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The Effect of The Colorado Early Literacy Grant on Elementary Student Achievement

Grant Clayton
Lesley S. Noel
Gregory B. Ecks
&
Christina D. Clayton
University of Colorado – Colorado Springs
United States

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Abstract: In 2012, the Colorado Legislature passed the READ Act. Like many literacy policy interventions, the READ Act focused on phonemic awareness, phonics, and fluency. To support the Act, the state simultaneously established the Early Literacy Grant (ELG). The ELG targeted professional development, better use of assessment, and the implementation of approved materials, along with external consultants, to support applicant schools' fidelity of implementation of science of reading strategies. ELG is now in the sixth cohort, having accepted 151 successful applicant schools across 64 districts for a total of nearly $53 million. We leverage the multi-year, multi-cohort implementation of the grant to measure the differential effects of treatment on Colorado Measures of Academic Success reading scores, the state's federally aligned statewide testing regimen. We do so

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via a series of event study models for a total sample of nearly 20,000 grade-school-year observations. We present results for the aggregate main effect of ELG participation across all treated schools and time as well as ELG Cohort and grade-specific results. We find no statistically significant positive results for ELG participation across all analyses. After the conclusion of grant support, we find negative effects primarily driven by the performance of third graders.
Keywords: science of reading; event study; grant funding; state assessments

El efecto de la Subvención de Alfabetización Temprana de Colorado en el rendimiento estudiantil de primaria

Resumen: En 2012, la Legislatura de Colorado aprobó la Ley READ. Como muchas intervenciones en políticas de alfabetización, la Ley READ se centró en la conciencia fonémica, la fonética y la fluidez. Para respaldar esta ley, el estado creó simultáneamente la Subvención de Alfabetización Temprana (ELG, por sus siglas en inglés). La ELG se enfocó en el desarrollo profesional, el uso más efectivo de las evaluaciones y la implementación de materiales aprobados, junto con consultores externos, para apoyar la fidelidad de las escuelas solicitantes en la aplicación de estrategias basadas en la ciencia de la lectura. Actualmente, la ELG está en su sexta cohorte y ha aceptado 151 escuelas beneficiadas en 64 distritos, con un total cercano a los 53 millones de dólares. Aprovechamos la implementación multianual y multicohorte de la subvención para medir los efectos diferenciales del tratamiento en los puntajes de lectura de las Medidas de Éxito Académico de Colorado (CMAS, por sus siglas en inglés), el sistema estatal de evaluación alineado con los estándares federales. Lo hacemos mediante una serie de modelos de estudio de eventos con una muestra total de casi 20,000 observaciones por grado, escuela y año. Presentamos resultados del efecto principal agregado de la participación en ELG en todas las escuelas tratadas y periodos, así como resultados específicos por cohorte de ELG y por grado. No encontramos resultados positivos estadísticamente significativos para la participación en ELG en ninguno de los análisis. Tras la finalización del apoyo financiero de la subvención, encontramos efectos negativos, impulsados principalmente por el rendimiento de los estudiantes de tercer grado.
Palabras clave: ciencia de la lectura; estudio de eventos; financiamiento por subvención; evaluaciones estatales

O efeito da Subvenção de Alfabetização Inicial do Colorado no desempenho de alunos do ensino fundamental

Resumo: Em 2012, a Assembleia Legislativa do Colorado aprovou a Lei READ. Como muitas intervenções em políticas de alfabetização, a Lei READ concentrou-se na consciência fonêmica, na fonética e na fluência. Para apoiar a lei, o estado criou simultaneamente o Programa de Subvenção de Alfabetização Inicial A ELG teve como foco o desenvolvimento profissional, o uso mais eficaz de avaliações e a implementação de materiais aprovados, juntamente com consultores externos, para garantir a fidelidade na implementação das estratégias baseadas na ciência da leitura nas escolas participantes. Atualmente em sua sexta coorte, a ELG já beneficiou 151 escolas em 64 distritos, totalizando quase 53 milhões de dólares. Aproveitamos a implementação multianual e multicohorte da subvenção para medir os efeitos diferenciais do programa sobre as notas de leitura no Colorado Measures of Academic Success (CMAS), o sistema estadual de avaliação alinhado às diretrizes federais. Utilizamos uma série de modelos de estudo de eventos com uma amostra total de quase 20.000 observações por série, escola e ano. Apresentamos os resultados do efeito principal agregado da participação no ELG ao longo do tempo e em todas as escolas tratadas, bem como resultados específicos por coorte e por série escolar. Não encontramos resultados positivos estatisticamente significativos para a participação no ELG em nenhuma das análises. Após o término do

financiamento da subvenção, observamos efeitos negativos, principalmente impulsionados pelo desempenho de alunos do terceiro ano.
Palavras-chave: ciência da leitura; estudo de eventos; financiamento por subvenção; avaliações estaduais

The Effect of The Colorado Early Literacy Grant on Elementary Student Achievement

