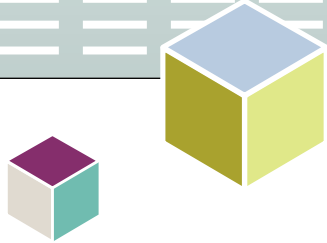Crane Center for Early Childhood Research and Policy

Ready 4 Success

Evaluation Report

Sherine Tambyraja, PhD
August 2019

THE OHIO STATE UNIVERSITY

COLLEGE OF
EDUCATION AND HUMAN ECOLOGY

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Executive Summary

This report presents data from the 2018-2019 academic year of the Ready 4 Success (R4S) initiative, which was funded by the city of Columbus. The primary goal of R4S is to improve early childhood programming in the city of Columbus and support the kindergarten readiness skills of four-year-old children attending prekindergarten programs.

- In the 2018-2019 academic year, several changes were implemented to enhance project activities and data collection. First, R4S services focused heavily on math instruction, as previous years' data suggest math to be a significant area of weakness. Second, professional development (PD) courses were offered online, in order to increase the accessibility to a broader range of teachers. Finally, R4S coaching programming utilized a multi-tiered framework in order to individualize the level of provided services based on children's scores and observed instructional practices in literacy and math.
- Overall results suggest that, on average, children had significantly higher scores in the spring of 2019 compared to fall of 2018 in both literacy and math, with just over 50% of children advancing from the "below average" category to "average" category.
- A significantly higher proportion of teachers participated in online PD courses, as compared to the in-person PD sessions offered in previous years.
- The multi-tiered approach to coaching allowed for teachers to receive a level of coaching supports specific to classroom needs. Teachers who received coaching demonstrated notable changes in their instructional practices and reported increased confidence in providing classroom instruction.
- Results indicated that children who had lower initial scores in literacy made more gain over the course of the year. Children whose teachers received coaching demonstrated greater gains in math, and had higher overall scores on the Kindergarten Transition Summary, compared to children whose teachers did not receive coaching.
- Activities for the upcoming year involve supporting the implementation of Read it Again-mobile to intensify language and literacy instruction in the classroom, refining processes surrounding classroom observations, coaching, and feedback, and the provision of additional online PD courses.

Introduction

Program Context and Background

Decades of research consistently show that achievement gaps between children from economically disadvantaged backgrounds and their peers from higher socio-economic status homes begin prior to formal schooling (e.g., Barnett, Lamy, & Jung, 2005; Magnusson, Meyers, Ruhm, & Waldfogel, 2004; Wertheimer, Moore, Hair, & Croan, 2003; Wright, Diener, & Kay, 2000), and continue to persist throughout their entire academic careers. Research suggests that children's gains in academic achievement is positively associated with attendance at high-quality prekindergarten programs (Howes et al., 2008), and this is particularly so for children from low-SES backgrounds (Christian, Morrison, & Frederick, 1998).

In the city of Columbus, the Ready 4 Success (R4S) initiative seeks to close that gap by bolstering the literacy and math skills of four-year-old children from low-SES backgrounds. R4S offers online professional development (PD) courses and individualized, job-embedded coaching to teachers who have at least one student in receipt of Early Start Columbus (ESC) funding. ESC funding is available through the city of Columbus to children who are or will be 4 years of age by September 30th of the current academic year, and whose families reside in the city of Columbus and meet the income level requirements (at or below 300% of the federal poverty guidelines). ESC funding allows families to receive free or low-cost tuition for their child to attend 3-, 4-, or 5-star rated prekindergarten programs in Columbus.

Historically, the two primary benefits R4S has provided to qualifying prekindergarten programs include child screenings in literacy and math, and PD and coaching opportunities for their teachers. The underlying rationale for providing these two services is to identify areas of need in terms of children's skills, and then support teachers' instructional practices to address those needs. Although research concerning direct effects from a teacher's receipt of coaching and PD participation to improved child outcomes is unclear, data does suggest that individualized coaching can strengthen teachers' abilities to embed early literacy strategies in their instruction (Hsieh, Hemmeter, McCollum, & Ostrosky, 2009; Neuman & Cunningham, 2009; Wasik & Hindman, 2011), and incorporate math-focused language into daily instruction (Rudd, Lambert, Satterwhite, & Smith, 2009). This is a particularly important area of focus, as recent research suggests that although children in most preschool classrooms are exposed to approximately 2 minutes of math-focused language a day (Bachman et al., 2018), the amount of math-focused language children experience throughout the year is significantly and positively related levels of math knowledge at the end of the academic year.

Based on data from the past several years, R4S services had two primary foci. **First**, given several years' data (Tambyraja, 2017; Tambyraja, 2018) showing that approximately half of children in prekindergarten classrooms in Columbus remain "below average" on a math screener, and specific teacher requests for more support in providing math instruction, R4S services aimed to improve math instruction in preschool classrooms. Teachers were invited to complete a free online PD course early in the 2018-2019 academic year regarding how to incorporate evidence-based math strategies in everyday instruction. In addition, R4S conducted classroom observations of math instructional learning time in order to understand teachers' current math strategies, and offer ways to support their future instruction, and offered additional book kits and activities for classrooms whose teacher participated in coaching opportunities. **Second,** R4S staff sought this year to better understand the extent to which online PD and coaching efforts are associated with changes in teacher behavior and perspectives about their teaching effectiveness. Data from the observation tools as a framework for measuring teacher behavior, and teacher questionnaires as a framework for measuring changes in teachers' feelings of confidence and self-efficacy in the classroom yielded much-needed and important information for how we can continue to improve and tailor our coaching services to ESC providers.

