An Impact Evaluation of Reading Corps in Colorado

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Introduction

Reading Corps Overview

Launched in 2003, Reading Corps is an AmeriCorps program that places community members in schools across the country to provide evidence-based literacy support to students from Kindergarten to grade 3. The theory of change underlying Reading Corps is that high-dosage tutoring provided by AmeriCorps members will help schools meet the literacy needs of students and increase the number of students achieving reading profiency by third grade.

Reading Corps trains AmeriCorps members (tutors) in a series of empirically supported literacy interventions aligned with science-based literacy instruction (Scarborough, 2001) and research compendia such as the National Reading Panel's Big Five areas of reading instruction: phonological awareness, phonics, fluency, vocabulary, and comprehension (Snow et al., 1998). Tutors deliver literacy intervention to individuals or pairs of students for 20 minutes each day. During the school year each tutor supports an average of 20 students with each student receiving an average of 20 weeks of tutoring.

Reading Corps provides tutors with multiple layers of supervision to ensure integrity of program implementation. Schools identity a staff member to serve as an "Internal Coach", who is typically a literacy specialist, teacher, or curriculum director, to serve as immediate on-site supervisor, mentor, and advocate for tutors. The Internal Coach's role is to monitor tutors and provide guidance in the implementation of Reading Corps's assessments and interventions. In addition, tutors and Internal Coaches receive support from a Reading Corps "Coaching Specialist", a program and literacy expert who ensures implementation integrity of Reading Corps program elements. Program staff provide a third layer of support, helping members complete a successful year of AmeriCorps service. Program staff also provide administrative support to schools participating in Reading Corps.

In addition to training and coaching on the delivery of literacy interventions, Reading Corps tutors and coaches are trained to regularly use data to make decisions about which students to support and when to modify that support. All students participating in the Reading Corps program must demonstrate a need for additional support—defined as literacy performance below grade-level expectations. Further, Reading Corps tutors monitor the progress of students in the program using brief weekly assessments of student performance.

Reading Corps in Colorado

Reading Corps was introduced in Colorado in 2012. During the 2022-23 school year, 142 Reading Corps tutors served a total of 2,682 students across 88 Colorado schools. The implementation of Reading Corps in Colorado is managed by Colorado Youth for a Change, a nonprofit organization that partners with school districts across Colorado to provide a continuum of programming for children and youth, spanning from age 3 all the way through age 21.

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About the Evaluation

The Reading Corps program has an extensive research base, including replicated positive findings from rigorous randomized controlled trial evaluations (Markovitz et al., 2014, 2018). The program is also identified as having the highest level of evidence by rigorous third-party reviews, such as the Evidence for ESSA clearinghouse at Johns Hopkins University. However, the causal impact of the program has not been directly replicated in the implementation context and settings of Colorado. The current evaluation leveraged the breadth of the program across multiple Colorado school communities and the fact that Reading Corps services have not yet been provided to every eligible student within those communities to conduct a rigorous quasi-experimental analysis of literacy outcomes that permits a causal interpretation of impact without the significant costs of novel data collection and randomization procedures.

The evaluation was guided by the following two research questions:

1. What is the impact of the Reading Corps program on the spring (year-end) literacy skills of participating students as compared to those who did not participate in the program?
2. Among students who are English Language Learners, what is the impact of the Reading Corps program on the spring (year-end) literacy skills of participating students as compared to those who did not participate in the program?

Impact Assessment

Measures

Reading Corps benchmarks student literacy performance during the fall (September), winter (January), and spring (April/May) seasons. Tutors measure student performance using letter sounds in kindergarten, nonsense words and oral reading fluency in first grade, and oral reading fluency in second and third grade. All measures assess fluency and produce scores expressed as "correct per minute."

Letter Sound Fluency. Letter sound fluency was assessed in the current evaluation using letter sounds probes containing a mix of upper and lowercase letters. The letter sounds assessment is scored as the number of letters sound correct per minute. Technical adequacy for letter sound fluency measures has 'convincing evidence' as reviewed by the National Center on Intensive Intervention (2023).

Nonsense Word Fluency (NWF). To measure decoding skills, tutors serving students in first grade used NWF assessments that contained CVC decodable pseudowords. Students were allowed to read the entire word or sound out individual parts when scoring correct responses. Credit was given for each word read correct. The number of words in 1 min was the primary outcome of interest. Reported alternate form and internal consistency reliability estimates for the *Formative Assessment System for Teachers* (FAST) NWF probes ranged from .86 to .96 and .73 to .98, respectively. Two-week test–retest reliability was reported as .76. Predictive validity with the Group Reading Assessment and Diagnostic Evaluation test was reported as .67 (Christ et al., 2018).