The science of reading (SoR) movement has swept through many state legislatures, beginning with Mississippi in 2013. As of June 2024, 41 states and the District of Columbia have implemented laws or policies requiring "evidenced-based," "science-based," and "scientifically based," all of which align with the SoR instruction (ExcelinEd, 2021; Katz & Gendill, 2024). These laws and policies require action in various components of SoR, including a growing emphasis on the adoption of and compliance with a state-approved, evidence-based reading curriculum, specific interventions and supports, teacher preparation, certification, and professional development (Neuman et al., 2023; Schwartz, 2024). In most cases, compliance with new legislative guidelines is mandatory for K-12 schools to maintain funding and for institutions of higher learning to retain certification. SoR legislation across the states varies in approach, a reflection of the difference in educational priorities and policy strategies deemed most effective to address achievement gaps and improve student achievement (Neuman et al., 2023). Like the Reading First initiative in 2001, many of these new laws required specific curricula and materials that focused on the five essential components of reading, required professional development and coaching for teachers, and mandated early diagnosis and screening for struggling readers. These new measures surpassed the Reading First initiative, affecting instruction in all schools and not just low-performing Title I schools, and look beyond K-3 grade bands, to include Pre-K, in 31 states (Neuman et al., 2023). In some states, the legislation goes so far as to specify the requirement for instruction to be explicit, systematic, direct, multisensory, and sequential, while others have included language to prohibit the use of the three-cueing system (Greene, 2024).

Curriculum and Instruction

Where curriculum is concerned, there is no federal oversight leaving states in control of the adoption of all materials for core and intervention instruction. The degree to which states have included reform specific to curriculum adoption varies widely. While some state mandates target curriculum extensively, others briefly mention curriculum adoption or do not address it at all (Pickford & Poteet, 2021). In some cases, the Department of Education within the states requires the adoption of a state-approved, highly prescriptive, systematic, direct-instruction phonics curriculum, whereas other states provide less specific guidelines requiring scientifically research-based reading instruction and curriculum to be determined more locally by the school district (Neuman et al., 2023).

In many instances, the political climate, values, and influential leaders have resulted in sweeping state-wide mandates on what can and cannot be taught, demonstrating the varying ideologically different approaches to improve literacy outcomes. One such distinctly different approach to instruction across the states is the banning of three-cueing, an instructional approach that encourages children to use context, sentence structure, and visual cues to identify words. At least 13 states have enacted policies banning the use of the three-cueing approach in reading instruction, including Arkansas (SB 349), Louisiana (Act 517), Florida (FL HB 7039), Indiana (HB 1558), North Carolina (HB 259), Ohio (HB 33), South Carolina (HB S418), Texas (HB 1605), West

Virginia (HB 3035), Wisconsin (Act 20), Kansas (SB 438), Minnesota (READ Act), and Virginia (SB 634). Georgia and Alabama have introduced legislation not yet enacted (Greene, 2024).

Teacher Preparation and Certification

Studies on teacher effects have found that teachers strongly influence student learning (Rivkin et.al., 2005; Rockoff, 2004). Research examining teacher effectiveness suggests teachers' efficacy is mediated by academic and verbal ability, subject matter knowledge, understanding of teaching and learning, teaching experience, and qualifications as measured by teacher certification (Darling-Hammond, 2000; Rice, 2003; Wilson et. al., 2002). Given the well-established relationship between teacher efficacy and student achievement, states have increasingly turned to teacher preparation as a strategic policy tool aimed to improve instructional outcomes (Steiner & Rozen, 2004; Walsh et al., 2016).

While states have historically played a role in shaping higher education curriculum with the aim of supporting student achievement, the SoR movement has prompted an increased level of state policy initiatives designed to strictly align teacher preparation programs with state-endorsed belief systems. This growing trend of leveraging teacher preparation and certification for SoR education reform reveals that states differ significantly in their use of mandates to control the content, structure, and focus of teacher training programs and certification (Walsh et al., 2016).

Professional Development

Teaching children how to read is an essential part of early childhood teaching; yet, how to do it and what knowledge is needed to do it has been shown to be a deficit for decades. Moats's (1994) seminal work showed that teachers struggled with linguistic knowledge, which is essential to teaching students to read. Subsequent studies have shown that this is an issue with both in-service and pre-service teachers (Bos et al., 2001; Brady & Moats, 1997; Cunningham et al., 2004; Joshi et al., 2009; Moats, 1994; Moats & Foorman, 2003; Pittman et al., 2019; Spear-Swerling & Cheesman, 2012; Washburn et al., 2016) and thus must be rectified with professional development on SoR for both pre-service and in-service teachers. Pre-service teachers have experienced this through classwork and rigorous certification tests such as the PRAXIS test. In-service elementary teachers have seen their re-certification for licensure include hours in SoR.

Analyses of Reading Policies

Given the number of states with policies, a wide variety of requirements, and students affected by these policies, scholars have started to focus attention on the interventions outlined above. There is a small but growing body of evidence about these policies. Perhaps the best studied are the policies focused on third-grade outcomes, including retention policies in Florida with positive short-term effects that fade as students move to later grades (Greene & Winters, 2007, 2009; Schwerdt et al., 2017). An evaluation of Michigan's Read by Grade Three law found significant improvement in third-grade achievement on state tests (Strunk et al., 2021). Westall and Cummings (2023) contributed a national-level analysis using NEAP and Stanford Education Data Archive's (SEDA) state-level outcomes. Like the present study, they leverage the staggered implementation of policies to conduct an event study. They found that having an early literacy policy improves third-grade test performance with reduced returns in later years (Westall & Cummings, 2023).