R4S sought to achieve these goals through four main activities. First, children were assessed on literacy and math screeners. Second, systematic classroom observations of shared book reading sessions and math learning sessions (e.g., circle time) were conducted to characterize the literacy- and math--focused instruction that regularly occurs in prekindergarten classrooms. Third, four online professional development courses were made available to all participating teachers in the areas of social-emotional classroom climate, math instruction, vocabulary development, and print-focused read-alouds. Finally, a three-tiered coaching model was created in order to offer the most efficient and individualized level of coaching to interested teachers. The format and frequency of coaching services provided were conditional upon the degree of support that was deemed appropriate. For example, teachers whose children scored mostly average and who demonstrated strong instructional methods in literacy and math were encouraged to complete online PD, whereas teachers whose children scored more poorly on the screeners and may have benefitted from more coaching support were offered in-classroom coaching opportunities as well as email check-ins.

Evaluation Aims

For the 2018-2019 year, R4S implemented a multi-pronged approach to meet program goals of preparing four-year-olds in Columbus for kindergarten, and supporting the teachers who serve them. This evaluation of R4S is focused on three aims:

> Aim 1: To what extent do children served by R4S exhibit gains in literacy and math at the end of their prekindergarten year?

> Aim 2: To what extent do teachers who participate in R4S PD and coaching opportunities demonstrate changes in their teaching practices and perspectives throughout the academic year?

> Aim 3: To what extent is teacher participation in R4S activities (PD, coaching, PD + coaching) associated with children's gains in literacy and math?

Methods

In the 2018-2019 academic year, ESC funding was utilized for children to receive free or low-cost tuition at high-quality childcare centers and prekindergarten programs. In order to be eligible for ESC funding slots, programs must have earned 3-, 4-, or 5-star ratings through Ohio's Step Up to Quality (SUTQ) Tiered Quality Rating System, and serve families of four-year-old children who meet the specified income level requirements. Any classroom in eligible centers that served at least one child receiving ESC funding could participate in R4S services (i.e., child screenings, classroom observations and coaching opportunities). In total, R4S staff served 116 classrooms across 84 preschool centers.

For the 2018-2019 year, however, R4S services were also piloted in three community-based locations that were 2-star, 1-star, and no star, in order to examine the feasibility and effectiveness of the services in centers that are usually ineligible. Data from these centers are reported in the results section, but separately from the results involving data from children receiving ESC funding.

Population

From the 116 classrooms serving children who received ESC funding, 55 were community-based classrooms, and 46 were in Columbus City School district locations. All teachers in the community-based programs responded to a survey gathering background information about their educational background and teaching experience. The survey was distributed to teachers in Columbus City Schools via email but only two teachers completed it. Of the 57 teachers who completed the questionnaire, 31% had an Associate's degree, 59% had earned at least a Bachelor's degree, and 8% had a Master's degree or higher level of education. Teacher' years of experience ranged from 1- 28 years with an average of 8.6 (SD = 6.9). Class sizes ranged from 7-26 children, with an average of 16 children per classroom. On average, classrooms had only one child with an IEP; the average number of children who were English language learners was slightly higher (M = 4.8, SD = 6.5).

Screenings were offered to all children in eligible classrooms, regardless of whether they specifically received ESC funding or not. In total, **915** children were screened at both time points (fall and spring) on the literacy screener, and 905 children were screened at both time points on the math screener. In the 2018-2019 year, this included 516 girls and 399 boys. Of those, **630** children were in receipt of ESC funding, either in isolation or in combination with an additional funding streams; 42% of children receiving ESC funding attended preschools in the Columbus City Schools (CCS) district. The average age in months of children receiving ESC funding was 54.27 months (SD = 3.56, $Range$ = 42 – 61 months) at the time of pre-test screening and 60.34 months (SD = 3.55, $Range$ = 47-68) at post-test.

Research Design and Procedures

In the 2018-2019 year, the R4S initiative provided multiple services to support the teaching practices of prekindergarten teachers in Columbus who serve children who receive ESC funding:

- First, all children receiving ESC funding, as well as any additional children whose parents provided permission, completed the literacy and math screening assessments in the fall of 2018 (i.e., pretest). The assessments were conducted by trained assessors; screenings were completed within an 8-week window (September 10 – November 9). Tablets were used for all data collection activities; scores were then entered into the CeeHive system.

- Second, R4S staff contacted all site directors to review the screening data with the teachers. The purpose of these meetings was to ensure that teachers understood the CeeHive system, and were aware of the current levels of literacy and math knowledge exhibited by their students.
- Third, R4S staff contacted site directors to schedule a classroom observation, to obtain additional qualitative information regarding teachers' instructional practices in shared book reading and math-focused instruction.
- Fourth, following the observations, data from child screening information and classroom observations were combined to establish one of three tiers of individualized professional development support (described in detail below).
- Fifth, in the spring of the academic year, children completed the literacy and math screening assessments (i.e., post-test), using the same assessments used in the pre-test in order to determine gains in these two important academic areas. The assessments were conducted by the same trained assessors who administered the fall screenings; screenings were completed within an 8-week window (March 28 – May 13). Tablets were used for all data collection activities; scores were then entered into the CeeHive system.
- Finally, teachers submitted their year-end assessment of children's kindergarten-readiness skills with the Kindergarten Transition Summary (KTS). This information was a requirement for those receiving ESC funding; KTS data were entered directly into CeeHive. Additionally, teachers who received coaching were asked to complete a brief exit survey to gather their feedback regarding their coaching experience and the extent to which they felt the coaching impacted their teaching practices.

Data Collection Tools

Primary Outcome Measures

Three measures of children's knowledge and academic progress were the primary outcomes of interest, in addition to two measures of teachers' instructional practice:

Get Ready to Read (GRTR). The GRTR (Whitehurst & Lonigan, 2001) is a 25-item literacy screener for children ages three to five years. The GRTR is comprised of 25 questions and takes approximately ten minutes to administer. This literacy screener assesses children's knowledge about letter names, letter sounds, phonological awareness, and print awareness. All items are administered directly to the child and scored as "1" if correct and "0" if incorrect. Scores are summed and reflect the total number of correct responses by the child. This summed score, along with the child's age, is used to classify the child's performance as *below average*, *average*, or *above average*, based on data from a normative sample. This screener was administered in the fall of 2018 and again in the spring of 2019.

