the NBS! program by Ready4Success community aides.

Table 4

Comparison Between Teacher-Implemented and Community Aide-Implemented Conditions on Child Outcomes at Follow up 1 and 2

Outcome of interest	Follow-Up 1 (F1)				Follow Up 2 (F2)			
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Print knowledge								
Print knowledge	1.54	1.45	1.06	.290				
Phonological awareness								
Phonological awareness	0.90	0.71	1.27	.206	1.34	1.53	0.88	0.3800
Language and comprehension								
Oral Comprehension	2.77	1.99	1.39	0.164	1.82	1.99	0.91	0.3610
Reading Comprehension	0.43	2.27	0.19	.850	1.61	3.23	0.50	0.6161
Emergent writing								
Name writing	0.08	0.12	0.67	0.503				
Invented Spelling	0.03	0.16	0.17	0.863	0.07	0.19	0.35	0.7250
Letter Writing	0.18	0.13	1.37	0.17				
Spelling	4.38	4.27	1.02	.306	2.3	4.5	0.51	0.6100
Story Composition					0.29	0.29	0.97	0.3320
Word Reading								
Letter-Word ID	6.06	3.52	1.72	.085	3.66	4.79	0.76	0.4450
Word Attack	5.52	3.52	1.57	.117	4.42	4.82	0.92	0.3590

Note. For these analyses the Teacher Condition was the reference group. Betas indicate the difference between the Community Aide condition and the Teacher Condition. Results are after controlling for pretest skills and using imputed datasets to account for any missing data.

Did NBS! improve children’s literacy learning for kindergarten readiness?

These analyses followed the preregistration [10.17605/OSF.IO/CG9MB](https://doi.org/10.17605/OSF.IO/CG9MB). The kindergarten readiness analyses included only the first two cohorts of the NBS! project due to the timing of receiving test results from the state of Ohio. As such, we reexamined baseline equivalence to determine if differences existed between the children in the control condition and those receiving the intervention. The results of those analyses are presented in Table 5 below. All covariates not demonstrating equivalence as defined by the What Works Clearinghouse 4.0 were deemed essential covariates and included in subsequent causal analyses.

Table 6 presents the first two cohorts' results on kindergarten readiness literacy, which was the dependent variable. Analyses were conducted using multilevel modeling on 30 imputed data sets, with all variables identified as non-equivalent at baseline included as covariates. Specifically, these analyses included phonological awareness, print knowledge, letter naming, letter-sound knowledge, rhyme awareness, alliteration, picture naming, oral comprehension, name writing, and the Get Ready to Read-Revised scores as covariates. Variables representing teacher-implemented or community aide-implemented conditions were the independent variables of interest. Models were estimated separately for each outcome, first contrasting the two NBS! conditions (teacher-implemented and community aide-implemented) with the control and then contrasting the two NBS! conditions with each other.

Table 7 presents results of Chi-square analyses comparing children receiving NBS! to their non-at-risk peers on kindergarten readiness literacy scores.

Table 5

Initial Equivalence and Effect Sizes by Condition (Cohorts 1 and 2 Only)

<i>Outcome</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>d</i>
Get Ready to Read-Revised					
Intercept	8.88	0.40	22.05	<.0001	
T condition	-1.59	0.55	-2.88	0.0047	-0.56
CA condition	-0.85	0.56	-1.52	0.1308	-0.33
Print knowledge					
Print knowledge					
Intercept	8.29	0.89	9.31	<.0001	
T condition	-2.75	1.22	-2.25	0.0264	-0.49
CA condition	-2.24	1.24	-1.81	0.0736	-0.36
Letter-name knowledge					

Table 5 (continued).