Colorado Context

Colorado was part of the first large group of states to pass SoR-based literacy reforms, amending the 2012 READ Act (House Bill 12-1238) in 2019 and again in 2021 and 2022. The aim of the 2012 READ Act was to help struggling readers in the primary grades through the creation of a

system to identify students experiencing challenges with reading, engage stakeholders in the development of reading improvement plans, and provide quality support for those most at risk (Colorado Department of Education, or CDE, 2012).

Colorado policymakers and the State Board of Education updated the READ Act in 2019 to focus on three areas believed to have contributed to the stagnation in desired outcomes: (1) The statute defined allowable uses of READ Act per-pupil intervention funds, but it did not provide clarity regarding accountability for the use of funds; (2) reporting requirements for the READ Act made it challenging to identify instructional programming and interventions effective in reducing the number of students identified with significant reading deficiencies; and (3) the need for increasing teacher knowledge on evidence-based practices for teaching reading (CDE, 2019). The updates further emphasized the use of evidence-based instructional practices, including early identification and intervention, personalized reading plans, and professional development for all educators. Specifically, all teachers who provide literacy instruction to students in grades K-3 and reading interventionists K-12 must complete evidence-based training in teaching reading (CDE, 2024a). After the 2019 update, Commissioner of Education Katy Anthes positioned the READ Act and the 2019 update squarely within the SoR with the goal "to ensure kindergarten through third-grade teachers have the scientifically based training they need to effectively teach reading" (Anthes, 2019, para. 9). As a result of the READ Act, most of the state's districts switched to state-approved curricula such as *Wonders* and *Into Reading* (Schimke, 2022). The CDE required all K-3 teachers to be certified in the SoR by 2022. Districts tracked how teachers were certified in this area, be it by licensure, PRAXIS, or approved SoR training materials. Teachers who were not certified at the start of the 2022–2023 school year had to be moved to positions outside of K-3 unless they were only teaching content other than literacy.

The Early Literacy Grant

The READ Act provides funds to CDE to ensure that schools have the necessary tools and support to effectively address reading challenges through the Early Literacy Grant (CDE, 2024b). This funding is carefully monitored by the CDE through a competitive grant application process restricted to local education providers (LEPs) "that are already implementing evidence-based or scientifically based universal instruction and interventions" (CDE, 2024c, p. 1), which was required under previous iterations of the READ Act and verified for compliance, making all schools potentially eligible. Eligible applicants include schools, districts, charters, and the Board of Cooperative Education (BOCES)—a regional educational cooperative. Allowable uses of grant money are narrowly defined by CDE as including funding literacy coaches "trained in the science of reading," professional development from CDE-approved topics, ELG implementation consultants, CDE-approved instructional training, training for CDE-approved diagnostic or interim assessments, related tuition or fees, and costs to attend approved professional development (CDE, 2024c). The grant intends to provide system-wide scientific and evidence-based reading instruction, provide multi-tiered support systems to reduce the number of students reading below grade level, provide professional development, and support matters related to universal screening, assessment, and data collection. Schools are required to submit detailed proposals outlining how the funds will be used to improve reading outcomes, ensuring that allocated resources are utilized efficiently and effectively. To date, the ELG has dedicated nearly $53 million to 151 schools across all regions of the state.

The ELG implementation consultant is a central feature of successful grants. Consultants must be from one of the 11 approved by the state and have vetted proficiency in "scientifically based reading research and instruction" (CDE, 2024d) and assist LEPs in the implementation of the grant and provide regular, on-site reviews (CDE, 2024d). Although contracted with LEPs, the consultant's responsibilities include collaboration "with the Colorado Department of Education

reading" (CDE, 2024e) on the implementation of classroom teaching and targeted interventions. Other duties include working with principals and school leaders on "creating a Comprehensive Local Literacy Plan (CLLP), budgeting, sustainability planning, evaluating existing instruction and assessment systems and structures, professional development in the science of reading and other tasks" (CDE, 2024e), making the consultant a central figure in fidelity of implementation and a key link between LEPs and the CDE.

The ELG supports schools for 3 years to implement grant goals. The state allows for a fourth sustainability year. During this extension, schools are provided with approximately half of the funding and grant consultations as a transition to fully sustaining ELG goals without external support.

Sample and Methods

We assembled multiple publicly available sources to construct a school-level dataset for all public elementary schools in Colorado. From CDE, we obtained the list of ELG schools, cohort-year, and district/BOCES (CDE, 2024f). We merged this with school demographic information, including participation in free/reduced price lunches, racial/ethnic composition of the schools, participation rate in standardized testing, and total enrollment (CDE, 2024g). Finally, we merged assessment data from the English Language Arts (ELA) Colorado Measures of Academic Success (CMAS) by grade-year (CDE, 2024g) from 2015–2023. CMAS is Colorado's statewide assessment used for state and federal testing requirements and is administered in all public schools during the spring of each year. Achievement data is suppressed for grades with fewer than 16 students. This results in a final dataset comprised of 18,974 school-grade-year observations. Colorado did not administer CMAS in any grade in 2020 and did not administer fourth-grade ELA CMAS in 2021, resulting in no fourth-grade assessment for two consecutive assessment cycles, but this loss of data affects ELG and non-ELG alike. Our dataset starts with CMAS assessments given in the spring of 2017 and continues uninterrupted through 2023.