Preschool Early Numeracy Screener – Brief (PENS-B). The PENS-B (Purpura & Lonigan, 2015) is a 24-item screener appropriate for children ages three to five years and assesses children's knowledge of the early numeracy skills needed for subsequent instruction in mathematics. It takes approximately ten minutes to administer directly to the child. The questions focus on assessing children's knowledge of cardinal numbers and number operations. Answers are scored as "1" if correct and "0" if incorrect. Testing is discontinued after three consecutive incorrect responses. Scores are summed and reflect the total number of correct responses provided by the child. The summed score, along with the child's age, is used to classify the child's performance as *below average*, *average*, or *above average,* based on data from a normative sample. This screener was administered in the fall of 2018 and again in the spring of 2019.

Kindergarten Transition Summary (KTS). The KTS is a 54-item comprehensive evaluation completed by teachers at the end of the prekindergarten year for each child. The KTS assesses five broad domains of development, including Social-Emotional Development, Approaches to Learning, Cognitive Development, Language and Literacy Development, and Physical Development. Total scores range from 0-110 and are organized into to three categories: a) *not yet evident*, b) *in progress*, and c) *proficient*. The KTS is a requirement by the city of Columbus for children receiving ESC funding, and all teachers were expected to submit their scores through CeeHive by the end of the academic year (May 28, 2019). KTS data for the majority of children who were receiving ESC funding (*n* = 574, 91%) was submitted at the time of this evaluation.

Classroom Observational Tools

Literacy-Focused Instruction. Literacy-focused instruction was measured with the revised and adapted version of the Systematic Assessment of Book Reading (SABR; Pentimonti, Zucker, Bowles, Tambyraja, & Justice, 2018). This observation tool measures the quantity of extra-textual talk by teachers specific to concepts of phonological awareness, print concept knowledge, letter knowledge, and vocabulary, during a whole-class shared book reading session. This observation tool also measures the quantity and variety of scaffolding strategies teachers use during book reading sessions to facilitate children's learning of literacy and language concepts. Specifically, the adapted SABR determined the number of times that teachers used the strategies of generalizing, reasoning, making predictions, co-participating, choice reduction, and eliciting verbal responses. Teachers were informed that they would be video-taped and observed, and then had the opportunity to view the video themselves for self-assessment purposes. R4S coaching staff utilized the videos and the SABR tool to provide individualized feedback and suggestions to teachers for additional ways they could utilize the book reading session for literacy-learning opportunities. In this evaluation, we considered the number of times teachers referenced each literacy concept (phonological awareness, print knowledge, vocabulary, letter knowledge), the total number of scaffolding strategies used, and the total number of different types of strategies used, at each observed time point (before coaching, after coaching).

Math-Focused Instruction. Although no standardized math-focused observation has been reported in the literature, we incorporated information from two peer-reviewed articles reporting on effective observations of math instruction in preschool classrooms (Rudd, Lambert, Satterwhite, & Smith, 2009; Klibanoff, Levine, Huttenlocher, Vasilyeva & Hedges, 2006), as well as the joint position statement of the National Association for the Education of Young Children (NAEYC) and the National Council of Teachers of Mathematics (NCTM) to create an easy-to-use math observation tool. Importantly, the observation tool aligns with the skills and knowledge assessed with the PENS-B as well as the Early Learning standards, including counting, number knowledge, number order, story problems and patterns. Similar to the SABR observations, math-focused instruction time was videotaped so the teacher and R4S coach could review the session together, and discuss ideas and suggestions for increasing math-learning opportunities in the classroom. For purposes of this evaluation, we considered the total number of times each math concept was referenced during the instructional session at both timepoints (before coaching, after coaching).

Primary Predictor Variables

Data from several different types of variables were used to understand the variability in children's gains in literacy and math throughout the academic year, specific to child-level factors (initial skill levels, attendance data) and classroom-level factors (teacher participation in R4S services).

Fall Scores. Children's fall scores on the GRTR and PENS-B were used to approximate children's levels of knowledge in literacy and math, respectively, at the beginning of the prekindergarten year. Accounting for children's fall scores is important for understanding the extent to which prior, or foundational, knowledge contributes to knowledge gain. In the 2017-2018 year, for example, results indicated that children who started the year with lower levels of literacy and math knowledge demonstrated the most amount of gain throughout the year, as they had more room to grow. This year, we sought to determine the extent to which this pattern persists.

Attendance Data. Teachers entered information pertaining to daily attendance into the CeeHive database for children receiving ESC funds. For the purposes of the analyses in this report, total days attended was tabulated for each child. Attendance data was available for 97% (*n* = 613) of children receiving ESC funding.

Participation in R4S professional development services. Teachers had several options for PD opportunities throughout the year. All teachers were encouraged to participate in the online PD modules created by R4S staff. The link was made available via email and participation was also encouraged in face-to-face meetings with teachers. Table 1 shows the total number of participants for each online PD. Note that some participants may not have been ESC providers, as the link may have been shared with others.

Table 1. Online PD participation

PD Course	Total number of participants
Understanding the Social and Emotional Climate of Your Classroom	104
Effective and Authentic Math Instruction	51
Power Words: Enhancing Children's Vocabulary Development	49
Print-Focused Read-Alouds for Literacy	11

In addition to online PD, job-embedded individualized coaching was also offered throughout the year. Because face-to-face coaching can be time- and resource-intensive, we offered three tiers of support, based on child-level data and classroom observation data, to deliver the most efficient and individualized suite of services to participating teachers. Out of the 55 *community-based classrooms* served by R4S this year, a large majority (*n* = 45, 82%) opted to participate in coaching. Columbus City School teachers chose not to participate in coaching this year due to other coaching programming in their district. Descriptions of the coaching tiers, the corresponding support, and the number of classrooms that were assigned to each coaching tier per content area (literacy or math) are seen in Table 2 below. Overall, coaches sent an average of 8.2 coaching emails (*SD* = 5.7, *Range* = 1-19), and conducted on average four face-to-face coaching encounters with teachers (*SD* = 1.3, R*ange* = 1-7).