Curriculum-Based Measurement—Reading (CBM-R). To measure oral reading rate among first, second, and third grade students, tutors used CBM-R probes, which assess the number of words read correct in 1 min by students. Median alternate form and internal consistent reliability for FAST CBM-R probes was equal to .92 (Christ et al., 2018). Fall to winter and winter to spring test–retest reliability estimates were equal to .90 and .82, respectively for grade-one students. Concurrent validity with the Test of Sentence Reading and Comprehension (Wagner, Torgesen, Rashotte, & Pearson, 2010) was equal to .86 for grade one students.

Participants

The present evaluation took place in a subset of the Colorado school districts implementing Reading Corps in 2022-23. The students served in these districts represent 34% of all Colorado students participating in Reading Corps. The full data file available for the evaluation included records for 1,571 students – both Reading Corps participants and non-participants – across kindergarten (n = 257), first grade (n = 475), second grade (n = 434), and third grade (n = 405). Students that received tutoring were spread across 30 different school sites and were served by one of 47 tutors. Students with no minutes of intervention were identified as "comparison" students (n = 661) and students with any minutes of service were assigned a preliminary "treatment" designation (n = 910). Thus,

there were generally fewer possible comparison students in the full data file relative to students who received some tutoring.

Inclusion Criteria and Baseline Equivalence of Groups

To be included in the current evaluation, students assigned to the comparison group were required to have no tutoring during the academic year. To be included in the treatment group, students were required to have at least 20 intervention sessions on record, which is equivalent to approximately four weeks of intervention. Finally, students in either group were excluded if they were missing assessment data in the fall (i.e., baseline) or spring (post-test). Adopting these inclusion criteria produced an initial analytic file with 1,039 students across kindergarten (n = 122), first grade (n = 313), second grade (n = 319), and third grade (n = 285). The resulting analytic file contained more students who received tutoring (n = 572) than not (n = 467) within and across grades.

Demographic characteristics and baseline assessment performance across groups prior to including propensity weights is presented in Table 1. In general, students were similarly distributed across grades with the fewest number of students observed in kindergarten. A majority of students in both groups were White, followed by Hispanic/Latino, with a slightly larger proportion of Hispanic/Latino students receiving intervention (42%) relative to those in the comparison group (34%). This slight difference between groups was consistent with the proportion of students with an ELL tag in the data file between the comparison group (15%) and treatment group (24%).

In regard to baseline performance, there were marked differences between groups, with higher scores uniformly observed among students in the comparison group. These baseline differences between groups were statistically significant and were expected given the program's focus on serving students who demonstrate a need for supplemental intervention.

Table 1. Demographic distribution and raw baseline scores across groups

Variables	Comparison	Treatment
Demographics		
Grade		
Kindergarten	13%	11%
First Grade	28%	32%
Second Grade	32%	30%
Third Grade	28%	27%
Gender		
Male	49%	46%
Female	51%	53%
Race		
White	55%	49%
Hispanic/Latino	34%	42%
Multi-Racial	7%	4%
Asian	1%	1%
American Indian	1%	1%
Black or African American	1%	2%
Unknown	1%	1%
Language		
ELL	15%	24%
Non-ELL	85%	76%
Fall Baseline Performance	**M (SD)**	**M (SD)**
Kindergarten		
Letter Sounds Correct/Min	5.55 (7.31)	2.98 (4.42)
First Grade		
CBM-NW, Words Correct/Min	13.83 (9.65)	7.33 (4.40)
CBM-R, Words Correct/Min	21.79 (24.98)	9.10 (9.08)
Second Grade		
CBM-R, Words Correct/Min	48.71 (30.01)	32.39 (17.72)
Third Grade		
CBM-R, Words Correct/Min	75.57 (31.24)	65.75 (23.39)

Note: M = Mean; SD = Standard Deviation; CBM-R = Curriculum Based Measurement in Reading; CBM-NW = Curriculum-Based Measurement in Nonsense Words.

Propensity Scores and Weighted Baseline Performance

Given the observed baseline differences between groups, we used logistic regression to generate student-level propensity scores that estimate the probability of being selected for Reading Corps support (Austin, 2011). More explicitly, we fit logistic regression models for each grade wherein "Treatment"—defined as receiving Reading Corps support (1) or not receiving Reading Corps support (0) was included as a dichotomous outcome, predicted by baseline scores and ELL status. We then used the results from that analytic model to obtain student-level probabilities of treatment assignment based on their baseline literacy performance and ELL status.