Coding Scheme

The ELG is a school-level grant with targeted interventions in grades K-3. CDE expects ELG schools to increase the quality of early literacy instruction, make better use of assessment data, and increase the number of students reading at grade level. We treat the analysis as a school-level intervention as well. Instead of tracking students or cohorts longitudinally, we analyze school-year-grade units, grades, and cohorts. For example, we compare the third-grade performance of ELG schools with control schools by year. In short, ELG schools are measured on their ability to successfully implement the grant and improve student achievement in given grades across time.

We use the following method to account for the multi-year implementation of ELG. Grade 3 is coded as one or "treated" in the baseline year of the grant, while grades 4 and 5 are not. In the second year of ELG, grades 3 and 4 are coded as one or treated, while grade 5 is not. Thus, by year 3, all tested grades are coded as treated and remain so throughout the analysis.

The CMAS tests started in spring 2015 (CDE, 2014) and were preceded by the Transitional Colorado Assessment Program (TCAP). The TCAP scores aligned to early iterations of the state standards, used a different distribution of constructed responses to multiple-choice questions, and had a different scale score. The TCAP scores are not maintained by CDE on the grade-year level by scale score; instead, they are reported as performance levels. This prevents us from having a pre-treatment score for the first cohort and would result in them being coded as treated in all years. Because of this, we begin with ELG Cohort 2—schools starting ELG in 2016—this results in four treated cohorts for the analyses. Starting with ELG Cohort 2, some schools were awarded the ELG

but dropped out of participation. We coded these five schools as not treated to preserve the analysis for treatment.

Characteristics of the Sample

We begin with a description of the six cohorts of ELG schools. For context, there are 178 school districts in Colorado, with the majority of students living in a few districts concentrated along the front range of the Rocky Mountains. Most districts, however, are smaller and usually rural. ELG Cohort 2 is typical with larger districts, such as Harrison District 2 in Colorado Springs, having multiple schools, and rural schools often having one or two participating schools. To date, 64 districts or BOCES and 151 schools have been accepted into the ELG.

Table 1 presents the demographic characteristics of schools awarded the ELG. As a note, we do not present characteristics for ELG Cohort 1 because they are not included in the analysis. Notably, the percentage of students whose parents identified them as White declined from 61% in ELG Cohort 2 to 35% ELG Cohort 5. Similarly, the percentage of students participating in free/reduced price lunches—a proxy for wealth—increased from 57% in ELG Cohort 2 to 70% in ELG Cohort 5. In comparison, control schools generally had higher percentages of students identified as White and lower percentages of Hispanics—with the exception of ELG Cohort 2—and consistently lower percentages of students participating in free/reduced price lunches.

Table 1

ELG Cohort Demographic Characteristics

ELG Cohort	Treatment Observation	Schools	Native	Asian	Black	Hispanic	White	Pacific Islander	Two +	FRL
Control	18,974	1,033	0.007	0.028	0.045	0.328	0.534	0.003	0.050	0.453
			(0.026)	(0.042)	(0.081)	(0.252)	(0.268)	(0.008)	(0.037)	(0.282)
Cohort 2	272	21	0.008	0.007	0.021	0.300	0.610	0.000	0.05	0.570
			(0.016)	(0.014)	(0.0320)	(0.226)	(0.227)	(0.005)	(0.046)	(0.174)
Cohort 3	99	11	0.005	0.006	0.050	0.491	0.410	0.010	0.032	0.657
			(0.012)	(0.012)	(0.065)	(0.198)	(0.240)	(-0.025)	(0.036)	(0.157)
Cohort 4	187	30	0.009	0.005	0.045	0.533	0.364	0.002	0.042	0.700
			(0.016)	(0.011)	(0.052)	(0.248)	(0.250)	(0.008)	(0.046)	(0.183)
Cohort 5	97	32	0.006	0.007	0.026	0.585	0.349	0.002	0.025	0.669
			(0.016)	(0.015)	(0.042)	(0.313)	(0.305)	(0.010)	(0.039)	(0.186)

Note: Mean (*SD*).

Control Variables

Table 2 details the vector of controls in the analysis. Statewide, about 46% of students participated in free/reduced price lunches, and 53% had parents who identified them as White. A unique characteristic of Colorado is non-participation in required standardized testing, commonly known as opting out (Clayton et al., 2019). The average participation rate across the sample was 82%, or 13% below the federally required participation rate. The number of students in a tested grade is aggregated across the entire school, meaning that, on average, a school had 66 students in a tested grade across all classrooms. The outcome variable is the CMAS test score with an approximate mean of 741, with a range of 135 points. For analysis, we standardized the scores for a mean of zero and a standard deviation of one.