Table 2. Classrooms receiving coaching in each tier

Tier assessment criteria	Coaching activities	Classrooms receiving literacy-focused coaching	Classrooms receiving math-focused coaching
Tier 1: 50% or less of children performing in the below average range.	Offer instructional support and ideas as needed,	23	9
Tier 2: Classroom observations indicate areas for some growth. 50%-74% of the children are performing in the below average range.	Encourage participation in online PD; offer face-to-face coaching services and/or via email or phone.	18	14
Tier 3: Classroom observations indicate areas for significant growth. More than 75% of children are performing in the below average range.	Offer biweekly face-to-face coaching meetings to focus on changing/improving implementation of instructional strategies.	4	22
Total		45	45

For purposes of analyses, however, we considered the degree of participation in R4S services as a categorical predictor. Thus, all teachers in R4S this year were coded as: a) not participating in any services (*n* = 62), b) only participating in online PD (*n* = 8), c) only participating in coaching services (*n* = 9), and d) participating in both online PD and coaching (*n* = 36).

Data Analysis

To address the first research aim, descriptive statistics were used to evaluate children's levels of risk, gains in literacy and math, and relative areas of strengths and weaknesses of school readiness across the five KTS domains. Descriptive statistics were also used to address the second aim of determining differences between teachers' observed instructional practices in the fall and spring of the academic year. For the third and final aim, three-level hierarchical linear modeling (HLM) was used to understand the associations between children's gains in literacy and math and the child-level and teacher-level predictor variables noted in the previous section (i.e., children's fall scores, attendance, teacher participation in R4S services) while controlling for the nested nature of the data (i.e., children clustered within classrooms, and classrooms clustered within school buildings). HLM considers the extent to which children's gains might be similar due to attending school in the same building and/or having the same teacher. As a preliminary step to determining the need for HLM, we calculated an intra-class correlation (ICC) to approximate the amount of variability that was accounted for by both teacher-level and school-level effects. A large ICC indicates significant and large differences between classrooms and schools, and justifies the need for HLM. With the current population of schools, teachers, and students involved in this evaluation of R4S, analyses determined that the degree of variation in children's gains attributable to school differences was negligible compared to gains on the GRTR and PENS-B (2.2% and 0.03%, respectively). Variation attributable to teacher differences on the GRTR and PENS-B was moderate (11.2% and 9.5%, respectively); but larger for the KTS (13%).

Results

Data collected throughout the year regarding children's literacy and math skills were measured with consideration of the classroom environments they experience, and the extent to which their teachers participate in the PD opportunities provided by R4S staff. This section addresses the specific evaluation aims of the R4S initiative for the 2018-2019 academic year.

Aim 1: To what extent do children served by R4S exhibit gains in literacy and math at the end of their prekindergarten year?

We addressed this question in two ways. First, we considered the number of children receiving ESC funds, whose GRTR scores were considered to be "below average" in the fall, but moved into an "average" or "above average" classification in the spring. In the fall, 334 children (53%) had scores on the GRTR that placed them in the "below average" category. By the spring, however, over one-half of those children improved their performance and had scores that were categorized as "average" ($n = 163$, 48.8%) or "above average" ($n = 21$, 6.3%).

Category movement for the PENS-B was not as large, but still notable. Of the 451 (72%) children receiving ESC funds whose PENS-B scores were considered to be "below average" in the fall, 190 children improved their age-based performance with scores that were either categorized as "average" ($n = 148$, 32.8%) or "above average" ($n = 42$, 9.3%).

We also considered improvement over the year with respect to the gains in the average raw score points on the two screeners, as examining actual score differences is an important method for evaluating the knowledge and skills learned throughout the year. Indeed, the examination of raw score differences suggested significant growth throughout the school year. As shown in Figure 1, children receiving ESC funds demonstrated significant gains in both literacy (5.23 points) and math (5.17 points) from fall to spring. Results from the HLM, controlling for school and teacher level effects, confirmed that gains in average scores were statistically significant for both literacy ($t(60.52) = 24.99$, $p < .001$) and math ($t(105.39) = 23.78$, $p < .001$).

Effect sizes were also calculated to determine the magnitude of children's gains over time. Cohen's *d* calculations of effect sizes can be interpreted as small (.3), medium (.5), or large (.8). The effect size for gains in literacy was .65 and .59 for math, indicating a medium-large magnitude of change over time.
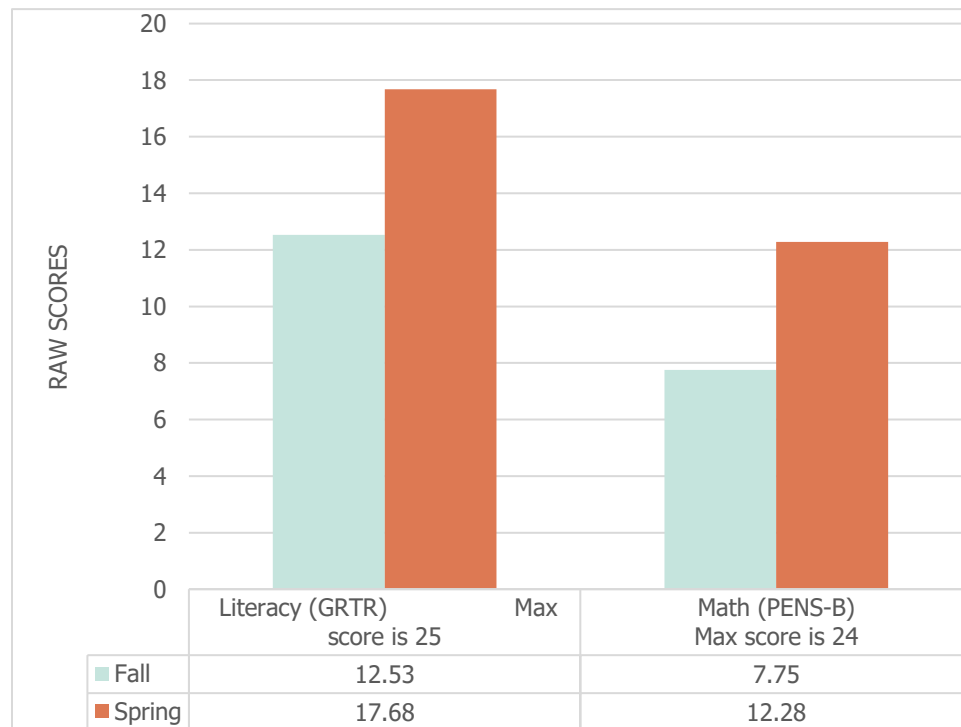

