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LITERACY DESIGN COLLABORATIVE 2018–2019 EVALUATION REPORT FOR NEW YORK CITY DEPARTMENT OF EDUCATION

LDC | 20145515 | Deliverable | Final Report

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JUNE 2020

The work reported herein was supported by grant number 20145515 from the Literacy Design Collaborative with funding to the National Center for Research on Evaluation, Standards, and Student Testing (CRESST).

The findings and opinions expressed in this report are those of the authors and do not necessarily reflect the positions or policies of the Literacy Design Collaborative.

To cite from this report, please use the following as your APA reference: Wang, J., Herman, J. L., Epstein, S., Leon, S., La Torre, D., Bozeman, V. (2020). *Literacy Design Collaborative 2018–2019 evaluation report for New York City Department of Education*. Los Angeles: University of California, Los Angeles, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).

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Executive Summary

The Literacy Design Collaborative (LDC) was created in 2009 to support teachers in implementing Common Core State Standards (CCSS) and embedding literacy skill development throughout content area curriculum. Engaged in the evaluation of LDC tools since June 2011, UCLA's National Center for Research on Evaluation, Standards, and Student Testing (CRESST) is the independent evaluator for LDC's current federally funded i3 validation grant. CRESST's evaluation study is using multiple data sources and a quasi-experimental design (QED) to examine LDC implementation and impact in two cohorts of schools in two large, urban school districts.

This report presents the results on implementation of LDC in the New York City Department of Education during the third year of the intervention, and the impact of the program across multiple years. The study schools serve largely Hispanic and Black populations, with a high proportion of students from economically disadvantaged backgrounds, and many English language learners (ELLs). As of 2018–2019, participating schools included 13 from Cohort 1, which began implementation during the 2016−2017 school year, and 23 from Cohort 2, which commenced at the beginning of the 2017−2018 school year. Our primary impact analyses, presented in this report for the first time, pool teachers from both cohorts to measure their impact after participating in LDC for 2 consecutive years (2017–2018 student outcomes for Cohort 1 and 2018–2019 student outcomes for Cohort 2).

The CRESST evaluation addresses research questions in three major areas:

- Program Characteristics and Implementation
- Contextual Factors and Implementation
- Program Impacts

The findings draw on multiple data sources and methods across the 5 years of the study. These include surveys of teachers, teacher leaders, and administrators; analysis of the quality of

performance tasks called LDC modules,[1] which are a central manifestation of LDC practice; participant interactions with LDC CoreTools, the electronic platform through which teachers access LDC professional development resources (online courses, existing LDC modules, module templates, and support for module development); data on teacher attendance, meeting lengths, and coach/teacher leader calls captured in professional learning communities (PLC) reflection forms; LDC administrative records capturing participant attendance at PLC sessions and professional development (PD) offerings for teacher leaders and administrators; and administrative data on students and teachers including class rosters, student demographics, and student performance on state standards-based assessments. We begin with the overall findings and then summarize participants' perspectives on key LDC components, intermediate effects on teachers' instructional strategies and practice, and effects on student outcomes. Detailed evidence with regard to key LDC activities, supports, and pedagogical impacts help to explain the mostly positive findings and offer implications for further strengthening LDC.

Overall Findings

Teachers and administrators appreciated LDC and perceived positive impact on their practice and their students' learning. Quasi-experimental analyses tended to produce positive estimates for the impact of LDC on student English language arts (ELA) assessment scores, but the differences did not reach the level of statistical significance. Specifically,

- Participants across all groups perceived a positive impact on student outcomes. A large majority of both teachers and administrators agreed that LDC helped improve student learning across multiple areas, including college and career readiness, literacy performance, writing, and content knowledge.
- Across all 3 years of the study, teacher, teacher leader, and administrator participants reported very positive attitudes toward LDC. Teachers appreciated the opportunity to collaborate and share practice, generally reported that the range of in person and digital supports was helpful, and agreed that participating in LDC positively impacted their practice, in areas such as engaging students in complex text, locating evidence of standards in final student work, and engaging students in understanding the performance task assignment and standards-rubric. Administrators generally saw LDC as a productive tool for meeting school instructional goals, but had some concerns with the intensive weekly time commitment needed to implement the program, with some administrators choosing to discontinue participation or dedicate less time to the program in favor of other priorities.
- While the LDC effect estimates tended to be in the positive direction, none of the quasi-experimental analyses yielded statistically significant results. Higher than expected levels of school and teacher attrition, and several changes in LDC project leadership are likely to have contributed to this lack of statistical significance. The

[1] An LDC module is a standards-embedded performance task assignment that explicitly guides students to write in response to reading complex and discipline-specific texts. The LDC module includes an assignment prompt and accompanying backwards-design instructional plan for teachers to implement in the classroom.

study does not, therefore, provide evidence that students taught by teachers who participated in the LDC program performed at different levels from matched comparison students on the New York State ELA Assessment.

Professional Learning Community and Teacher Collaboration

- Nearly all LDC teachers participated in LDC-oriented PLCs. The frequency with which PLCs met in 2018−2019, however, varied greatly across schools, with the number of recorded meetings ranging between six and 37 times in the year, and averaging 12.9 times. The average teacher's individual attendance rate was 74%, but again there was great variation. A little over half of teachers met the teacher-level fidelity threshold of 80% attendance. Only one fifth of schools met the program goal of three quarters of PLC participants attending 80% of meetings, with many schools experiencing challenges related to protecting planning time and ensuring that teacher participants attended PLC meetings. Both teacher surveys and PLC reflection forms indicated that PLC meetings typically lasted 45 to 59 minutes or an hour or more, and therefore met the LDC expectation.
- Teachers valued the collaborative nature of LDC and its PLCs. A large majority of teachers credited LDC with making them more likely to collaborate with other teachers, not only within their grade levels and content areas but outside of them as well.

