National Study of Professional Learning Communities at Work

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Socially Responsible Evaluation in Education
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Socially Responsible Evaluation in Education

Study conducted by the Office of Socially Responsible Evaluation in Education (SREED) at the University of Wisconsin Milwaukee. For more information about this report, please contact the author Curtis Jones at jones554@uwm.edu or visit www.uwm.edu/sreed.

The Office of Socially Responsible Evaluation in Education conducts rigorous evaluations and research on issues relevant to providing students from all backgrounds with effective education opportunities.

Summary

Socially Responsible Evaluation in Education (SREED) conducted a national study of student achievement growth in elementary and middle schools participating in the Professional Learning Communities at Work (PLC at Work). PLC at Work is a research-based school improvement framework designed to enhance student learning through sustained and structured teacher collaboration. The present study examines student achievement growth in a subset of PLC at Work schools designated as *Model* PLC at Work schools. Model PLC at Work schools have demonstrated sustained and effective implementation of PLC at Work. By restricting the sample to schools demonstrating high levels of implementation fidelity, the present study seeks to more accurately assess the potential impact of the PLC at Work framework on student learning outcomes.

Although Model PLC at Work schools demonstrated relatively high levels of achievement prior to their implementation of the PLC at Work framework, additional gains were observed following sustained and effective implementation of the PLC at Work model. In reading, Model PLC at Work schools moved from the 66th to the 73rd percentile of schools in their state. In math, schools moved from the 66th to the 75th percentile.

The results of statistical modeling show that Model PLC at Work schools demonstrated statistically significant improvements in both reading ($\beta = 0.13$) and math ($\beta = 0.15$) achievement. These statistically significant positive achievement gains were observed

across most states, with the largest improvements measured in Kentucky, South Carolina, Iowa, and California.

The practical significance of the measured gains suggests students in Model PLC at Work schools experienced additional math achievement gains equivalent to approximately 38% of a nine-month school year of learning, or about 3.4 additional months of learning, compared with schools prior to Model PLC at Work implementation and to schools across the state not engaged in PLC at Work. Students in Model PLC at Work schools also experienced additional reading achievement gains equivalent to approximately 33% of a year of learning, or about 2.9 additional months of learning.

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National Study of PLC at Work

The University of Wisconsin–Milwaukee (UWM) Office of Socially Responsible Evaluation in Education (SREED) was commissioned by Solution Tree to conduct an independent, national study of student achievement growth in elementary and middle schools participating in the Professional Learning Communities at Work (PLC at Work) program. PLC at Work is a research-based school improvement framework designed to enhance student learning through sustained and structured teacher collaboration. The model fosters a culture of collective efficacy and shared responsibility in which educators engage in continuous, cyclical processes of collaborative planning, formative assessment, and targeted instructional interventions to address diverse student needs. Grounded in three foundational principles (an emphasis on learning, the development of a collaborative professional culture, and a strong orientation toward results), PLC at Work emphasizes the prioritization of measurable student learning outcomes, the implementation of coherent and shared instructional practices, and the systematic use of data to inform instructional decision-making. Collectively, these elements provide a comprehensive framework for developing high-functioning professional learning communities that support students' academic development.

The present study examines student achievement growth in a subset of PLC at Work schools designated by Solution Tree as *Model* PLC at Work schools. To earn this designation, schools must demonstrate, over a minimum of three years, schoolwide

implementation and integration of the PLC at Work framework, the consistent use of timely and responsive student interventions, and evidence of sustained improvements in student learning outcomes.

The rationale for focusing on *Model* PLC at Work schools is to examine the effects of PLC at Work under conditions of strong implementation. In educational program evaluation, findings are frequently inconclusive, and many studies fail to detect statistically significant program effects. Such results do not necessarily indicate program ineffectiveness; rather, they often reflect variability or inconsistency in program implementation. When implementation fidelity is unclear, it becomes difficult to determine whether null findings are attributable to the intervention itself or to how it was implemented. By restricting the sample to schools demonstrating high levels of implementation fidelity, the present study seeks to more accurately assess the potential impact of the PLC at Work framework on student learning outcomes.