Table 2

Vector of Controls X'

Variable	All	STD Differences Pre-Match	STD Differences Post-Match
Free/Reduced Lunch	0.459 (0.281)	0.755	0.100
Native American	0.007 (0.026)	0.002	0.047
Asian	0.028 (0.042)	-0.710	-0.054
Black	0.044 (0.080)	-0.186	0.050
Hispanic	0.341 (0.253)	0.351	0.032
White	0.532 (0.268)	0.210	0.011
Pacific Islander	0.003 (0.008)	-0.005	0.002
Two or More Races	0.045 (0.038)	-0.089	0.005
Non-White	0.468 (0.268)		
Tested Grade	66.484 (29.57)	-0.728	-0.091
Participation Rate	82.372 (32.191)	0.529	-0.044
Control Z score	0.00 (1)	0.623	-0.031
Treatment Z score	-0.56 (0.80)		
Mean CMAS Score	740.8304 (17.759)		

Note: Mean (*SD*) Total Observations 18,715

Analytic Approach

A classical approach to policy analysis utilizes a difference in differences (DID) estimator and variations known as the two-way fixed effects model. The traditional DID compares the average change over time between "treated"—ELG—and "control" groups that did not participate in ELG. The canonical form of the DID estimator compares treated and control groups across two time periods (Card & Krueger, 1994). For the present analysis, one of the central challenges of the DID approach is the staggered implementation of ELG, where the intervention was adopted at different times for different schools, which can bias estimates of the treatment effect heterogeneity (Callaway & Sant'Anna, 2021; Clarke & Tapia-Schythe, 2021).

To address these challenges, we calculated the effect of ELG participation on ELA CMAS using an event study approach. Specifically, we used the STATA *eventdd* command (Clarke & Tapia-Schythe, 2021). The event study is designed to address "differential treatment timing and treatment effect heterogeneity" (Rosinger et al., 2023, p. 669) from the traditional DID approach and has been widely used in policy analyses that utilize differential timing of the intervention (Kraft et al., 2020; Redding & Carlo, 2025; Rosinger et al., 2023) and by Westall and Cummings (2023) to examine national trends in early literacy policies. One of the key features of this analytical approach is that it includes dynamic lead indicators to account for baseline pre-treatment and lags to identify treatment effects over multiple time periods (Brunner et al., 2019; Clarke & Tapia-Schythe, 2021).

Formally, we estimate the event study using variations of the following:

$$(1)\ CMAS_{ijt} = \beta_0 + \sum_{j=-2}^{j} \beta_j(lead_z)ELG + \sum_{k=1}^{k} \beta_k(lag_k)ELG + \beta X' + \lambda_i + \varphi_j + \delta_t + e_{ijt}$$

Where ELA $CMAS_{ijt}$ is the standardized CMAS score for grade *i* in school *j,* in year *t*,, $lead_z$ represents a series of year indicators spanning the pre-ELG period, lag_k are a series of year indicators spanning the post-ELG period, *X'* is a vector of controls listed in Table 1, λ_i is grade fixed effect, φ_j is a school fixed effect, δ_t is a year fixed effect, and e_{ijt} is a robust standard error term.

Table 1 shows notable pre-treatment differences between ELG and control schools, commonly known as parallel trends, which could bias estimates of ELG. To address this issue, we follow the approach of Redding and Carlo (2025), for which we use the *kmatch* command in STATA (Jann, 2021) to match ELG to similar schools, in the year prior to treatment, along the vector of observables in Table 2. This approach uses Mahalanobis-distance kernel matching to generate a matching weight. Table 2 shows both pre- and post-match standardized differences with strong matches and the largest standardized differences being 0.100, less than that used by Redding and Carlo (2025) and within the guidelines suggested by Blankenberger et al. (2017). After matching, we conducted a test of joint significance to verify that parallel trends were not significant in the year prior to treatment and found no violation of the assumption. Finally, we conducted the event study using matched treatment and control schools with robust standard errors clustered on the school level. The results are presented as standardized CMAS scores.

Limitations

The primary limitation is the voluntary nature of ELG participation. Unlike statewide policies with rolling implementation that are externally imposed on schools, districts and schools elect to apply for ELG, with a subset accepted into treatment. As a result, we eschew strong causal statements about policy effects of ELG that the event study analysis might otherwise provide. Instead, we posit that the combination of matching and event study greatly reduces unobserved variable bias. Given the large number of grade-year treated schools and the widespread uptake of ELG across school characteristics, we remain confident that our analyses provide the best possible estimates for ELG participation. Because some schools apply but are not accepted, there could be anticipation effects for schools that apply but are not accepted into ELG, which could bias treatment estimates. Given the highly intrusive nature of ELG with regular grant consultant visits and the average grant per school of over $360,000, we find it unlikely that schools not accepted into ELG would elect to implement the intervention without winning an award.

A second limitation is the outcome measure CMAS ELA. The assessment has both multiple-choice and constructed-response sections. It could well be that students are *reading* better as a result

of ELG but not yet *writing* well enough to show improved scores. Indeed, WestEd, CDE's external evaluation firm for ELG, identified this very issue in their final report,

> CMAS is a measure of the state's academic standards in English Language Arts, not just reading. CMAS measures reading, writing, and use of language…. A question for CDE to consider is whether the outcomes of the READ Act should be measured in terms of overall CMAS performance or a narrower construct of reading represented by CMAS reading subscores. Reading sub-score data were unavailable for WestEd's analyses. (Lemke et al., 2022, p. 14)

Like WestEd, we would have preferred to have both sets of subscores for this analysis to test the possibility that reading and writing sections function differently. Unfortunately, CDE was unable to provide these scores.

Finally, COVID contributed to instruction interruptions, learning loss, and 2 consecutive years without fourth-grade testing in all but the second cohort.