LDC Training and Support

- Teachers were nearly uniform in their positive attitudes about the value of their PLC participation. They found the PLCs a safe space for sharing instructional plans, problem solving, and learning to develop modules.
- Teacher leaders were almost universally reported to be highly approachable, supportive, knowledgeable, and helpful.
- Teacher leaders reported high satisfaction regarding the support they received from coaches, PD offerings, and how the teacher leader role allowed them to be instructional leaders in their schools.
- Overall, LDC coaches received positive feedback on the survey, with 93% of teachers and 97% of teacher leaders reporting that their coaches gave them appropriate and timely feedback and support. Data suggest room for improvement when it comes to frequency and usefulness of coach feedback. While coaches were somewhat more likely to meet fidelity thresholds on module comments in 2018−2019 than 2017−2018, peer review was used even less frequently in 2018−2019 than it was used in 2017−2018.
- Most teachers rated CoreTools positively, which demonstrated the success of changes LDC made prior to the 2017−2018 school year including refinement of the content, sequencing, delivery of CoreTools' instructional content, and streamlining of participants' learning process. Overall, teachers were enthusiastic about much of the online learning content, with three quarters or more of teachers rating most aspects

as good or excellent. About a quarter of teachers, however, were concerned with the ease of use of the online course materials. Despite teachers' positive attitudes, analysis of CoreTools data revealed that they were being exposed to less online course content than program goals intended. There was some improvement in this area from 2017−2018 to 2018−2019, with a few schools meeting fidelity of implementation on exposure to the instructional content, but still exposure rates were considerably lower than fidelity thresholds. It is possible that there was not sufficient PLC time to cover the content with which LDC intended participants to engage.

LDC Implementation

- Teachers typically reported adapting/creating and implementing between two and three LDC modules across the school year, which meets LDC program expectations.
- Analysis of program data suggests that while nearly all participants were engaging with the module-building platform to some extent, the level of engagement varied greatly across individuals and across subgroups (role, cohort, school level, and content area) as evidenced by the wide range in the number of views, edits, and comments across teachers. More in-depth analysis of the portions of the modules that teachers edited online indicated that engagement varied greatly across teachers' user accounts, with about half of user accounts associated with engagement at a basic level (editing the teaching task), and other accounts associated with deeper engagement (editing multiple portions of modules). It is important to note that in response to teachers collaborating on and implementing common modules in schools, LDC refined its data collection in the summer of 2018 to include tracking engagement data on modules that teachers collaborated on. The fidelity matrix, and CRESST's analyses of editing data, were not designed to capture this shift toward a collaborative model of instructional design in CoreTools, and therefore may not fully capture engagement in the design process.
- The majority of teachers (81% to 92%) reported success in nine key areas of LDC module development. Teachers were most confident in selecting focus standards, creating the writing assignment, and identifying skills needed in the module. The module analysis, however, suggests that the materials adapted and created by PLC members varied in levels of completion and quality.
- With regard to their classroom implementation of LDC modules, the majority of teachers reported success with all six key areas queried (84% to 91%). Teachers were most confident with engaging students in complex text, locating evidence of standards in final student work, engaging students in understanding the assignment and rubric, and providing feedback to students using the assignment rubric.

Leadership Support

- Almost all teachers and teacher leaders reported that their administrators encouraged LDC participation at the school. The majority of teachers and teacher leaders agreed with administrators that they allocated resources to ensure that LDC teachers could participate in meetings. Administrators generally voiced strong support for LDC, but

varied in their level of direct engagement with the work, with some taking a hands-on approach by attending many PLC meetings, and some not.

- Both administrators and teacher leaders were less likely to take full advantage of the in-person meetings offered by LDC in 2018–2019 than they were in 2017–2018, with administrator engagement particularly low. On the other hand, coach/teacher leader calls were more consistent in 2018–2019 than in 2017–2018; nevertheless, many schools did not meet program goals related to the frequency of calls.

Impact on Teacher Practice

- The majority of teachers reported improving their practice in seven LDC-related skills (79% to 85%). Teachers were a bit more likely to report impact on selecting focus standards for an assignment, creating standards-driven writing assignments, and identifying skills that students need in writing assignments (skills concentrated at the beginning of the LDC learning cycle).
- Over 80% of teachers agreed that participating in LDC raised their expectations for students' writing, helped them incorporate writing assignments into their existing curriculum, and made them more likely to collaborate with other teachers on designing instruction.
- Among teachers who completed the survey in both 2017−2018 and 2018−2019, attitudes around impact on teacher skills and practices were on average even more positive in 2018−2019 than in 2017−2018.
- Overall, CRESST's ratings of module quality decreased from 2017−2018 to 2018−2019, when looking at all rated modules. The results for those modules created by a subpopulation of teachers who were present in both years were more mixed. Please note that sample sizes were small and thus comparisons across years were exploratory in nature.

Sustainability

- Survey respondents generally reported confidence that the LDC program would be sustained in their schools. Analysis of attrition patterns, however, revealed concerns about sustaining the LDC initiative in schools. Even with the substantial supports provided by LDC, a number of administrators decided over the course of the 3 years that they did not have the resources (particularly staff time) to remain in the program. Competition for time between different reform efforts and school priorities seemed to play a role in whether schools remained in the LDC program.

Impact on Student Learning

- Survey respondents were nearly uniform in perceiving a range of positive impacts of LDC on student learning. Among teachers who completed the survey in both 2017−2018 and 2018−2019, attitudes about LDC impact on students were on average even higher in 2018−2019 than in 2017−2018.

- Although effect estimates tended to be in the positive direction, the study provides no evidence of a statistically significant difference in ELA assessment scores between students taught by LDC teachers and matched comparison students.

Conclusions

Implementation data demonstrated great appreciation for LDC among teachers, teacher leaders, and administrators. Educators found LDC to be a helpful tool for fostering collaboration, creating a safe space for sharing practice, and increasing teacher skills and knowledge around literacy instructional design and teaching. Despite broad support, however, many schools and teachers did not meet fidelity thresholds related to attendance, exposure to instructional content, and principal observations of LDC instruction. The findings demonstrate the importance of school leaders and teachers understanding and committing to the program in advance of implementation, and school leaders dedicating substantial resources to the program, particularly time for common planning.

Quasi-experimental analyses did not provide evidence of a statistically significant impact of LDC on student learning, as measured by New York State ELA Assessment scores. Effect estimates, however, tended to be in the positive direction. The program was challenged by substantial attrition in both cohorts of schools and teachers, and fidelity of implementation varied greatly across schools. Improved retention of teachers and higher fidelity could potentially lead to greater effectiveness in future LDC implementations.