Descriptive Findings

Descriptive analyses were used to examine longitudinal changes in standardized school-level reading and mathematics achievement for schools with at least six years of available data prior to earning the Model PLC at Work designation. The initial three years of analyzed descriptive data (years −6 to −4) served as a baseline period, providing an estimate of school performance prior to high-fidelity implementation of the PLC at Work framework. The subsequent four years (years −3 through the year of designation) captured achievement outcomes during periods in which schools implemented PLC at Work with demonstrated fidelity, culminating in approval as a Model PLC at Work school.[1]

Although Model PLC at Work schools demonstrated relatively high levels of achievement prior to their strong implementation of the PLC at Work framework, additional gains were observed following sustained and effective implementation, suggesting continued improvement even among initially high-performing schools. During the baseline years, standardized reading achievement among these schools ranged from 0.40 to 0.49 standard deviations above the state average (Figure 1). During the years when schools were performing as Model PLC at Work schools, standardized math achievement increased to a range of 0.53 to 0.66 standard deviations above average. In reading, the observed increase from 0.40 to 0.60 standard deviations

[1] Refer to Figure 4

corresponds to an improvement from approximately the 66th to the 73rd percentile. In math, the increase from 0.42 to 0.66 standard deviations corresponds to an improvement from approximately the 66th to the 75th percentile.

Improvement was observed in several states as well (Table 1). While these descriptive state level results are compelling, their interpretation is somewhat difficult. The percentile change was calculated by comparing the standardized results in years when the school was performing as a Model PLC at Work school with baseline years. Because of this, schools with more baseline years are weighted more heavily in the calculation. The next section presents the inferential results, which addresses this limitation and produce a clearer estimate of improvement associated with Model PLC status.

Figure 1: Change in school standardized reading and math averages in the years before earning Model PLC at Work status

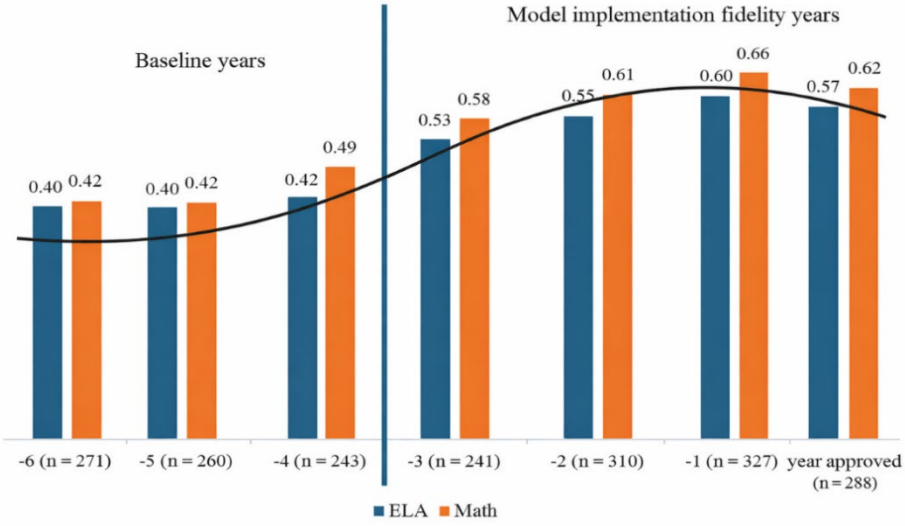


Table 1: Percentile ranking changes from baseline to Model PLC at Work implementation

	Math percentile change	*Reading percentile change*
Arkansas	2	2
California	9	8
Colorado	-9	-10
Florida	0	-2
Georgia	1	-1
Indiana	6	2
Iowa	10	8
Kentucky	27	25
Missouri	8	12
New York	2	2
South Carolina	11	7
Texas	10	10
Wisconsin	2	1
Wyoming	13	18
National change	*8*	*7*

Inferential Statistics Findings

Reading and math improvement estimates associated with Model PLC at Work schools were calculated for each state separately using difference-in-differences (DiD) modeling. DiD modeling estimates program effects by comparing school performance during baseline years with performance during years in which schools operated as Model PLC at Work schools. This change is then compared with the corresponding change in performance for schools not engaged in PLC at Work during the same years.