Results

Table 3 presents the average treatment effect on the treated (ATET) of ELG participation across all cohorts and grades measured in standard deviation changes (overall analysis). It can generally be considered an overall ELG effect for schools participating in ELG. Time in Column 1 is the duration of exposure to account for multiple years of ELG, with the first row being the year of implementation of ELG and ELG 3 the final full year of support. Schools continue to be calculated as treated for the remainder of the panel even after funding ceases. From Figure 1, we descriptively see ELG schools trending lower compared to their matched peers in the years prior to receiving the grant, although none of these differences are statistically significant. The year prior to implementation, there are no differences between the schools due to matching for the event study analysis (Clarke & Tapia-Schythe, 2021; Wooldridge, 2023). Relative to their matched peers, we do not find statistically significant differences for schools during the three main ELG grant years. By the transitional year, results are -0.146 *SD* lower than non-ELG schools but only at the more liberal 90% confidence interval, perhaps due to only some schools receiving transitional funding. By the time schools are fully off ELG (see years 4 and 5 in Figure 1), ELG schools are -0.191 and -0.282 *SD* lower than non-ELG schools ($p<0.05$). Figure 1 graphically illustrates the information presented in Table 4 along with the 95% confidence interval.

Table 3

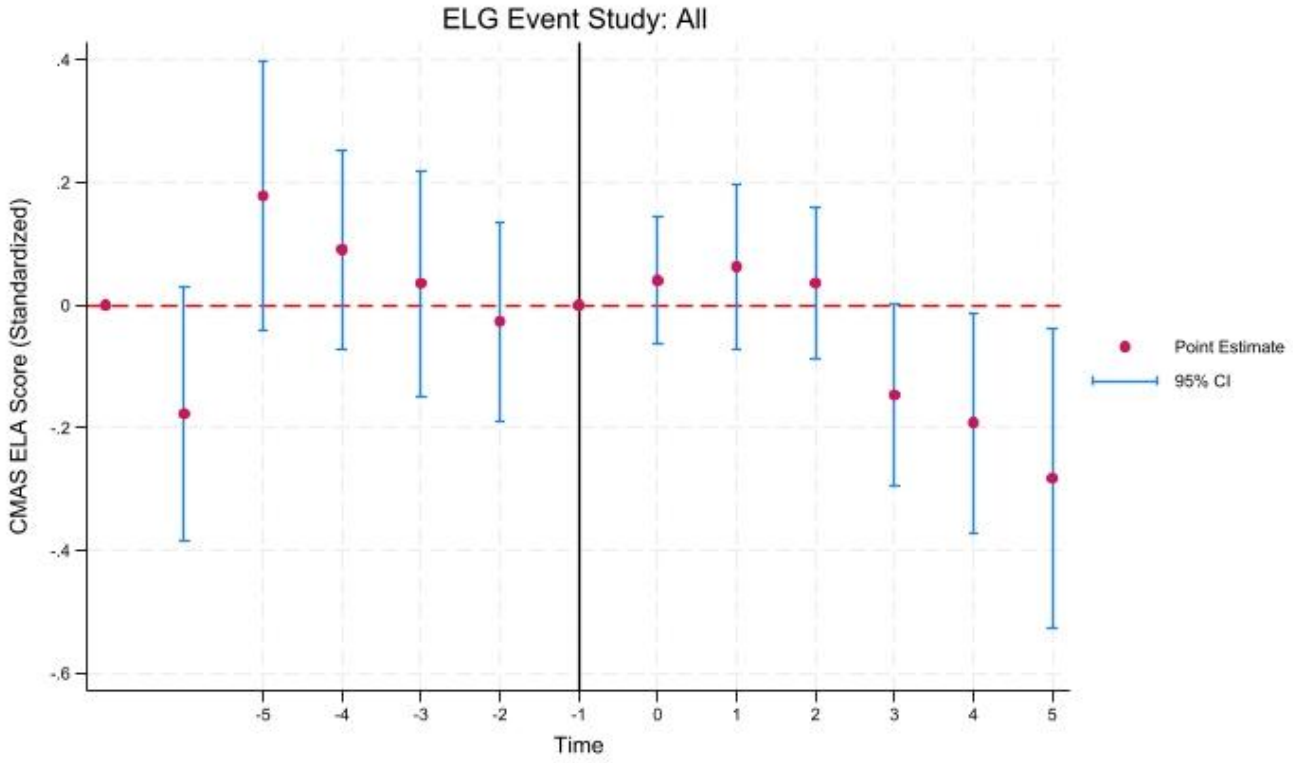
ATET Over Time

Years of Treatment	ATET	SE	*p*
Implementation	0.406	0.530	0.444
ELG 2	0.631	0.069	0.357
ELG 3	0.362	0.629	0.565
Sustaining	-0.146	0.750	0.052
Off ELG 1	-0.191	0.912	0.036
Off ELG 2	-0.282	0.124	0.023

* $p<0.10$, ** $p<0.05$, *** $p<0.001$

Figure 1

ATET Over Time for All Cohorts and Grades



Note: The points correspond to ATET for years after implementation of the ELG and are surrounded by the 95% confidence interval. T3 is significant at the 90% confidence interval.

ELG Cohort–Specific Results

It is quite possible that ELG Cohorts could function differently from each other, and ELG Cohort–specific effects are lost in the aggregate results presented above. To investigate this possibility, we conduct separate analyses for ELG Cohorts 2–5. Table 4 details these ELG Cohorts individually compared to matched schools. Like the overall analysis, we do not find statistically significant effects for ELG participation while schools were on full grant funding. By years 4 and 5, results approach significance at the 90% confidence interval once schools are fully off ELG.