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1.0 Introduction

The Literacy Design Collaborative (LDC) was created in 2009 to support teachers in implementing Common Core State Standards (CCSS) by integrating literacy skill development throughout the content areas. LDC is a national community of educators providing a teacher-designed and research-based framework, online tools, and resources for creating both literacy-rich assignments and courses across content areas. Used by individual teachers, schools, and districts in 40 states for the past 4 years, LDC also is a statewide-adopted strategy for CCSS implementation in Kentucky, Colorado, Louisiana, and Georgia.

UCLA's National Center for Research on Evaluation, Standards, and Student Testing (CRESST), in collaboration with its partner Research for Action (RFA), engaged in the evaluation of LDC implementation and its impact on student learning and teacher effectiveness starting in June 2011, via two parallel research studies funded by the Bill and Melinda Gates Foundation. Those studies included an examination of LDC implementation in eighth grade social studies and science classrooms in Kentucky and Pennsylvania and a districtwide implementation in sixth grade advanced reading classes in a large district in Florida. Results for the studies are available in two CRESST reports (Herman et al., 2015a; Herman et al., 2015b), as well as a journal article published by AERA Open (Herman et al., 2016).

Because of its earlier success in helping students and teachers in middle schools, LDC received an Investing in Innovation (i3) validation grant to further develop the program. The current i3 project focuses on developing teacher competencies through job-embedded professional development and the use of professional learning communities (PLCs). Teachers work collaboratively with coaches to develop their expertise further and design standards-driven, literacy-rich writing assignments within their existing curriculum across all content areas. Currently, CRESST serves as the independent evaluator for LDC's federally funded i3 validation grant.

While the initial focus of the i3 grant was to serve teachers and students in middle schools, LDC responded to local conditions by expanding its implementation to also include elementary and high schools at both study districts: New York City Department of Education

(NYCDOE) and a large urban school district on the West Coast. The comprehensive mixed-methods evaluation includes quasi-experimental design (QED) analyses designed to estimate the impact of LDC on student learning and document LDC's impact on teacher skills and practices. Specifically, the evaluation study addresses a wide range of questions about program characteristics, conditions, and impacts in the context of the two school districts. The study measures teacher implementation and skill improvement with teacher surveys, analytic data from LDC's online CoreTools module building platform, PLC reflection forms, and artifact analysis. While we document the core strategies of the LDC model as implemented and provide support for LDC improvement, the central focus of our comprehensive mixed-methods evaluation is to examine the impact of LDC on student learning using a QED.

This report examines LDC implementation at NYCDOE schools during the 2018−2019 school year, and the impact of LDC on student learning across 2017−2018 and 2018−2019. It draws on data from two cohorts of schools, with each school housing a PLC of teachers who engage in professional learning about LDC and implement LDC mini-tasks and modules in their classrooms. The first cohort of schools began implementing LDC during the 2016−2017 school year, and the second cohort began implementation during the 2017−2018 school year. A parallel report focusing on implementation in the West Coast school district was prepared and shared in February 2020.

In this report, we present results from (a) surveys of classroom teachers, LDC teacher leaders, and school administrators; (b) analyses describing how LDC participants interacted with the CoreTools module building platform; (c) CRESST ratings of instructional modules created by LDC participants; (d) analysis of the fidelity of implementation across multiple key components, indicators, and data sources; and (e) primary and supplementary student outcome analyses using QED techniques.

Survey results provide a window into how LDC was implemented in 2018−2019 (the final study year), the perceived utility and effectiveness of various program components, and the perceived impact of LDC on both teacher and student skills and knowledge. The analysis of CoreTools user data and modules created and adapted by teachers provides evidence on the level of engagement with the online platform and module design process, and the quality of the products created by the teachers and PLCs. Fidelity of implementation analysis, utilizing the fidelity matrix designed collaboratively by LDC and CRESST, provides a broad picture of how schools and the program as a whole performed on key fidelity indicators in 2018–2019.

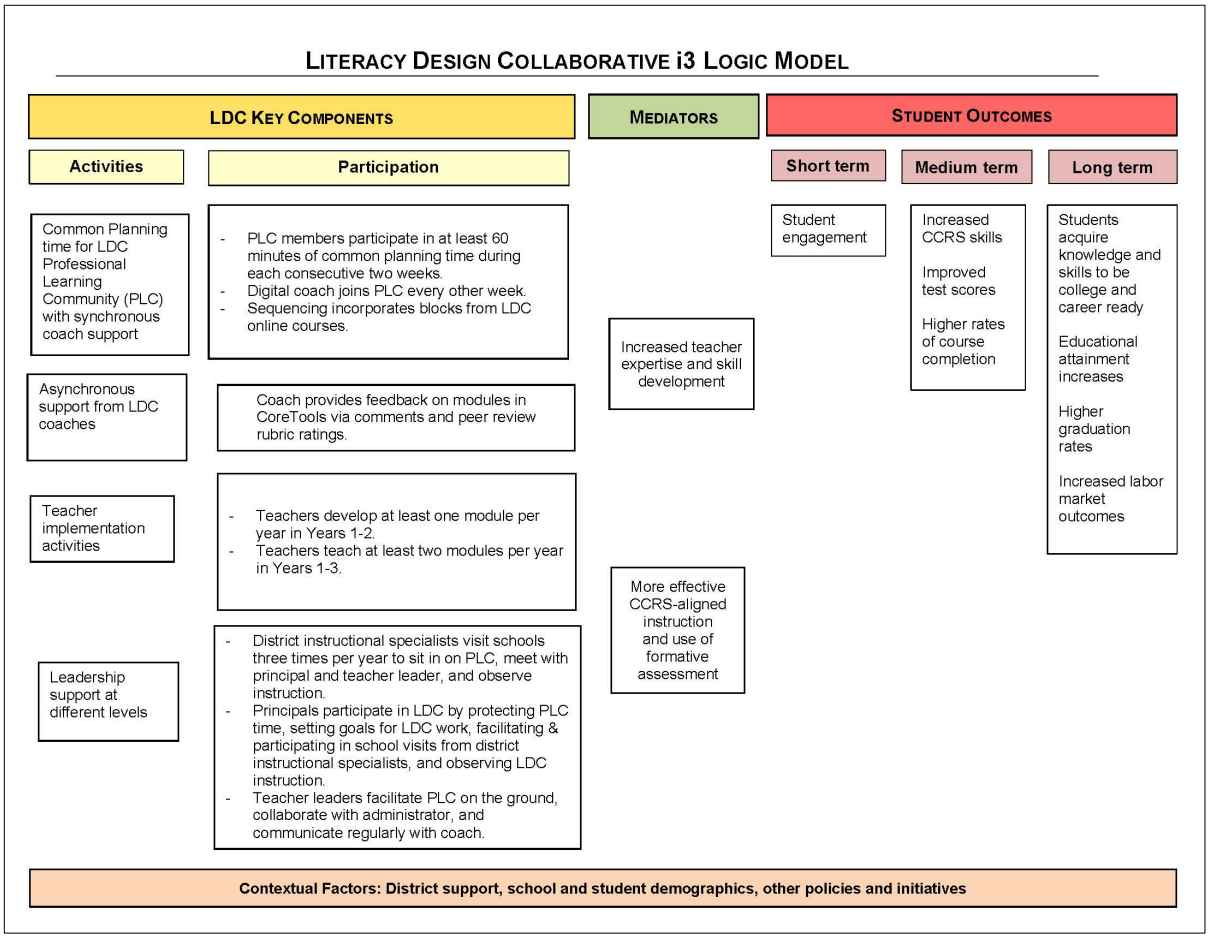
Our primary quasi-experimental analyses illuminate the impact of LDC on students, as practiced by teachers who amassed 2 or more years of experience with LDC. In addition, supplementary analyses examine the impact of Cohort 2 teachers alone and the impact on subgroups of students based on whether they were exposed to LDC in the prior year and how much exposure they had to LDC in the outcome year.