	Literacy (GRTR) Max score is 25	Math (PENS-B) Max score is 24
■ Fall	12.53	7.75
■ Spring	17.68	12.28

Figure 1. Average gain scores on the GRTR and PENS-B by children receiving ESC funds

Finally, although the KTS does not approximate change over the academic year, the measure provides teachers with an opportunity to assess children's kindergarten readiness across multiple areas, as described in the previous section. The overall scores, which consider all skills areas, ranged from 17-110 (*M* = 89.90, *SD* = 19.28). The vast majority were categorized as "Proficient" (*n* = 464, 81%), with a much smaller percentage classified as "In Progress" (*n* = 98, 17%), and 12 children whose overall kindergarten readiness skills were deemed to be "Not Yet Evident" (2%). When considered by domain, the proportion of children categorized as "Proficient" was similarly large for Social Emotional Skills (78%), Approaches to Learning (72%), Cognitive Development (77%), Language and Literacy (79%), and Physical Development (96%).

Aim 2: To what extent do teachers who participate in R4S PD opportunities demonstrate changes in their teaching practices and perspectives throughout the academic year?

As noted above, teachers' book reading sessions and math-focused instructional time were observed and coded for the presence of specific behaviors considered to be predictive of children's acquisition of literacy and math skills, respectively. Because these observed sessions were of the teacher's choice of books and math activities, and thus varied considerably, the observations were conducted as an example of what teachers might typically do. We approached this question from two persepctives: first, we considered whether teachers' classroom instructional behaviors differed from fall to spring, after receiving coaching; second, we considered whether teachers' sense of self-efficacy and evaluation of their strengths and weaknessess differed from fall to spring. For these analyses, data from the 45 teachers who received coaching were used.

Change in Instructional Behavior – Shared Book Readings

We used scores from the book reading observation to assess change in teachers' instructional behavior with respect to referencing and supporting literacy skills from fall to spring (see Table 3). Specifically, we examined the number of times teachers used the book reading sessions to promote print awareness, phonological awareness, letter knowledge, and vocabulary. We also examined the total number and total types of scaffolding strategies used. Note that observations were conducted in classrooms where children's average literacy scores were very low; spring observations were only conducted for teachers who a) received literacy-focused coaching and b) responded to requests to schedule a second observation.

Table 3. Average number of literacy-related references during shared book readings in fall and spring

	Fall (*n* =19)	Spring (*n* = 9)
Print Awareness	5.01	6.62
Phonological Awareness	0	5.51
Letter Knowledge	0	2.04
Vocabulary	0	3.07
Total scaffolding strategies used	14.74	18.71
Number of unique scaffolding strategies used	3.42	3.57

Change in Instructional Behavior – Math Instruction

We used scores from the math activity observation to assess change in teachers' instructional behavior with respect to developing math skills. Specifically, we examined the total number of times math content area was referenced or taught within the instructional session, as well as the total number of different types of math content areas teachers referenced within a session, from fall to spring. These comparisons, displayed in Table 4, indicate that across most content areas, teachers referenced more math concepts during the observed times in the fall compared to the spring. These data also indicate math content areas that teachers may feel less comfortable teaching, and may be areas for continued PD and support.

Table 4. Average number of math-related references during math instruction in fall and spring

Math skill	Example	Fall (*n* = 42)	Spring (*n* = 19)
Counting	Counting, labels "how many" objects	8.41	9.74
Number knowledge	Identifying the total number in a set, applying verbal counting sequence to a set of objects and using one number name for each object counted	13.01	13.08
Set/numeral comparisons	Using terms such as more/less	6.55	9.06
Number order	Knowing the numbers that come before and after other numbers in the counting sequence	3.13	4.52
Number combinations	Basic addition problems	2.92	3.03
Story problems	Contextualized verbal addition and subtraction	2.62	6.01
Patterns	Notices and copies simple repeating patterns	9.20	12.67
Displaying/analyzing data	Sorts objects and counts and compares the groups formed	6.15	6.20