In order to use the propensity scores generated from the logistic regression models, we transformed the probabilities into analytic weights that are suitable for linear regression as follows, where ω = the resulting analytic weight and $\hat{e}(x)$ = the observed probability of group assignment (Olmos & Govindasamy, 2015).

Treatment Group Probability Transformation	Control Group Probability Transformation
$\omega = \dfrac{1}{\hat{e}(x)}$	$\omega = \dfrac{1}{1 - \hat{e}(x)}$

The resulting linear weights were used to weight individual students in the treatment and comparison group according to their propensity for group assignment. All reported descriptive and inferential analyses below are weighted using the aforementioned analyses.

The weighted averages for baseline literacy performance across grades and groups are displayed in Table 2. As previously noted, unweighted baseline scores in the treatment and comparison group were significantly different from one another on all outcomes and grades. In addition, there were generally more ELL students in the treatment group within and across grades. After weighting, there were no observed differences in baseline literacy scores between groups in any grade and there were no differences in the proportion of ELL students in the treatment and comparison group.

We also present weighted descriptive outcomes for spring literacy scores across grades and groups in Table 2. Across all grades, student performance increased from fall to spring; however, those increases were generally more pronounced among students who received Reading Corps support. For example, the average score increased from 4.36 to 35.22 letter sounds correct per minute among kindergarten students who did not receive Reading Corps and 4.55 to 54.34 among students served by a Reading Corps tutor during the academic year. Similar differences in spring scores between the treatment groups were observed in other grades, with the smallest differences observed in first grade in the context of CBM-NW performance (approximately three words correct) among first grade students.

Table 2. Baseline and spring literacy scores across grades and groups after propensity score weighting

	Baseline Literacy Scores		Spring Literacy Scores	
Outcomes	Comparison	Treatment	Comparison	Treatment
Weight-Adjusted Scores	M (SD)	M (SD)	M (SD)	M (SD)
Kindergarten				
Letter Sounds Correct/Min	4.36 (6.03)	4.55 (6.58)	35.22 (17.63)	54.34 (15.89)
First Grade				
CBM-NW, Words Correct/Min	9.43 (8.12)	9.88 (7.60)	21.93 (12.31)	24.28 (11.47)
CBM-R, Words Correct/Min	13.60 (18.71)	11.75 (10.58)	51.89 (34.40)	56.50 (28.21)
Second Grade				
CBM-R, Words Correct/Min	36.93 (28.91)	36.83 (19.71)	69.44 (37.12)	85.65 (25.77)
Third Grade				
CBM-R, Words Correct/Min	69.07 (32.36)	69.24 (22.67)	103.0 (32.75)	109.25 (25.11)

Inferential Modeling to Assess Reading Corps Program Impact

The observed descriptive data for the analytic sample indicate a general trend in favor of students served by a Reading Corps tutor. To empirically evaluate the degree to which student scores differed during the spring benchmark period, we fit five multi-level regression models (one for each grade, and two in first grade) in which we regressed spring scores on students' baseline literacy scores and treatment assignment, adjusted using the aforementioned propensity weights. We used multi-level modeling due to the clustered nature of the data, with students nested by school. A number of covariates were included in the initial model fitting process (race, gender, ELL status); however, the inclusion of those covariates did not improve the model, had no effect on treatment effect estimates, and were therefore not included in the final models.

Results from the final analytic models are displayed in Table 3. A statistically significant and positive treatment effect was observed across all grades and all outcomes, with the exception of first grade CBM-R scores. Among kindergarten students, Reading Corps participation was associated with a 17.08 increase in letter sound spring performance relative to students in the comparison group, with a standardized effect size (Cohen's d) equal to 0.91. Among first grade students, the impact of Reading Corps service on spring nonsense word fluency performance was statistically significant and equal to 2.34 words read correct per minute ($d = 0.20$); however, there was no significant impact on CBM-R scores as a function of Reading Corps participation ($p = 0.12$). Among second grade students, the impact of Reading Corps was the second largest in magnitude relative to other grades and equal to 15.06 words read correct per minute ($d = 0.49$). The observed impact of Reading Corps in the third grade model was statistically significant and equal to 5.95 words read correct per minute ($d = 0.21$).