1.1 Logic Model

The logic model includes four key intervention components that are predicted to be the drivers of change in teacher practice and student learning (see Figure 1.1). These components include a coach-supported "professional learning community" formed to implement the LDC intervention at the school site and provide a space for teacher collaboration; "asynchronous support from coaches" primarily in the form of feedback in CoreTools through comments and peer review; "implementation activities" completed by participating teachers including module development and classroom implementation; and "leadership support" at different levels. Note that the model also indicates LDC's expectations for the level of implementation in each area.

Figure 1.1

LDC i3 Logic Model



The logic model predicts that the four key components will lead to increased teacher expertise and skill development and more effective CCSS aligned instruction that incorporates ongoing formative assessment. In turn, increased teacher capacity and more effective instruction will lead to increased student engagement in the short term; increased student skill

acquisition, higher test scores, and higher rates of course completion in the medium term; and improved college and career readiness, education attainment, graduation rates, and labor market outcomes in the long term.

Note that the logic model was revised based on refinements to the program in response to learning from both the pilot year (2015–2016) and Cohort 1's first year of implementation in 2016–2017.

1.2 Evaluation Questions

Our evaluation questions focus on addressing three main areas: program characteristics and implementation, contextual factors and implementation, and program impacts. This is the first report to provide results on our primary outcomes analyses, estimating the impact of LDC on student learning, as implemented by teachers participating in the program for two consecutive years.

1. Program Characteristics and Implementation
    a. Who are the participating teachers and schools? Are they representative of the teacher/school populations of the respective district on years of teaching, education level, prior student performance, etc.?
    b. How is the LDC program implemented in each district? What are the core components (e.g., training, tools, on-site or other direct support) and who are the key participants? In what ways did the LDC implementation align with the intended model?
    c. In what ways do teachers implement the LDC tools in their classrooms? To what extent do teacher practices align with intended LDC practices?
    d. How are teachers utilizing the online LDC system (including online tools, exemplars, collaborative work spaces, and technical assistance) in terms of frequency and use of key features? Does this vary by teacher characteristics? What are teachers' perceptions of the value and quality of the online LDC system?
    e. What types of LDC professional development opportunities are offered to and utilized by teachers at each school/district? Are teachers and schools satisfied with the LDC professional development opportunities they received?
2. Contextual Factors and Implementation
    a. What factors facilitate or hinder successful implementation of the LDC model at the teacher, school, and district levels?
    b. How can implementation of the model be improved at the teacher, school, and district levels?
    c. What other educational reforms are being implemented in the participating schools and districts? What are their influences on the LDC adoption in the schools and districts? Are schools able to align reform efforts?

d. What are the roles of school and district leadership in shaping the LDC implementation?

3. Program Impacts

   a. What is the impact of LDC on the academic performance of participating students as measured by the state assessments?

   b. Do the academic impacts vary by student subgroup including prior achievement, race, ethnicity, socioeconomic status, gender, language proficiency, and/or disability? Does LDC help close the achievement gap between student subgroups?

   c. Do the academic impacts vary by student grade level or subject?

   d. What is the impact of LDC on teacher skill improvement and learning as measured by CoreTools and by the quality of LDC modules they produce? What is the self-reported impact of LDC on teacher learning?

   e. To what extent do teachers report changes in their practice (e.g., teaching strategy, collaboration with others) and changes in their comfort in implementing CCSS during and after the LDC intervention?

   f. What is the relationship between the fidelity of implementation, fidelity of intervention, and student learning? What are the conditions and contexts under which LDC tool use is most effective?

   g. To what extent do Cohort 1 participating schools and teachers continue their LDC-influenced practices in the 2019–2020 school year after the LDC support ends? What contributed to their decision to continue or stop? What factors contributed to their levels of continued implementation? How does Cohort 1's actions align with their previously stated intentions for continuation of LDC-influenced practices as reported in spring 2017? To what extent do Cohort 2 participating schools and teachers plan to continue their LDC-influenced practices after the LDC support ends?

2.0 Study Methodology

In this chapter, we provide an overview of the methodology behind this report on LDC implementation and impact. We begin by describing the various instruments and data sources for the analyses, including surveys of classroom teachers and teacher leaders participating in PLCs as well as administrators overseeing the implementation; analytic data from LDC's CoreTools platform; module artifacts including samples of student work; LDC administrative data; and district administrative data on students and teachers used for the outcome analyses. We then describe the sample of educators and schools for each of these data sources. Finally, we discuss the methodological approaches for the various analyses we conducted.

2.1 Data and Instruments

We next describe each of the data instruments and the elements they contain. Most variables are measured at the teacher level, which is the unit at which the LDC intervention is being implemented. Administrative data for the analysis of the impact of LDC on student learning includes school-, teacher-, and student-level variables.