Teacher Self-Evaluation

In the fall, teachers who responded to the initial questionnaire (*n* = 57) were asked to report their levels of confidence in planning and implementing literacy and math activities in their classroom. As seen in Figure 2 below, most teachers reported to have relatively high levels of confidence overall, but more so in literacy-focused instruction compared to math-focused instruction.
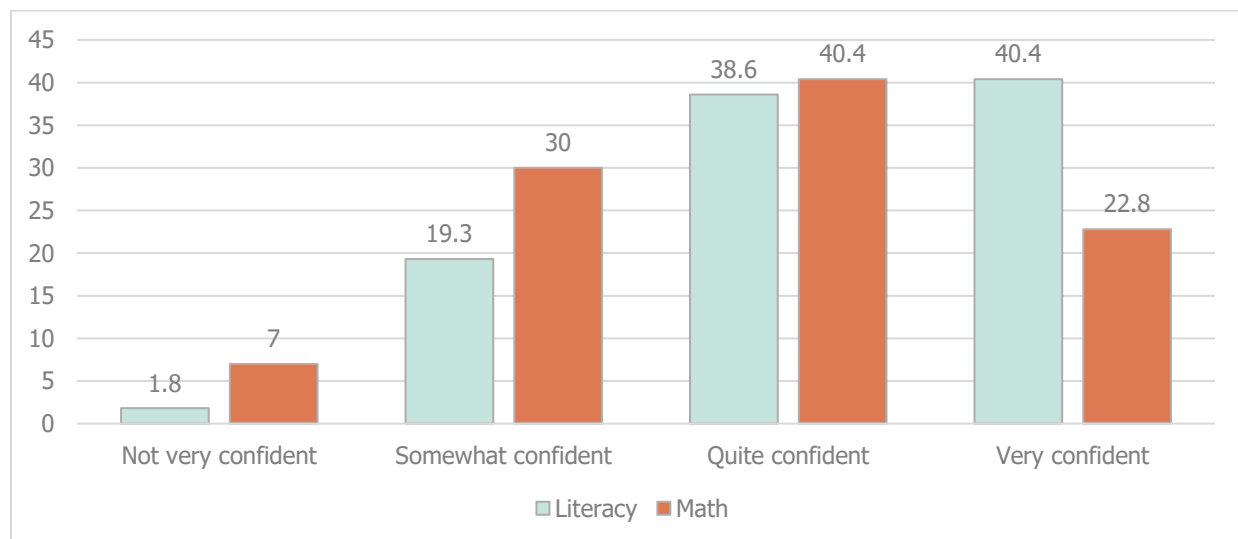

Figure 2. Percentage of teachers reporting confidence levels in providing literacy and math instruction – fall

Teachers who received coaching and responded to the final survey (n = 15), either agreed that their confidence increased in literacy (n = 7) and math (n = 9), or strongly agreed that their confidence increased in literacy instruction (n = 8) and math (n = 6). Open-ended responses to the survey indicated that videos from the online PDs were particularly helpful for improving their math instruction, and that the book kits and individual coaching helped teachers to implement new and different activities in the classroom.

Aim 3: To what extent are child-level variables and/or teacher participation in R4S activities (PD, coaching, PD + coaching) associated with children's gains in literacy and math?

The final aim of this evaluation was to understand the child-level and teacher/classroom-level variables that contributed to gains in literacy and math skills over the academic year for children who receive ESC funding. Identifying these variables is critical to continuing to improve R4S services and understanding optimal ways to serve prekindergarten children in Columbus. Based on data from the previous academic year (2017-2018), we included several child-level variables that were associated with children's gains in literacy and math as covariates in the multi-level regression model. Specifically, we included data pertaining to children's fall scores and the total number of days the child attended school throughout the year. We also examined the extent to which attendance at a Columbus City preschool or a community-based preschool was associated with gains in literacy and math. The primary teacher/classroom-level predictor variable of interest was the extent to which teachers' participation in R4S services was directly associated with children's growth throughout the year. Four categories of participation were entered in the model: a) no participation at all, b) online PD only, c) coaching only, and d) PD and coaching.

The first model examined the extent to which these variables predicted children's gains on the GRTR assessment over the academic year. Results indicated that the child's fall score (b = -.301, p < .001) was significantly associated with GRTR gains. Results indicated a negative relation between children's fall score and the amount of gain they demonstrated on the GRTR; that is, children with lower fall scores exhibited greater gain over the year compared to children with higher fall scores. No other child-level variables (attendance, ESC funded) or teacher/classrooms variables (R4S PD participation, CCS preschool) were statistically significant.

We also examined the extent to which the same predictor variables were associated with children's gains on the PENS-B assessment over the academic year. Results indicated that teachers' participation in coaching (b = .285, p = .042) was significantly associated with children's gains in math skills.

Finally, we investigated the associations between the predictor variables and children's KTS total score. Teachers' participation in coaching was significantly associated with a greater overall score on the KTS (b = 31.10, p = .040).

Pilot Centers

As noted above, R4S services were piloted in three community-based locations that were 2-star, 1-star, and no star, in order to examine the feasibility and effectiveness of the services in centers that are usually ineligible. Although their data was not included in the formal evaluation for this year, it was of interest to examine the literacy and math skills of children served in preschool centers that are not eligible for ESC funding (i.e., not 3-, 4-, or 5-star rated). As seen in Figure 3 below, the children served in the pilot centers exhibited significantly lower scores on both the literacy and math screeners at both time points; however, the *gain scores* (i.e., pre-test – post-test) of children attending pilot centers was *not* statistically significantly different for literacy ($p = .205$) or math ($p = .289$), from that of children receiving ESC funding.
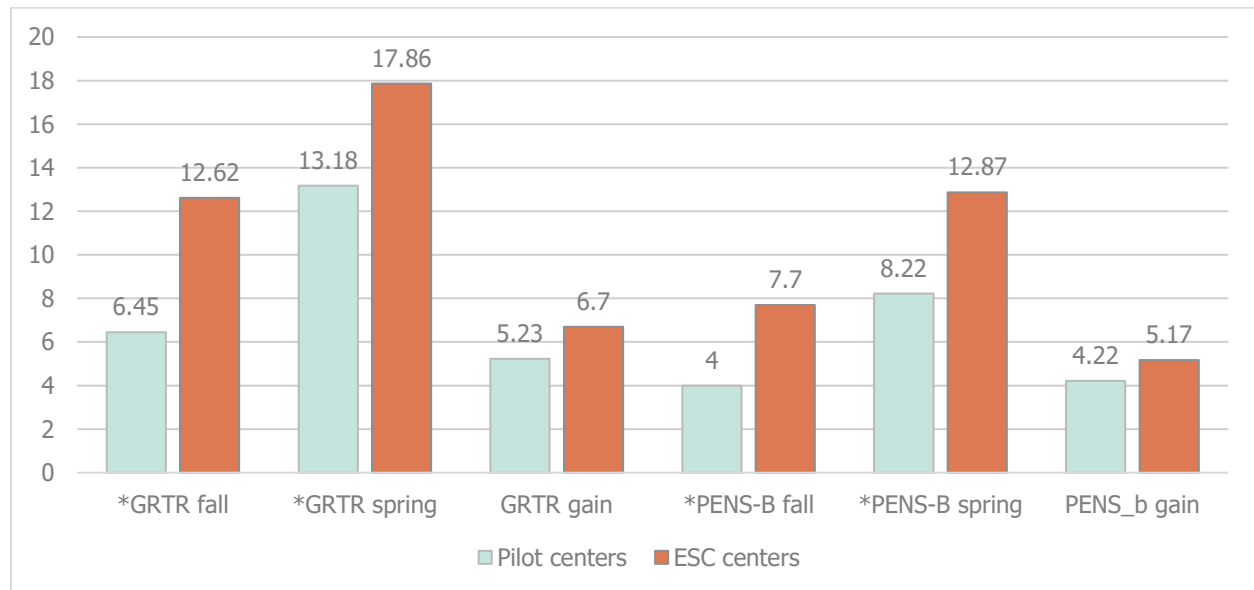
Note. * denotes statistically significant difference between groups, p < .05