Table 3. Final multi-level model results across grades and outcomes

Model	b	SE(b)	z-value	p-value
Kindergarten				
Intercept	33.85	4.53	7.47	<.01
Fall Letter Sounds	0.41	0.30	0.18	.18
Treatment	**17.08**	**4.12**	**4.14**	**<.01**
First Grade (CBM-NW)				
Intercept	12.38	1.26	9.86	<.01
Fall CBM-NW	0.74	0.11	6.48	<.01
Fall CBM-R	0.17	0.04	3.78	<.01
Treatment	**2.40**	**1.11**	**2.10**	**<.05**
First Grade (CBM-R)				
Intercept	29.18	4.01	7.28	<.01
Fall CBM-NW	0.97	0.24	3.95	<.01
Fall CBM-R	1.11	0.13	8.09	<.01
Treatment	**5.25**	**3.39**	**1.55**	**.12**
Second Grade				
Intercept	34.24	4.35	7.86	<.01
Fall CBM-R	0.99	0.08	12.44	<.01
Treatment	**15.06**	**2.70**	**5.57**	**<.01**
Third Grade				
Intercept	45.11	4.92	9.15	<.01
Fall CBM-R	0.84	0.05	17.37	<.01
Treatment	**5.79**	**2.61**	**2.21**	**<.05**

Exploratory Subgroup Analysis

Although not the primary purpose of the present evaluation, it is relevant to note that Reading Corps in Colorado serves a predominately White (49%) and Latino (42%) population, many of whom are English Language Learners (36%). English Language Learners (ELL) are of particular interest to the program given the relatively high volume of service provided to ELL students and potential concerns regarding the impact of Reading Corps support for ELL students specifically. Thus, similar to previously published evaluations of Reading Corps in which researchers examined impact estimates with demographic subgroups (e.g., Markovitz et al., 2014), we were interested in treatment effects for ELL students in particular. Accordingly, the subgroup analyses described in this section relate solely to literacy scores of ELL students served by Reading Corps relative literacy scores of ELL students not served by Reading Corps. Across groups and within grades, there were 18 students identified as ELL in kindergarten, 93 students identified as ELL in first grade, 50 students in second grade, and 40 students in third grade. Given the limited sample size of kindergarten ELL students in the sample,

subgroup analysis was restricted to grades one, two, and three. Table 4 presents descriptive and impact estimates for ELL students across grades and groups.

The approach to statistical modeling was identical to the full model insofar as data were adjusted using the previously described propensity weights and schools were included in the model as a random effect. Descriptive data for baseline scores differed somewhat when restricting the data to ELL data; however, we evaluated baseline differences using a mixed effects model in which fall scores were regressed on group assignment and schools were included as a random effect. There were no statistically significant group differences at baseline.

Across all grades the observed effect of Reading Corps service on ELL spring scores was statistically significant, positive, and larger in magnitude relative to results of the primary analysis. Among first grade students, we observed an unstandardized effect of 6.09 (d = 0.55) in the context of nonsense word fluency and 12.44 (d = 0.41) on oral reading fluency. The standardized effects in first grade were more than double those observed in the full sample, and program impact on oral reading fluency—for which there was no significant effect with the full sample—was statistically significant. A similar pattern of results was observed among second and third grade students where the observed program impact on oral reading fluency was equal to 27.35 (d = 0.89) and 10.03 (d = 0.35), respectively.

The impact estimates observed in the subgroup analysis provide preliminary evidence for larger effects among ELL students in Colorado; however, it is important to note that the sample sizes were somewhat small and future research should seek to further articulate the potentially unique value of Reading Corps support for ELL students.

Table 4. Baseline scores and mixed model results among ELL students across grades

Baseline Performance	Comparison		Treatment	
	M	SD	M	SD
First Grade				
Fall CBM-NW	6.10	6.67	6.89	3.58
Fall CBM-R	10.56	17.91	8.71	8.36
Second Grade				
Fall CBM-R	29.64	29.23	39.43	14.69
Third Grade				
Fall CBM-R	68.31	33.28	63.39	29.20

Mixed Model Results	b	SE(b)	z-value	p-value
First Grade (CBM-NW)				
Intercept	9.63	2.04	4.73	<.01
Fall CBM-NW	0.68	0.40	1.72	0.09
Fall CBM-R	0.19	0.18	1.04	0.29
Treatment	**6.09**	**1.61**	**3.78**	**<.01**
First Grade (CBM-R)				
Intercept	20.32	8.57	2.37	<.01
Fall CBM-NW	1.67	0.80	2.09	<.05
Fall CBM-R	0.97	0.34	2.83	<.01
Treatment	**12.44**	**5.72**	**2.17**	**<.05**
Second Grade				
Intercept	26.25	8.27	3.17	<.01
Fall CBM-R	1.02	0.19	5.31	<.01
Treatment	**27.35**	**6.06**	**4.51**	**<.01**
Third Grade				
Intercept	50.18	3.37	14.87	<.01
Fall CBM-R	0.70	0.07	10.14	<.01
Treatment	**10.03**	**4.09**	**2.45**	**<.05**