Surveys (Teachers, Teacher Leaders, and Administrators)

This report includes findings from the third and final year of survey collection in 2018−2019. In collaboration with LDC, CRESST previously made minor revisions to the 2016−2017 surveys for the 2017−2018 survey administration. These refinements involved streamlining the language of certain questions, in particular those capturing teacher pedagogical practice and the perceived impacts of LDC on teachers and students. In a few cases, questions and items were also added to collect systematic information on program conditions and impacts that were observed by LDC and CRESST anecdotally. The 2018−2019 surveys were substantively identical to the 2017−2018 surveys.

In 2018−2019, four different surveys were administered to LDC participants playing three different roles: teacher, teacher leader, and administrator. Some teacher leaders were classroom teachers who implemented LDC with their students, while other teacher leaders were out-of-classroom faculty (coaches or coordinators); these two groups received different versions of the survey tailored to their roles. Thus, four versions of the surveys were administered in spring 2019: (a) teacher, (b) teacher leader (for coaches and coordinators), (c) teacher leader (for teachers), and (d) administrator.

The surveys were designed to capture multiple perspectives on key aspects of LDC's logic model (see Figure 1.1), and to provide data to answer the evaluation's research questions presented earlier. Survey questions targeted at the three roles fall under the domains and subdomains in Table 2.1. Domains were selected to align with the LDC i3 logic model and with the CRESST evaluation questions. Note that most domains cover multiple subdomains, constructs, and survey questions. "Professional Learning Community/Teacher Collaboration," for example, captures the intensity, frequency, and collaborative environment of common

planning time; “LDC Training and Support” includes quality of online courses, utility and effectiveness of coach support, etc.; and “LDC Implementation” encompasses module creation, classroom implementation of modules, and module peer review.

Table 2.1

Survey Domains for Three Respondent Groups

Domain	Teacher	Teacher Leader	Administrator
LDC Participation	X	X	X
Professional Learning Community and Teacher Collaboration	X	X	X
LDC Training and Support	X	X	X
LDC Implementation			
Module Creation	X	X	
Classroom Implementation	X		
Module Peer Review	X		
Alignment		X	X
Leadership Support			
Teacher Leader Support	X		
School Administrator Support / Classroom Observation	X	X	X
Teacher Leader Leadership Role	X	X	X
District Support		X	X
Impact			
Impact on Teacher Practice and Learning	X		X
Impact on Student Learning	X		X
Scale-Up and Sustainability		X	X
Facilitators and Barriers	X		
Areas of Improvement	X	X	X

Teachers and administrators were asked to reflect on both LDC’s “Impact on Teacher Practice and Learning” and “Impact on Student Learning.” Questions within a number of domains further asked respondents to reflect on conditions and supports that may potentially impact LDC’s implementation. These domains included teachers’ perceptions of “Facilitators and Barriers” to implementation and perceptions regarding leadership roles and support for LDC at different levels. Teacher leaders and administrators were also asked for their

perceptions regarding if and how LDC would be sustained and expanded within the school. Finally, all respondents were asked open-ended questions regarding "Areas of Improvement" for LDC implementation. Teacher, teacher leader, and administrator survey results can be found in Chapter 3, and the survey instruments can be found in Appendices A, B, and C.

LDC CoreTools

The CRESST team received the LDC program data on i3 participants' interactions with the CoreTools module-building platform. The data files captured a number of behaviors including document page viewing, document editing, document commenting, coach use of peer review, exposure to LEARN instructional cycle content, and uploading of student work. The data contained date- and time-stamped records of participants' activities in all of these areas.

Using these data files, we were able to analyze variation in the number of times the participants viewed, edited, and commented on documents across the school year. We generated descriptive statistics (minimum, maximum, mean, and standard deviation) for the number of times participants viewed a document page, edited a module document, and commented on a module document. We then produced descriptive statistics on these behaviors for each role group (teacher, teacher leader, and administrator), school level (elementary, K−8, middle, 6−12, and high schools), cohort, and content area subgroup. We also compared the average engagement in these key activities across two groups: teachers who implemented modules as measured by the presence of uploaded student work and those teachers for whom we do not have evidence of module implementation. The results on these overall metrics of engagement are reported in Chapter 4.

CoreTools data were also used to analyze to what extent (a) teachers were exposed to instructional cycles of LEARN content; (b) coaches provided feedback via commenting and peer review functions; (c) teachers edited key portions of modules; and (d) teachers uploaded student work (a proxy for classroom implementation). Results for these indicators are reported in Chapter 6.

Modules

We adapted the existing module rating rubrics (Reisman et al., 2013) that were developed for earlier studies of LDC. The rubrics were designed to examine the instructional quality and coherence of the LDC modules, and to address the rigor in both content and literacy development materials (i.e., template task, student work samples, and descriptions of the pacing and goals of the modules). The first two dimensions examined the quality of the teaching task, while the remaining four dimensions focused more holistically on module quality: (a) effective writing task; (b) alignment to the CCSS and local and state literacy and content standards; (c) fidelity to LDC module instruction; (d) quality instructional strategies; (e) coherence and clarity of module; and (f) overall impression.

Each of the dimensions was rated using a 5-point scale with anchor points on the first five dimensions ranging from "not present or realized" to "fully present or realized" and the final dimension ranging from "inadequate" to "advanced" LDC module implementation. This scale mimics the structure of the three-level LDC jurying system scale that uses the ordered anchors of "work in progress," "good to go," and "exemplary quality." For each dimension, a 1 represented the lowest possible level of quality, while a 5 represented the highest level of quality (see Appendix D).

LDC Administrative Records

The fidelity matrix analyses in Chapter 6 utilize administrative records collected by LDC as part of their ongoing program management. These records include (a) PLC reflection forms, and (b) attendance records for in-person meetings organized for the benefit of school administrators and teacher leaders. The PLC reflection form captures attendance at regular PLC meetings, the amount of time spent on LDC during these meetings, whether teacher leaders had a separate planning call with coaches, and the subjects that PLCs were working on during sessions.

Administrative Data Used in Student Outcomes Analysis

Student-level variables utilized in the outcome analysis included race/ethnicity, gender, poverty status, special education status, English language proficiency, grade, and baseline achievement in mathematics and English Language Arts (ELA), as well as outcome year achievement in ELA on state assessments. Teacher level indicators obtained and utilized included years of teaching experience and teacher attendance. We also requested and received roster files that establish a link between teachers and students via specific courses.