Figure 3. Mean scores and gain scores of children in pilot centers vs ESC centers

Discussion

Interpretation of Results

The goals of R4S are centered on improving the school readiness of young children in Columbus by supporting the teachers who serve them. For many community-based providers, access to PD opportunities may be difficult, and the R4S staff seeks to meet this critical need in the early childhood community in Columbus. In the 2018-2019 year, R4S focused heavily on supporting math instruction. In addition, the PD services were streamlined to directly support literacy and math instruction, and redesigned to meet individual classroom needs. PD courses were offered online to increase accessibility and resources. Coaching efforts were tailored to address the child-specific and instruction-specific needs of each classroom. These changes in the delivery of services allowed a greater number of teachers and centers to participate and broadened the reach of these programs. Below, we highlight some of the results from this evaluation that warrant further discussion and underscore modifications for the 2019-2020 year.

The first point of discussion relates to and substantiates the strong emphasis placed on supporting math-focused instruction. For the past three years, the baseline math skills of young children who qualify for financial support to attend prekindergarten programs have been consistently poor, with approximately 75% of children scoring in the "below average" category for their age in the fall of their prekindergarten year. This year was no exception; moreover, data from the three pilot centers highlighted this issue even further. Children attending no-star, or low-star rated centers had a mean score of 4 on the PENS-B in the fall, and a score of 8 by the spring, which is comparable to the score that most children in the higher-rated centers achieved in the fall. In other words, children in centers with perhaps fewer resources are at even greater risk for ongoing achievement gaps in math, compared to those attending high-quality centers. On the one hand, these consistent data suggest that R4S programming and ESC funding for children who may otherwise begin their formal schooling at a distinct disadvantage compared to some of their peers continues to serve a critical need for children in Columbus. On the other hand, these data also reveal distinct achievement gaps even within the group of children deemed "at risk". These results should be interpreted with caution, of course, as the number of children included in the pilot group was considerably smaller than those in the ESC center group. But as preliminary data, there is evidence that finding ways to reach teachers who work in a range of early childhood community-based centers may be extremely important. Relatedly, although all children did not fully catch up throughout the year, steady and significant progress was evident, even for children attending the "pilot centers". Although the mean scores of children in the pilot centers was consistently lower compared to peers in centers serving children with ESC funding, the rate of gain in both literacy and math was similar across groups. This finding suggests that even though their baseline knowledge may be lower, their ability to learn and acquire knowledge does not differ from their peers in other centers. In short, we must consider avenues for increasing outreach and access to resources for teachers and students in a variety of early childhood education settings.

A second outcome from this evaluation that warrants consideration pertains to the observed changes in teachers' instructional behaviors from the first observation in the fall to the second observation in the spring. As described earlier, coaching goals this year were specific to literacy and/or math, and the observation scheme guided coaches' feedback and suggestions to their teachers. Although there was no control group to determine the extent to which these changes are specifically attributed to coaching efforts, the increase in both literacy and math references during instructional periods is a positive result. Similarly, responses not only indicated teachers' satisfaction with coaching services and PD, but also teachers' increased levels of confidence from the coaching and professional development support. Indeed, these results align with previous, rigorously conducted studies examining the effects from coaching. Specifically, research supports the notion that systematic coaching imparts direct effects teacher practices, particularly when coaching is focused on supporting or changing specific behaviors (e.g., Magnuson et al., 2004; Powell, Diamond, Burchinal, & Koehler, 2010; Wright et al., 2000).

Perhaps the most compelling outcome from these analyses, however, is that the receipt of coaching was significantly associated with children's gains in math, as well as their overall scores on the KTS. Indeed, the majority of coaching efforts were specific to supporting math instruction, as children's literacy scores and teachers' literacy-focused instruction were relatively stronger. These results support the idea that coaching can influence teacher practice, and in turn, children's outcomes (e.g., see Kraft, Hogan, & Blazar, 2008 for a review; Wasik & Hindman, 2011). It should also be noted that the degree of coaching offered to teachers was relative to children's average math scores in the fall. Thus, coaching services were provided in classrooms where children's scores were particularly low, and subsequently, would be most likely to evidence growth over the year. Even if there was some degree of overlap between the effects from children's fall scores and teachers' receipt of coaching, this is a very promising outcome and validates the programmatic changes made this year to use coaching to support math instruction, and to adjust the intensity of coaching services, based on classroom and teacher needs.