We present results for Cohort 5 for completeness but include an extra note of caution. Cohort 5 differed greatly from previous cohorts, with 23 of 33 schools being classified as small and rural, with many of them lacking sufficiently tested students to meet state minimums for reporting scores. Indeed, one of the recipients in Cohort 5 has a graduating class of four. This greatly reduced sample size; thus, the results reflect the minority of schools that did meet reporting standards and are not reflective of the whole cohort.

Table 4

ELG Cohorts

Years of ELG	ATET	SE	*p*
Cohort 2 (AY 2015/2016–2018/19)			
Implementation	-0.094	0.064	0.144
ELG 2	-0.046	0.069	0.508
ELG 3	0.015	0.088	0.868
Sustaining	-0.092	0.103	0.373
Off ELG	-0.130	0.079	0.102
Off ELG	-0.147	0.091	0.107
Cohort 3 (AY 2016/17–2019/20)			
Implementation	0.128	0.187	0.493
ELG 2	0.028	0.169	0.868
ELG 3	-0.232	0.211	0.271
Sustaining	-0.272	0.207	0.190
Off ELG	-0.280	0.190	0.000
Cohort 4 (AY 2018/19–2020/22)			
Implementation	-0.020	0.189	0.915
ELG 2	0.812	0.192	0.671
ELG 3	0.010	0.180	0.955
Sustaining	-0.054	0.195	0.782
Cohort 5 (AY 2019/20–2023/24)			
Implementation	0.201	0.161	0.214
ELG 2	0.333	0.217	0.126
ELG 3	0.300	0.196	0.127

* $p<0.10$, **$p<0.05$, ***$p<0.001$; Robust SE

Grade-Specific Results

Like ELG Cohorts, grades could function differently from each other. For example, third grade is included in the ELG grant, and we might expect to see closer alignment with ELG goals, especially during grant implementation, under the supervision of CDE and grant consultants. Conversely, we might expect effects to fade with a function of time as students age and CMAS shifts focus from early literacy to reading comprehension and longer written passages. To investigate differences in grade level responses to ELG, we present Table 5 below detailing third, fourth, and fifth grades as a function of time. Please note, there are two less-treated years than expected for fourth grade because ELA CMAS was not administered in 2020 and 2021. Like the overall results, we do not find statistically significant differences other than the negative effects of -0.249 and -0.308 ($p<0.05$) in the 2 years off ELG support for the third grade.

Table 5

ATET By Grade

Year	ATET	SE	*p*
3rd Grade			
Implementation	-0.578	0.096	0.545
ELG 2	-0.010	0.115	0.932
ELG 3	-0.618	0.929	0.506
Sustaining	-0.222	0.120	0.064
Off ELG	-0.249	0.126	0.049
Off ELG	-0.308	0.150	0.041
4th Grade			
ELG 2	-0.224	0.930	0.809
ELG 3	0.071	0.123	0.561
Sustaining	-0.212	0.174	0.224
Off ELG	-0.164	0.121	0.175
Off ELG	-0.015	0.132	0.907
5th Grade			
ELG 3	-0.310	0.868	0.717
Sustaining	-0.031	0.104	0.579
Off ELG	-0.018	0.094	0.848
Off ELG	-0.157	0.135	0.244

* $p<0.10$, ** $p<0.05$, *** $p<0.001$; Robust SE

Discussion

Other than a non-significant positive trend during ELG funding, we do not find effects for participation in ELG on CMAS scores. This could be an artifact of the methodology as event study point estimates "tend to be noisy" (Brunner et al., 2019) and potentially fail to capture significant differences. Indeed, Westall and Cummings (2023) found positive results in grades 3 through 5 using NAEP data when aggregated across states with similar policies. Our focus was on only ELG schools rather than the whole state, however. We find it unlikely that we missed an effect since grade- and cohort-specific results failed to capture this trend. Once funding and grant consultant supports end, we do find statistically significant negative trends in the overall, third-grade, and cohort three results. In those instances, the effects range from -0.191 to -0.308 standard deviations even after matching to similar schools.

Prior research focuses on statewide policy adoptions, while ours examines a similar suite of interventions for a subset of schools within a larger policy adoption of the SoR statewide landscape. Doing so provides a focus with a verified fidelity of implementation and intense support. Unlike statewide intervention studies that find positive effects in Florida (Greene & Winters, 2007, 2009; Schwerdt et al., 2017), Mississippi (Spencer, 2024), Michigan (Strunk et al., 2021), and nationally (Westall & Cummings, 2023), we do not find positive effects during the grant period. Therefore, our results are not intended to call into question SoR policies or early literacy–focused legislation. Instead, we do issue a cautionary note about ELG and similar interventions, given the relatively high

average cost of $360,465 per school. Colorado faces a budgetary shortfall of $1.2 billion this year (Coltrain, 2025), and we question how much longer ELG funding can continue given the results and budgetary climate.