Findings and Implications

Main Findings

The primary analysis within the current evaluation found that Reading Corps makes a statistically significant impact on the literacy outcomes of participating students, with the exception of literacy skills measured in first grade via CBM-R. In addition, the exploratory analysis provides unique evidence for larger affects among ELL students served by Reading Corps in Colorado. In practical terms, the significant benefit conferred by the program translates to several additional months of standardized literacy growth (Hill, Bloom, Black, & Lipsey, 2008), and that benefit was more pronounced for ELL students in grades one through three. For example, using the average annual growth from Hill and colleagues, the practical effect on nonsense word reading skills in first grade would be approximately 6 weeks of additive growth among all students and nearly 16 additional weeks for ELL students.

Overall, these findings align with and expand on the existing research base for the Reading Corps program. Causal analyses that allow statements of impact have consistently shown the program confers benefits to participating students, albeit with occasional exceptions within select grades. For example, the first randomized controlled trial found non-significant effects among second grade students (Markovitz et al., 2014), but that outcome reversed in a subsequent evaluation (Markovitz et al., 2018), and the latter finding has been supported again in the current evaluation. Likewise, the subgroup findings observed in the current study for ELL students align with previous subgroup analyses that showed a significant impact within systematically disadvantaged groups (e.g., Markovitz et al., 2014).

Implications and Additional Considerations

The body of research related to the Reading Corps program continues to demonstrate that the program significantly benefits participating students. This body of research now extends to the learning contexts of the participating schools in Colorado. For policy and education leaders, it is important to contextualize the Reading Corps program's positive effects alongside research showing its cost-effectiveness. In particular, cost-benefit analyses of the program suggest a relatively strong return on investment of over $5 to $1, which is driven in part by stronger educational outcomes throughout school and greater rates of high school graduation (Munaretto et al., 2020). It is relatively clear that among high-quality tutoring programs, the Reading Corps program stands out as an accessible and promising option for many schools and their communities.

In light of its consistently positive effects and estimated cost-feasibility, it is worth highlighting the way in which Reading Corps creates tutoring supports for local schools. Individuals who live in or near a local school's community offer to complete a year of service, providing in-person, individualized tutoring to students in kindergarten through grade three. This approach to supporting students is consistent with research findings that affirm effective tutors do not need to be highly-trained (or compensated) professionals (Slavin, Lake, Davis & Madden, 2011), but rather any individual with

sufficient support can provide effective tutoring. Such a finding is of particular importance in the context of the national infrastructure provided by AmeriCorps that creates local opportunities for tutoring in almost any community.

Although the above interpretations are substantiated by consistent and robust research findings, the current study is not without limitations that suggest directions for future research. First, the inconsistent findings for first grade CBM-R suggest the program should seek ways to better improve its supports for these students. Options might include ensuring implementation is meeting expectations, better matching interventions to student needs, or determining if the instructional alignment to district and school initiatives could be improved.

Second, it is important to note that the literacy skills that Reading Corps develops are essential components of early reading (Scarborough, 2001), but that they do not measure overall reading competency. Future research could examine the impact of Reading Corps on composite literacy measures (e.g., computer-based measures that assess many of the component skills of reading) or – in the case of older students – measures that assess comprehension (e.g., state reading assessments).

Finally, the degree to which the Reading Corps program makes a positive impact on critical subgroups of students needs further investigation. The current findings are encouraging for ELL students, and the instructional practices of Reading Corps fully or partially align with several of the best practices identified for supporting literacy development within the ELL population (Gersten et al., 2007). However, the strong within group effects as observed in the current evaluation do not indicate a closure of any performance gaps relative to non-ELL students. Rather, the current findings suggest a strong benefit compared to the absence of the Reading Corps program for comparable ELL students; additional research should examine the outcomes of ELL students to ensure they are progressing toward skill levels that simultaneously leverage their primary language skills for learning and allow them to access all instructional content in their local schools.

Conclusion

The Reading Corps program has demonstrated positive effects on literacy outcomes across many studies and locations, and the current study adds to that body of research in two ways. Students served by Reading Corps in Colorado schools, across all grades with the exception of the CBM-R measure for first grade, showed improved outcomes at the end of the school year. Similarly, ELL students served by Reading Corps showed improved outcomes relative to those who were not. These findings add further support to the effectiveness of the Reading Corps program while also highlighting directions for further research.

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