Implications

The implications from this year of R4S data extend to both children and teachers. First, the fact that, year after year, children in Columbus demonstrate similar levels of literacy and math knowledge at the beginning of the school year suggests that providing access to high-quality prekindergarten programming will continue to be a crucial contributor for improving children's kindergarten readiness in Columbus. However, these consistent data may also indicate that more efforts need to be made even prior to children's prekindergarten year. Decades of research suggest that children from low-income households begin formal schooling at a disadvantage compared to peers from higher-income backgrounds (e.g., Barnett et al., 2005; Wright et al., 2000). Although commendable efforts are in place to support their learning in the year before kindergarten, perhaps even more benefits would be observed if supports started earlier. Increasing funding for attending preschool earlier may not be feasible; however, other strategies such as community-based efforts to establish parent training programs to facilitate children's early socio-emotional and cognitive development may be a worthwhile endeavor.

A second and important implication from these data pertains to the fact that many teachers in community-based centers were both receptive to and appreciative of the highly-individualized model of coaching services provided. In previous years, teachers had specifically requested supports in math-focused instruction, and our concerted efforts to meet those needs this year were successful. Implications from this outcome are two-fold: first, teachers were cognizant of the areas in which they needed guidance and additional resources; second, when guidance and resources were offered, many teachers were open to and eager to implement newly learned strategies. As such, content areas for future coaching should continue to be teacher-initiated, to the extent possible.

It is also worth noting that the data presented in this report are largely quantitative, and focus on the evidence-based changes and outcomes from the year. However, these data do not capture the extent to which the interpersonal relationships developed between R4S staff and teachers contribute to positive outcomes from coaching. Coaching models differ considerably, but most converge on the notion that coaching is dependent on a strong partnership and a sense of trust between the coach and the coachee (Jablon, Dombro & Johnsen, 2016). Thus, the fact that a new model of coaching, coupled with in-classroom observations, showed signs of being successful for enhancing teacher practice and children's outcomes, suggests that the R4S coaches were extremely skilled in developing and offering these services to teachers in ways that were respectful and supportive. Indeed, these data should be considered preliminary as this is the first year that we implemented the tiered system to coaching. However, implications from this year's results suggest that the modifications implemented this year to focus on math instruction and individualize coaching efforts based on child-level and classroom-level data were appropriate and meaningful to these teachers, and that this approach to supporting teachers should continue.

Limitations and Recommendations

Limitations, strengths, and findings from the present year inform the recommendations and changes planned for the upcoming 2019-2020 academic year.

First, although many teachers in community-based programs participated in the online PD, the creation and rollout of these courses took more time than anticipated; thus, participation rates in later PD courses was lower than those offered earlier. This year, R4S staff will create and provide two additional online PD courses early in the academic year to ensure that teachers have sufficient time access and complete these courses early, and will have more time to implement newly learned strategies in their classrooms. Based on teacher feedback, we will offer a course specific to managing challenging behaviors in the classroom, and a training PD for implementing the Read It Again-Mobile (RIA-M) program in all classrooms. In addition, the online PD modules will available to all and any interested preschool teachers, to expand our reach, and increase access to free resources. As noted earlier, finding ways to support teachers in different locations, particularly teachers who may have experienced barriers to attending PDs may be crucial for meeting the needs of all children in Columbus. The four online PDs offered to R4S teachers this year have been made available to the public, and participation has been extremely high. This suggests that the investments made in creating these online PDs for R4S teachers are enormously beneficial to the early childhood education community in Columbus, and these courses will continue to remain open.

Second, although the observation-based data helped us to understand changes in teacher behavior, teachers' responsiveness to observations at a second timepoint, as well as their responsiveness to the final survey was rather low, limiting our ability to draw strong conclusions about the general effectiveness of coaching on teachers' instructional practices. As such, in the coming year, observations of literacy and math instructional time will be conducted on the same day, to limit the number of classroom visits. More concerted efforts to obtain end-of-year data will be implemented by utilizing both paper and online versions of surveys.

Finally, in the past year, coaching related to literacy instruction was individualized; however, generally children in these classrooms had relatively better literacy skills compared to math skills. Subsequently, fewer teachers received literacy-focused coaching, and those that did, worked towards variable goals. In the coming year, teachers will be trained and supported to implement the Read it Again – Mobile (RIA – M) curriculum in their classrooms in order to support the language skills of young children, in addition to their literacy skills. RIA – M is the mobile version of the fully manualized RIA curriculum (Justice & McGinty, 2009) that is effective for students with diverse abilities and backgrounds. Teachers will be provided with tablets, curriculum materials, and student progress monitoring capabilities to support the language and literacy learning of all students.

Conclusion

R4S collects valuable information and offers much-needed support for Columbus area children by developing their kindergarten readiness skills. R4S also supported their teachers by providing individualized coaching and PD. Data show that children made significant progress throughout the year, but that many children in Columbus begin their prekindergarten year at a remarkable disadvantage compared to their peers, and many continue to perform below their peers in math, even at the end of the year. This information strongly supports the idea that the R4S program meets a critical need among young children in Columbus and the early childhood education programs that they attend but that our work must be more specific and targeted to supporting math development and impacting teachers' instructional practices. Therefore, the recommendation and plan for the 2018-2019 year is to continue to gather data about the skills and school readiness of youngsters in our city, increase the accessibility to online PD earlier in the year, and continue to monitor the impacts this programming has on the ways that teachers meet children's needs in the classroom.

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Author Note

The Crane Center for Early Childhood Research and Policy (CCEC)

The Crane Center for Early Childhood Research and Policy (CCEC), in the College of Education and Human Ecology at The Ohio State University, is a multidisciplinary research center dedicated to conducting high-quality research that improves children's learning and development at home, in school, and in the community. Our vision is to be a driving force in the intersection of research, policy and practice, as they relate to children's well-being.

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The recommended citation for this paper is:

Tambyraja, Sherine R. (2019). *Ready 4 Success: Evaluation Report*. Columbus, OH: Crane Center for Early Childhood Research and Policy, The Ohio State University.