The model estimates effects separately for each school within a state, and these school-level effects are then pooled to produce an overall state-level effect. Standard errors are clustered by school and year to ensure that schools with more years of data are not weighted more heavily. Instead, each school's contribution is weighted by the precision of its estimated effect.

Tables 2 and 3 present the DiD results for reading and math achievement by state. The results indicate positive achievement gains associated with Model PLC at Work status across most states, specifically ten out of fourteen, with the largest improvements observed in Kentucky, South Carolina, Iowa, and California. These findings are largely consistent with the descriptive results, with the exception of Georgia. While the descriptive analyses suggested no improvement in schools implementing PLC at Work in Georgia, the DiD results indicate statistically significant gains in both reading and math achievement. Precision weighting of state effects was then used to

estimate the national effects of PLC at Work.[2] **At the national level, Model PLC at Work schools demonstrated statistically significant improvements in both reading ($\beta = 0.13$) and math ($\beta = 0.15$) achievement.**

Table 2: Results of math achievement difference-in differences modeling

	Math effect size	*Math Standard Error*	*Sign. level*
Arkansas	0.04	0.07	0.57
*California***	0.24	0.05	< 0.0001
Colorado	0.30	0.20	0.13
Florida	-0.08	0.06	0.224
*Georgia***	0.13	0.04	0.001
*Indiana**	0.22	0.09	0.018
*Iowa**	0.28	0.12	0.019
*Kentucky**	0.38	0.15	0.011
Missouri	0.31	0.16	0.053
New York	0.00	0.08	0.966
*South Carolina****	0.40	0.07	<0.0001
*Texas***	0.18	0.05	0.001
Wisconsin	0.05	0.07	0.473
Wyoming	0.15	0.11	0.185
National effects***	*0.15*	*0.02*	*<0.0001*

*$p < .05$, ** $p < .01$, *** $p < .001$*

[2] Van Den Noortgate, W. & Onghena, P. (2003). Estimating the mean effect size in meta-analysis: Bias, precision, and mean squared error of different weighting methods. *Behavior Research Methods, Instruments, & Computers, 35*, 504-511. https://link.springer.com/content/pdf/10.3758/BF03195529.pdf

Table 3: Results of reading achievement difference-in differences modeling

	Reading effect size	*Reading Standard Error*	*Sign. level*
Arkansas	0.01	0.07	0.849
*California****	0.17	0.04	<0.0001
Colorado	0.14	0.15	0.35
Florida	-0.10	0.06	0.108
*Georgia**	0.09	0.04	0.016
Indiana	0.15	0.10	0.137
*Iowa**	0.19	0.09	0.048
Kentucky	0.46	0.14	0.001
*Missouri****	0.42	0.11	<0.0001
New York	0.04	0.09	0.637
*South Carolina***	0.27	0.08	0.001
*Texas****	0.16	0.04	<0.0001
Wisconsin	0.07	0.08	0.347
*Wyoming**	0.26	0.11	0.021
National effects***	*0.13*	*0.02*	*<0.0001*

*$*p < .05$, ** $p < .01$, *** $p < .001$*

Practical significance of effects

To contextualize the magnitude of these effects, the results were compared to the impact of one year of schooling. A standardized effect size of approximately 0.40, referred to by Hattie as the "hinge point", corresponds to roughly nine months of academic

learning.[3, 4, 5]. Using this benchmark provides an intuitive way to interpret the size of the measured improvements.

Based on the national math effect size of 0.15, students in Model PLC at Work schools experienced math achievement gains equivalent to approximately 38% of a nine-month school year of learning (0.15 / 0.40), or about 3.4 additional months of learning, compared with students in the same schools prior to Model PLC at Work implementation. The national reading effect size of 0.13 corresponds to approximately 33% of a year of learning (0.13 / 0.40), or about 2.9 additional months of learning compared to students in students in like schools not engaged in PLC at Work. Figures 2 and 3 present the additional number of months of learning measured in each state with statistically significant results. Both South Carolina and Kentucky schools demonstrated nearly a full year of greater math learning when they operated as a Model PLC at Work school. Missouri and Kentucky schools demonstrated nearly a full year of greater reading learning.