2.2 Study Population and Generalizability

Here we describe the population of schools and teachers who participated in LDC, how that population changed over time, and how that population compared to all schools and teachers in the district. Over the course of the project, two cohorts of schools were recruited to participate in LDC, with one cohort beginning implementation in 2016−2017 and a second cohort beginning in 2017−2018. The initial 29 Cohort 1 schools included two elementary schools, 17 middle schools, three high schools, four K−8 schools, and three 6−12 schools. Cohort 2 included 16 elementary schools, 11 middle schools, five K−8 schools, and three 6−12 schools. As displayed in Table 2.2, there was substantial attrition at both the school and student levels for each cohort. Over one third of Cohort 1 schools dropped out of the program after 2016−2017, and within the remaining Cohort 1 schools, 53% of teachers did not continue with LDC in 2017−2018. Attrition in Cohort 2 was somewhat less pronounced but still very substantial. About one third of schools did not continue with LDC in 2018−2019, and within the remaining Cohort 2 schools, 36% did not continue with the program in 2018−2019.

Table 2.2

Attrition of Cohort 1 and Cohort 2 Teachers, Administrators, and Schools

Sample	Teachers	Administrators	Schools
Cohort 1 (beginning 2016–2017)			
Participated in LDC in 2016–2017	219	47	29
Remained in LDC in 2017–2018	52	22	18
Attrition rate as of 2017–2018	76%	53%	38%
Remained in LDC in 2018–2019	28	16	13
Attrition rate as of 2018–2019	87%	66%	55%
Cohort 2 (beginning 2017–2018)			
Participated in LDC in 2017–2018	229	54	35
Remained in LDC in 2018–2019	97	28	23
Attrition rate as of 2018–2019	58%	48%	34%

To better understand teacher and school attrition, we conducted an interview study of school administrators in the 2017–2018 school year. Twenty principals and assistant principals from both the West Coast district and our parallel New York City Department of Education study volunteered to be interviewed. The principal interview responses revealed a diversity of reasons. The main reason for teacher retention involved teacher and grade-level team decisions to leave or stay, followed by the principals' decision to switch participation of teachers between the 2 years. Buy-in also seemed to affect teachers' decisions on whether to continue. Although the sample was small, one of the reasons schools seemed to have dropped out was because they were overburdened by other priorities, including other reform efforts in the districts. Information submitted by school administrators to LDC confirmed that there were many other reform initiatives happening in schools during the study, including programs related to ELA, such as Early Language and Literacy Plans, Scholastic Leveled Bookrooms, and Achieve 3000. See Appendix E for a detailed description of the results as well as the methodology for the interview study.

In Table 2.3, we provide a snapshot of participation in 2018–2019, the final implementation year, by cohort, the year the teacher or administrator began participating in LDC, and school level. Over one third of participants were from elementary schools, a little less than a third from middle schools, and a little less than a third from either K–8 or 6–12 schools. Over two thirds of participants were from Cohort 2 schools. Both cohorts of schools also had teachers and administrators join LDC after the first year of implementation. Ninety-six teachers and administrators in Cohort 1 schools joined LDC in either 2017–2018 or 2018–2019, including 18 who participated in both 2017–2018 and 2018–2019, 49 who participated only in

2017−2018, and 29 who participated only in 2018−2019. These participants are not part of our primary impact analyses; however, we conducted supplementary analyses to evaluate their impact on student learning when there was sufficient sample.

Table 2.3

Number of Participants in 2018−2019 by Cohort/Start Year and School Level

Cohort/Start Year	Elementary	K−8	Middle	6−12	Total
Cohort 1 school/started 2016−2017	8	10	17	9	**44**
Cohort 1 school/started 2017−2018	2	1	13	2	**18**
Cohort 1 school/started 2018−2019	2	6	12	9	**29**
Cohort 2 school/started 2017−2018	55	27	31	12	**125**
Cohort 2 school/started 2018−2019	47	16	21	1	**85**
Total	114	60	94	33	301

Next, we describe how the participating schools, teachers, and students in the LDC program compared to those in the school district as a whole. In Table 2.4, we provide a snapshot for each of the three study years. For each year, we present characteristics of schools and their grade 3−8 student populations compared to all schools and all grade 3−8 students in the district. We chose to focus our reporting of student characteristics on the grade 3-8 population, because our quasi-experimental analyses are based on that grade range. We also, however, examined the characteristics of all students in grades K-12, and those results were very similar to those reported in Table 2.4.

Not surprisingly given LDC's focus on middle schools, the LDC treatment group had a greater proportion of middle schools and a smaller proportion of elementary schools than the district as a whole. The student population in LDC schools was consistently more likely to be Black or Hispanic, and less likely to be White or Asian/Pacific Islander than the district's overall student population. Students in LDC schools were also more likely to be economically disadvantaged. Students were classified as Limited English Proficient and eligible for special education services in similar proportions in the two groups. LDC schools were substantially lower performing in both ELA and mathematics than all schools in the district serving students in grades 3−8.

Table 2.4

Characteristics of LDC Schools and Grade 3–8 Student Population at LDC Schools Compared to Students in New York City Department of Education as a Whole, by Year

Variable	2016–2017		2017–2018		2018–2019	
	LDC	Whole district	LDC	Whole district	LDC	Whole district
School level						
Elementary schools (%)	8	51	35	51	33	53
Elementary/middle schools: K–8 (%)	19	14	15	14	22	12
Middle schools (%)	58	20	40	20	33	21
Middle/high schools: 6–12 (%)	15	7	10	7	11	8
K-12 schools (%)	0	8	0	8	0	7
Student level characteristics						
Hispanic (%)	51	41	47	41	47	41
Black (%)	34	26	38	26	37	22
Asian/Pacific Islander (%)	7	15	7	15	9	18
White (%)	6	15	5	15	4	17
Female (%)	51	49	48	49	50	48
Limited English proficient (%)	17	15	16	15	16	16
Special education (%)	25	21	23	22	23	23
Poverty (%)*	86	71	86	76	84	74
Student Achievement						
Mean standardized ELA achievement	-0.346	0.00	-0.320	0.00	-0.296	0.00
Mean standardized mathematics achievement	-0.441	0.00	-0.393	0.00	-0.394	0.00

Next, we explore how the main LDC teacher groups of interest compared to teachers district wide (see Table 2.5). These groups are Cohort 1 teachers with 2 years of LDC participation as of 2017–2018 and Cohort 2 teachers with 2 years of LDC participation as of 2018–2019. We report on a number of teacher characteristics, as well as the mean achievement of these teachers' students in the baseline year. Not all variables were available for each of the two cohorts/years. For example, demographic characteristics were not available for 2018–2019. The analysis suggests that Cohort 1 teachers on average had less experience than their peers in the district as a whole, and Cohort 2 teachers on average had more experience. Cohort 1 and Cohort 2 teachers also taught students that were substantially lower

performing on average at baseline than grade 3–8 students in the district as a whole. Cohort 1 teachers more likely to be Black and less likely to be White than in the district as a whole.