<i>Outcome</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>d</i>
Intercept	11.12	1.72	6.48	<.0001	
T condition	-5.68	2.36	-2.40	0.0181	-0.52
CA condition	-3.33	2.39	-1.39	0.1664	-0.29
Letter-sound knowledge					
Intercept	2.45	0.67	3.64	0.0006	
T condition	-0.18	0.93	-0.19	0.8493	-0.06
CA condition	1.29	0.93	1.38	0.1701	0.30
Phonological awareness					
Phonological awareness					
Intercept	10.37	0.65	15.95	<.0001	
T condition	-1.63	0.89	-1.83	0.0697	-0.35
CA condition	-1.26	0.91	-1.39	0.1687	-0.28
Rhyme awareness					
Intercept	2.44	0.42	5.83	<.0001	
T condition	-1.31	0.57	-2.29	0.0242	-0.50
CA condition	-0.70	0.58	-1.20	0.2331	-0.22
Initial sound awareness					
Intercept	6.72	0.49	13.71	<.0001	
T condition	-0.94	0.67	-1.40	0.1635	-0.31
CA condition	-1.14	0.68	-1.67	0.0979	-0.35
Language and comprehension					
Narrative ability					
Intercept	18.87	0.28	66.78	<.0001	
T condition	-0.50	0.39	-1.31	0.1932	-0.25
CA condition	-0.18	0.39	-0.46	0.6448	-0.09
Vocabulary					
Intercept	4.68	0.43	10.77	<.0001	
T condition	-0.78	0.60	-1.29	0.2015	-0.31
CA condition	-0.65	0.61	-1.06	0.2896	-0.23
Oral comprehension					
Intercept	439.88	2.29	191.75	<.0001	
T condition	-4.36	3.16	-1.38	0.1700	-0.29
CA condition	-4.56	3.19	-1.43	0.1556	-0.32
Emergent writing					
Name writing					
Intercept	2.10	0.15	14.26	<.0001	
T condition	-0.32	0.20	-1.60	0.1120	-0.97
CA condition	-0.15	0.21	-0.74	0.4590	-0.36
Letter writing					
Intercept	1.57	0.10	15.47	<.0001	
T condition	-0.18	0.14	-1.28	0.2027	-0.19
CA condition	-0.15	0.14	-1.05	0.2956	-0.15

Table 5 (Continued).

<i>Outcome</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>d</i>
Invented spelling					
Intercept	1.12	0.06	19.54	<.0001	
T condition	0.00	0.08	0.00	0.9994	0.00
CA condition	0.10	0.08	1.24	0.2167	0.16

Note. Intercept represents the control condition. T condition=teacher condition. CA condition=Community aide condition.

Table 6

Kindergarten Readiness Literacy Score Comparisons between Teacher-Implemented, Community Aide-Implemented, and Control Conditions (Cohorts 1 and 2 Only)

<i>Outcome</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Control Condition as Reference				
Kindergarten Literacy Readiness				
Intercept	214.13	38.71	5.53	<.0001
T condition	0.36	2.61	0.14	0.8915
CA condition	-1.09	2.6	-0.42	0.6763
Control (Reference)				
CA Condition as Reference				
Kindergarten Literacy Readiness				
Intercept	214.48	38.82	5.53	<.0001
T condition (Reference)				
CA condition	-1.44	2.6	-0.55	0.5795
Control	-0.36	2.61	-0.14	0.8915

Note: Model results after controlling for non-equivalent baseline scores—phonological awareness, print knowledge, letter naming, letter-sound knowledge, rhyme awareness, alliteration, picture naming, oral comprehension, name writing, and the Get Ready to Read-Revised—using imputed datasets to account for any missing data. T condition=teacher condition, preschool children taught the NBS! program by preschool teachers. CA condition=Community aide condition, preschool children taught the NBS! program by Ready4Success community aides.

Table 7
Comparing Children At-Risk for Reading Difficulties and Those Not-At-Risk (Peers) on Kindergarten Readiness Literacy Scores

Outcome	Peer		At-Risk		Chi-Square Results		
	<i>n</i>	%	<i>n</i>	%	Chi-Square	df	<i>p</i>
Kindergarten Readiness					26.458	1	<.0001
Not Demonstrating Readiness	49	34.80%	53	71.60%			
Demonstrating Readiness	92	65.20%	21	52.60%			