[3] Hattie, J. (2009). *Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement.* London, UK: Routledge.
[4] Hattie, J. (2012). *Visible Learning for Teachers: Maximizing Impact on Learning.* London, UK: Routledge.
[5] Kraft, M. A. (2020). Interpreting effect sizes of education interventions. *Educational Researcher, 49*(4), 241–253.

Figure 2: In states showing improvement associated with Model PLC at Work - Months of additional learning in *math*

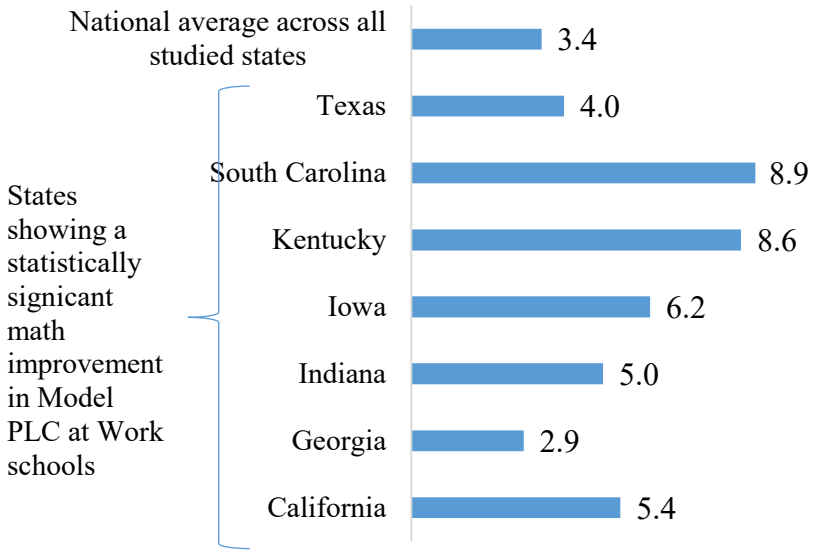
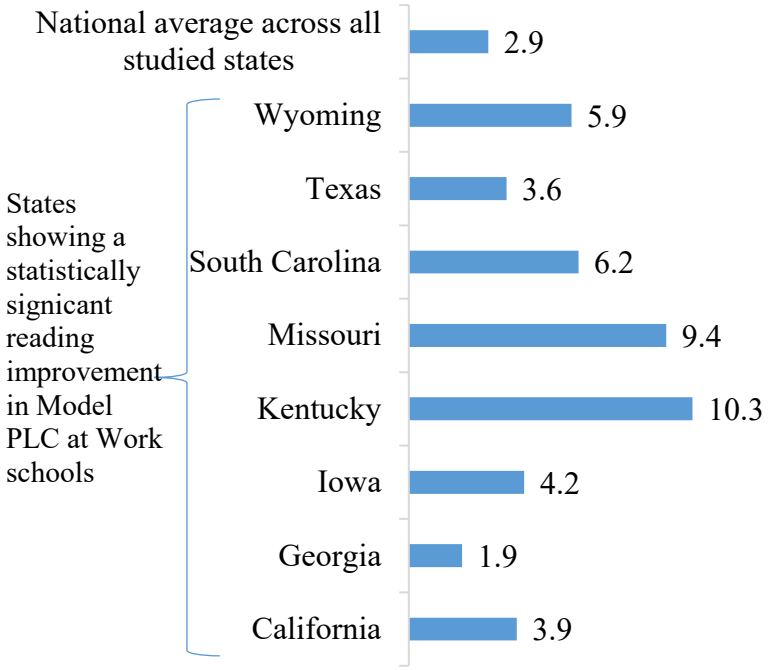


Figure 3: In states showing improvement associated with Model PLC at Work - Months of additional learning in *reading*



Discussion

The current study adds to a growing body of research on the PLC at Work program demonstrating its effectiveness in improving student and school achievement. Prior studies in Arkansas[6, 7] and Texas[8] have linked PLC at Work to statistically significant gains in school achievement. This study is the first national investigation of PLC at Work, drawing on data from schools in 14 states to examine changes in reading and mathematics achievement associated with the initiative.