Table 2.5

Characteristics of LDC Core Content Area Teachers with Two Consecutive Years of LDC Participation and New York City Department of Education Teachers, by Cohort and Year

Variable	Cohort 1 in 2017–2018		Cohort 2 in 2018–2019	
	LDC	Whole District	LDC	Whole District
Hispanic teachers (%)	14	15	NA	NA
Black (not Hispanic) teachers (%)	29	19	NA	NA
Asian (not Hispanic) teachers (%)	7	6	NA	NA
White (not Hispanic) teachers (%)	46	58	NA	NA
Female teachers (%)	61	74	NA	NA
Teachers with regular/permanent assignment (%)	93	97	97	98
Teacher mean years of experience	8.4	10.4	13.4	10.5
Mean standardized ELA achievement at baseline of students taught by teachers	-0.38	-0.01	-0.39	-0.01
Mean standardized mathematics achievement at baseline of students taught by teachers	-0.43	0.01	-0.46	0.00

2.3 Sample for Implementation and Outcomes Analyses

Here we explore the teacher and administrator samples for the various implementation analyses in the final study year (2018–2019), as well as for outcomes analyses across the multi-year study. Table 2.6 displays the overall population and sample sizes for the different study measures and analyses included in this report. This includes all participants in 2018–2019. As can be seen, data were available for a majority of the participants. Seventy-eight percent of teachers consented to participate in the study, with 81% of all teachers completing the survey in spring 2019 (some teachers who did not return consent forms nevertheless completed the survey). Eighty-seven percent of administrators consented to participate in the study, and 45% completed the survey. Nearly all teachers (98%) and most administrators (82%) were present in the CoreTools dataset, which was provided directly to CRESST by LDC, and did not depend on teachers' individual study consents. Most teachers (87%) were present in the PLC reflection attendance data as well (six schools did not properly record the data and therefore there is no attendance data on teachers at these schools).

Table 2.6

Number of Participating Schools and Teachers in the District and Sample Size for Different Instruments, 2018–2019

Instruments	Classroom teachers	Administrators	Schools
Participated in LDC	254	47	36
Consented to CRESST study	199	41	35
Completed survey	206	21	35
Present in CoreTools dataset	250	39	36
Authored/coauthored a module with student work uploaded	153	0	35
Present in PLC reflection form attendance records	221	26	30
Leader in-person meeting attendance	NA	NA	29
Included in outcomes analysis for 2018−2019	69	NA	23

The school district required individually signed consent forms before releasing teacher data and teacher/student rosters, so for the outcome analysis, we only received data on teachers who consented to participate in the study. Samples were further restricted by the need for student achievement data for both the outcome year (2017−2018 or 2018−2019 for Cohorts 1 and 2 respectively) and the baseline year (2015−2016 or 2016−2017 for Cohorts 1 and 2 respectively). As a result, participants teaching either in high school or the primary elementary grades (K−3) were not included in any of the student outcome analyses. Middle school teachers who did not teach a core ELA, science, or social studies/history class were also excluded from the analyses. Of the 254 teachers from 36 schools who participated in LDC in 2018−2019, 69 teachers from 23 schools were represented in at least one of the quasi-experimental analyses reported on in Chapter 7 with 2018–2019 as an outcome year.

In Tables 2.7 and 2.8, we list all the potential teacher samples by cohort, school level, start year, and outcome year. Our previous reports examined the impact of LDC after 1 year for Cohort 1 and Cohort 2 elementary and middle school teachers. We also previously estimated the impact of Cohort 1 middle school teachers after 2 years of implementation. This final annual report includes models pooling across cohorts for each school level separately, and for the elementary and middle schools combined. We also examine the impact of LDC as implemented in Cohort 1 schools by teachers with 3 years of LDC participation. We also conducted supplementary analyses examining the impact of middle school teachers who joined existing PLCs in their schools' second year of LDC implementation.

Table 2.7

Number of Classroom Teachers by Cohort, Implementation Years, School Level, and QED Eligible Students (Cohort 1)

School level/ start year	Outcome year	Years in LDC	Teachers	Consented teachers	Consented teachers with eligible students	Summary of reporting
Elementary school						
2016–2017	2016–2017	1	26	25	14	2018 and 2020 reports
2016–2017	2017–2018	2	10	10	2	2020 report*
2016–2017	2018–2019	3	6	6	0	Not conducted
2017–2018	2017–2018	1	10	8	2	Not conducted
2017–2018	2018–2019	2	2	2	0	Not conducted
2018–2019	2018–2019	1	3	2	0	Not conducted
Middle school						
2016–2017	2016–2017	1	147	133	104	2018 and 2020 reports
2016–2017	2017–2018	2	35	33	26	2019 and 2020 reports
2016–2017	2018–2019	3	17	17	11	2020 report
2017–2018	2017–2018	1	51	31	17	2019 and 2020 reports
2017–2018	2018–2019	2	15	12	8	2020 report
2018–2019	2018–2019	1	18	10	9	Not conducted
High school						
2016–2017	2016–2017	1	57	51	0	NA
2016–2017	2017–2018	2	7	7	0	NA
2016–2017	2018–2019	3	3	3	0	NA
2017–2018	2017–2018	1	10	6	0	NA
2017–2018	2018–2019	2	2	1	0	NA
2018–2019	2018–2019	1	7	4	0	NA

Note. *There was insufficient sample size to test the impact of Cohort 1 elementary teachers in their second year of implementation independently, but these teachers were included in pooled analyses examining the impact of Cohort 1 and 2 elementary teachers after 2 years of implementation.