The ELG has many of the same elements as the Reading First Initiative, such as specifically identified curricula, targeted professional development, and early screening requirements. The results were also similar, with an inability to produce statistically significant improvement in reading scores (Gamse et al., 2008). This multipronged approach across all schools makes it difficult to identify what elements may be useful for schools. Similar school improvement grants for turn-around schools also struggled to produce consistent, positive results for English achievement in a pooled sample (Sun et al., 2021), so we remain curious if it is the intervention or the implementation that fails to produce results. To investigate further, we recommend that CDE make available detailed records of the grants, including how money was spent, notes from the ELG consultant, and the application materials. This would allow researchers to attempt to disentangle features that were successful. Similarly, we recommend CDE vary the types of grants to help explore what elements are successful and can be replicated.

We do not question the need for systematic, explicit literacy instruction in those areas targeted by ELG as being foundational for literacy. However, the lack of results points to a potential need for emphasis on exposure to—and active engagement with—complex vocabulary and increased exposure to complex texts, in addition to the current focus on decodable texts to support development of reading comprehension. Research has consistently concluded that the effect of phonics instruction is stronger on word reading than on passage comprehension outcomes (Gersten et al., 2020) and that phonemic awareness and phonics instruction are just two essential parts of effective research-based reading instruction, which should also include a focus on reading skills and strategies that will allow for successful comprehension while also taking into consideration the social and cultural worlds that lend meaning and provide a more inclusive framework to reading, writing, and speaking.

We are not the first to note this potential need. In their final report, WestEd, the state's contracted external evaluator, questioned the alignment of materials to higher-order reading skills, stating that materials "reflected the state's minimum standards for K-3 reading. However, not all instructional programs fully reflected the dimensions of reading that engage students in drawing inferences and making connections beyond the text as required by Colorado's reading standards" (Friedrich et al., 2021, p. 86). It could be that an overemphasis on foundational literacy skills is limiting students' ability to meet the higher-order standards assessed on CMAS that would allow them to achieve proficiency expectations.

WestEd further identified that state-approved interim measures may be better suited to capture early literacy gains in their external evaluation reporting. WestEd notes, "READ Act interim assessments tend to focus (particularly at the early grades) on specific foundational reading skills and behaviors, as described in the READ Act itself" (McCrary et al., 2022, p. 37). While these measures may be sensitive to early literacy gains, especially in the areas around phonics and phonemic awareness, makers of state-approved assessments (CDE, 2024h) note their high correlation with CMAS when marketing to schools (Renaissance Learning, 2023). Researchers and policymakers should expect to see gains in ELG schools if the interim assessments accurately measure reading gains. The READ Act identified CMAS as the measure of reading proficiency, and we assert that CMAS gains should be measurable if the ELG is functioning as designed.

Finally, we acknowledge the well-documented effect of COVID-era school closures on student learning (Strunk et al., 2023), but we do not find compelling reasons to believe ELG schools would be differentially affected from the rest of the state. Thus, we are challenged to attribute the results of the present study to COVID, especially when our panel begins prior to the start of the

pandemic, and we did not find any statistically significant, positive results in the years prior to COVID.

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About the Authors

Grant Clayton
University of Colorado – Colorado Springs
gclayto2@uccs.edu
https://orcid.org/0000-0002-0423-9663
Grant Clayton is an associate professor in the Department of Teaching and Learning at the University of Colorado – Colorado Springs. His primary research interests are in education policy, concurrent enrollment, and teacher preparation.

Lesley S. Noel
University of Colorado – Colorado Springs
lnoel@uccs.edu
https://orcid.org/0009-0004-9972-5235
Lesley S. Noel is an assistant professor of early childhood and elementary literacy at the University of Colorado – Colorado Springs. Her work focuses on effective reading-comprehension instruction and intervention and the impact of educational policies on marginalized populations.

Gregory B. Ecks
University of Colorado – Colorado Springs
gregory.ecks@d11.org
https://orcid.org/0009-0001-6844-6020
Gregory B. Ecks is an adjunct professor in the Department of Teaching and Learning at the University of Colorado – Colorado Springs and serves full-time as Director of Data Science in Colorado Springs District 11. His research interest is in student engagement, including attendance, discipline, and achievement.

Christina D. Clayton
University of Colorado – Colorado Springs
christina.clayton@d11.org
Christina D. Clayton is an adjunct professor in the Department of Teaching and Learning at the University of Colorado – Colorado Springs and serves full-time as principal at Sabin Middle School in Colorado Springs District 11. She is a former ELG recipient. Her research interests are in second language acquisition, school performance, and teacher efficacy.

About the Guest Editors

Rachael Gabriel
University of Connecticut
rachael.gabriel@uconn.edu
https://orcid.org/0000-0001-6791-5721
Rachael Gabriel is professor of literacy education at the University of Connecticut. She is author of more than 50 refereed articles, and author or editor of seven books for literacy teachers, leaders and education researchers. Rachael currently teaches courses for educators and doctoral students pursuing specialization in literacy and is Editor in Chief of *The Reading Teacher*. A former teacher and

reading specialist, Rachael's research is focused on: literacy instruction, leadership and intervention, as well as policies shape opportunities to develop literacy in school settings.

Danielle V. Dennis
University of Rhode Island
danielle_dennis@uri.edu
https://orcid.org/0009-0005-7356-5314
Danielle Dennis is the Dean of the Feinstein College of Education at the University of Rhode Island and professor of literacy teacher education. Her research focuses on building teacher capacity in literacy through sustained professional development, the design and implementation of curriculum, and policy initiatives that enhance or inhibit educational experiences. Dr. Dennis currently serves as the Vice President of the International Literacy Association Board of Directors.

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