This study focuses specifically on schools engaged in PLC at Work that, through sustained and effective implementation, have earned designation as Model PLC at Work schools. By centering on these schools, the study examines the potential impact of PLC at Work when it is implemented with high fidelity.

The results indicate that effective implementation of PLC at Work is associated with meaningful improvements in school achievement. Across the 14 participating states, statistically

[6] Hanson, H., Torres, K., Yoon, S. Y., Merrill, R., Fantz, T., & Velie, Z. (2021). *Growing together: Professional Learning Communities at Work generates achievement gains in Arkansas.* Education Northwest. https://educationnorthwest.org/sites/default/files/plc-at-work-impact-evaluation.pdf

[7] Education Northwest. (2021). *Independent evaluation validates success of Arkansas PLC at Work project.* https://educationnorthwest.org/insights/independent-evaluation-validates-success-plc-work-project-arkansas

[8] Mansell, K. E., & Kirksey, J. J. (2025). *Exploring the effectiveness of the PLC at Work process in Texas schools: Part 2. Evaluating the effectiveness of the PLC at Work process and student achievement in Texas*. Center for Innovative Research in Change, Leadership, and Education, Texas Tech University. https://files.eric.ed.gov/fulltext/ED675138.pdf

significant gains in reading and mathematics achievement were observed in eight and seven states, respectively. On average, functioning as a Model PLC at Work school was associated with achievement gains equivalent to approximately 3.4 months of mathematics instruction and 2.9 months of reading instruction.

As PLC at Work continues to evolve, future research should examine the sustainability of achievement gains beyond the point at which schools earn Model PLC at Work designation. At present, achievement data beyond the designation year are available for only a small number of schools. As additional longitudinal data become available, studies of sustained impact will be possible.

Future research should also focus more explicitly on program implementation. Although Model PLC at Work designation provides a useful indicator of effective practice, it does not capture the full extent or variability of implementation across schools. Assessing the degree to which PLC at Work components are implemented, as well as which aspects are most strongly associated with achievement gains, could provide valuable formative evaluation data to support improved implementation and sharper program focus.

Sample and State Participation

The analytic sample consisted of elementary and middle schools located in the 17 states with the highest numbers of Model PLC at Work schools. Reading and mathematics average scale score data were successfully obtained for all traditional schools across these 14 states. One state (Utah) declined to participate in the study, and two additional states (Alabama and Illinois) had not provided the requested data at the time this report was prepared. As a result, schools from these three states were excluded from the study.

The final sample included 369 Model PLC at Work elementary and middle schools and all non-participating traditional schools across the 14 participating states, representing approximately 87% of all Model PLC at Work elementary and middle schools within the original 17-state sampling frame. The distribution of Model PLC at Work schools by state is presented below (Table 4).

Table 4: Numbers of Model PLC at Work schools in each state included in the national study.

	Model PLC at Work Schools
Arkansas	41
California	41
Colorado	13
Florida	12
Georgia	43
Indiana	9
Iowa	12
Kentucky	6
Missouri	25
New York	9
South Carolina	15
Texas	105
Wisconsin	17
Wyoming	21

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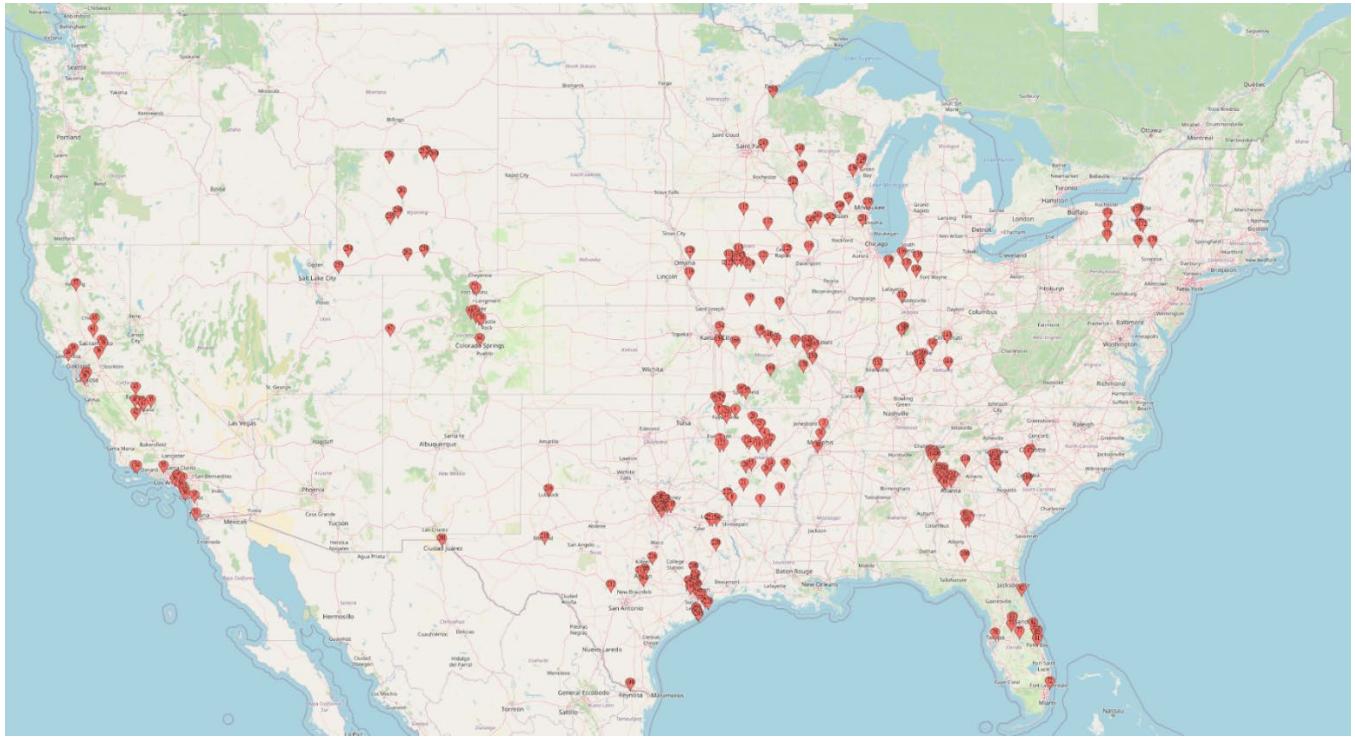
Communities with Study Model PLC at Work Schools



Outcomes

The outcomes for this study were school average standardized reading and mathematics scale scores on state-administered assessments. Scale scores were used rather than proficiency rates because they are sensitive to incremental changes in student achievement over time. Unlike proficiency, which relies on categorical cut points, average scale scores capture meaningful growth even in the absence of changes in proficiency levels.

To facilitate comparability across states and assessment systems, school-level average scale scores were standardized within each state using the distribution of scores from all schools statewide. A school's overall annual reading and mathematics standardized scores were calculated as the weighted average of grade-level standardized scores, weighted by the number of students who took the assessment in each grade level.

This process produced relative measures of school performance that are robust to changes in state assessments over time and comparable across states. Standardized scores reflect the extent that a school's performance deviates from the state average, with a score of 0 representing average (i.e., the 50th percentile). Positive values indicate above-average performance, whereas negative values indicate below-average performance. Standardization

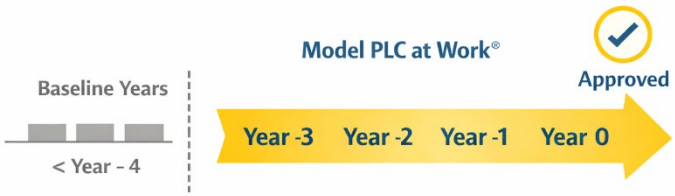
produces school effect sizes and is a widely used method for combining the results of studies across different contexts.[9, 10]

[9] Bloom, H. S., Hill, C. J., Black, A. R., & Lipsey, M. W. (2008). Performance trajectories and performance gaps as achievement effect-size benchmarks for educational interventions. *Journal of Research on Educational Effectiveness, 1*(4), 289–328.
[10] Hedges, L. V., & Olkin, I. (1985). *Statistical Methods for Meta-analysis.* Orlando, FL: Academic Press.

Analytic Approach

This study examined changes in standardized student achievement outcomes for Model PLC at Work schools by comparing performance during the three years in which schools had to demonstrate strong implementation of the PLC at Work framework to earn the Model PLC at Work designation, including the year in which the Model PLC at Work designation was earned, to performance in earlier years, treated as the baseline (Figure 4). The baseline included years in which schools may have been partially implementing the PLC at Work framework or had not yet adopted the model.

Figure 4: Categorization of years as either Model PLC at Work or baseline



The number of years for which data were available varied by state (Table 5). For instance, a hypothetical Indiana school awarded the Model PLC at Work designation in 2019, would have implementation years in 2016, 2017, 2018, and 2019. That school would have six baseline years in 2009, 2010, 2011, 2012, 2013, 2014 and 2015. No schools administered state assessments in 2020

because of COVID-19. Thus, study schools that earned the Model PLC at Work designation after 2019 have either one fewer implementation or pre-implementation year, depending on when they earned the Model PLC at Work designation.

Table 5: Achievement assessment availability in different states

	First year	*Last Year*	*Years*
Arkansas	2013	2024	12
California	2015	2025	11
Colorado	2016	2025	10
Florida	2009	2025	17
Georgia	2015	2025	11
Indiana	2009	2025	17
Iowa	2010	2025	16
Kentucky	2010	2024	15
Missouri	2018	2025	8
New York	2014	2024	11
South Carolina	2016	2025	10
Texas	2012	2025	14
Wisconsin	2012	2025	14
Wyoming	2018	2025	8

Student achievement outcomes for Model PLC at Work schools were analyzed using both descriptive and inferential statistical methods. Descriptive analyses examined trends in standardized reading and mathematics achievement over time. Inferential analyses employed a difference-in-differences (DiD) regression framework to estimate changes in student achievement associated

with sustained, high-fidelity implementation of the PLC at Work model. [11]

The DiD approach estimates program effects by comparing changes in outcomes across two dimensions. First, the analysis compared standardized achievement outcomes for Model PLC at Work schools during baseline years with outcomes observed during periods in which schools demonstrated strong implementation of the PLC at Work framework. Second, these within-school changes were contrasted with contemporaneous changes in standardized achievement outcomes for schools within the same state that were not engaged in PLC at Work during the same time periods. By differencing across both time and treatment status, the DiD framework helps account for unobserved, time-invariant differences between schools and for statewide trends affecting all schools similarly.[12] The model specification below represents the difference-in-differences analytical approach.

$$Y_{it} = \beta_0 + \beta_1(PLC_i) + \beta_2(TimePLC_t) + \beta_3(PLC_i \, x \, TimePLC_t) + \varepsilon_{it}$$

Where Y_{it} is the standardized reading or math score for a school; PLC_i is an indicator of if a school was ever identified as a Model PLC at Work school (1 = yes, 0 = no); $TimePLC_t$ is a binary indicator of if a school was organized as a Model PLC at Work

[11] Angrist, J. D., & Pischke, J.-S. (2009). *Mostly Harmless Econometrics: An Empiricist's Companion.* Princeton, NJ: Princeton University Press.
[12] Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How much should we trust differences-in-differences estimates? *Quarterly Journal of Economics, 119*(1), 249–275.

school in a given year (1 = implementation year, 0 = pre-implementation year). In difference in difference modeling β_3 is the factor of interest (difference-in-differences estimator), estimating the improvement of achievement associated with a school implementing PLC at Work with fidelity. A positive value for β_3 suggests improvement associated with schools implementing PLC at Work well. $\beta_3$was estimated separately for each state. National impacts of the PLC at Work program were then estimated using precision-weighting[13], in which each state-level impact estimate (β_3) was weighted by the inverse of its corresponding standard error. This approach assigns greater influence to state results with more precise estimates when calculating national reading and mathematics effects.

[13] Van Den Noortgate, W. & Onghena, P. (2003). Estimating the mean effect size in meta-analysis: Bias, precision, and mean squared error of different weighting methods. *Behavior Research Methods, Instruments, & Computers, 35*, 504-511. https://link.springer.com/content/pdf/10.3758/BF03195529.pdfhttps://link.springer.com/content/pdf/10.3758/BF03195529.pdf