Table 2.8

Number of Classroom Teachers by Cohort, Implementation Years, School Level, and QED Eligible Students (Cohort 2)

School level/ start year	Outcome year	Years in LDC	Teachers	Consented teachers	Consented teachers with eligible students	Summary of reporting
Elementary school						
2017–2018	2017–2018	1	137	129	54	2019 and 2020 reports
2017–2018	2018–2019	2	78	77	31	2020 report
2018–2019	2018–2019	1	63	57	16	Not conducted
Middle school						
2017–2018	2017–2018	1	56	53	31	2019 and 2020 reports
2017–2018	2018–2019	2	38	36	32	2020 report
2018–2019	2018–2019	1	12	9	8	2020 report
High school						
2017–2018	2017–2018	1	6	5	0	NA
2017–2018	2018–2019	2	6	5	0	NA
2018–2019	2018–2019	1	3	3	0	NA

In addition to the CoreTools analytic files, we also received module artifacts from LDC for an analysis of the quality of module design. We restricted our analysis to modules that were created during the 2018–2019 school year and included original uploaded student work samples, because these samples were required for module scoring. That restriction yielded a pool of 137 modules that were authored or coauthored by 153 teachers (60% of all participating teachers), across 35 schools. Because the number of modules created surpassed available resources for scoring, we sampled the last module created by each teacher wherein they served as the sole or lead author. Our intent was to represent teachers' best LDC work, and presumably, modules created later in the school year would be more skilled than those created earlier. The final total sample was 109 modules. Table 2.9 provides further detail about the distribution of modules. We also conducted an exploratory analysis of the 13 elementary teachers and 30 secondary teachers who created a complete module both this year and during the previous school year.

Table 2.9

Background Variables for the Primary Module Analysis

Variables	Elementary		Secondary		Total	
	#	%	#	%	#	%
Cohort						
Cohort 1 (2016–2017)	4	8.3	14	23.0	18	16.5
Cohort 1 (2017–2018)	1	2.1	14	23.0	15	13.8
Cohort 2 (2018–2019)	1	2.1	9	14.8	10	9.2
Cohort 2 (2017–2018)	23	47.9	17	27.9	40	36.7
Cohort 2 (2018–2019)	19	39.6	10	16.4	29	26.6
Subject						
ELA	24	50.0	31	50.8	55	50.4
Science	11	22.9	10	16.4	21	19.3
Social Studies	13	27.1	20	32.8	33	30.3
Total	48	44.0	61	56.0	109	100.0

2.4 Survey Recruitment and Administration

As in previous years, CRESST and LDC worked together to conduct the consent process for teachers and administrators who newly joined LDC in 2018–2019, and were successful in consenting 58% of these new participants. As required by the UCLA Office of the Human Research Protection Program, all consent forms included language stating that the study was voluntary, that data would be protected, and that by signing the form, participants consented to be emailed an electronic survey in spring 2019 and to have CRESST request district data linking them and their students.

Directly compensating educators for participation in research is not permitted in New York State. We therefore offered instead gift cards of $300 to the school to be used for school supplies to directly benefit students. The gift cards were given to the school if the school's teacher leader and at least five teachers participating in the PLC completed the survey.

Surveys were administered in spring 2019. CRESST coordinated with LDC staff and coaches to administer the online surveys during common planning sessions. Multiple email reminders were sent to participants who were not present at these sessions or who otherwise did not complete the survey. The teacher survey administration was closed at the end of the school

year in June 2019. The administrator survey window was left open through August 2019 when administrators returned from their summer break.

2.5 Module Scoring Process

LDC requirements specified that all teachers implement two modules over the course of the year, with the first spanning 1 week based on one text and the second spanning across multiple weeks and incorporating multiple texts. Modules could be developed as original units of work or could be adapted from existing modules within the LDC CoreTools Library. Modules could also be either developed or adapted in solo or collaboratively with other teachers within the PLC. LDC modules were collected from elementary and secondary teachers who participated in LDC during the 2018–2019 school year. In total, 109 modules created by NYCDOE teachers were rated with 45 or 41.3% being rated by two panelists. Further details about the modules can be found in Appendix F.

Eight expert raters with experience teaching in the targeted grade spans and content areas were recruited from Los Angeles county schools. Four panels were convened with two or three experts rating each of the following sets of modules: elementary ELA and social science, elementary and secondary science, secondary ELA, and secondary social science. It should be noted that one rater served on both the secondary ELA and the secondary social science panels. In addition, three of the teachers had 2 years of prior experience working as raters on the LDC module analyses and three had 1 year of prior experience.

Separate trainings lasting approximately 2 hours were conducted for each module scoring panel. All trainings were conducted by a member of the evaluation team who is an expert on the CCSS and the rating of student and teacher artifacts, and who had been conducting the training for the past three cycles of scoring. The training included an overview of the LDC goals, template task, the structure of the modules, and the CRESST rating dimensions. Once the training was complete, calibration was conducted by having teachers individually score and then discuss their ratings for one module in the content area on which they would be focusing. Scoring was then conducted on subsequent days with each module individually rated. Those modules rated by two expert teachers were then discussed with the goal, but not the requirement to reach consensus (see Carlson & McCaslin, 2003). All discussions were facilitated by the same evaluation team member who conducted the initial training.

2.6 Analytical Approaches

Both quantitative and qualitative analytic methodologies were applied to the data to answer the evaluation questions about how LDC was implemented, conditions affecting implementation, and program impacts. The following describes the approaches used to analyze each data set.

Surveys

Survey responses were analyzed using descriptive statistics for multiple-choice items and qualitative coding for open-ended responses. As previously noted, surveys were administered to teachers, teacher leaders, and administrators. Some teacher leaders were classroom teachers while others were coaches or coordinators. Because of this, the samples were not mutually exclusive, with teacher leaders who taught in the classroom represented in both the teacher and teacher leader results. Generally, we report the number and percentage of respondents who selected different multiple-choice options. In a few cases, where responses are numerical rather than categorical, we present means rather than proportions. Descriptive statistics for all multiple-choice items are presented in full in Appendix A for teachers, Appendix B for teacher leaders, and Appendix C for administrators.

LDC CoreTools

The first stage of our analysis examined the proportion of all participants who created CoreTools user accounts, and engaged in three key behaviors: viewing, editing, and commenting on modules. We then analyzed each of the three key measures of participants' interaction with the LDC online tools, and reported frequencies and/or descriptive statistics (e.g., minimum, maximum, mean, standard deviation) as measures of participants' engagement with the online LDC system. In addition to reporting the overall results, we provide results by cohort, the content areas taught (ELA, social studies/history, and science), by participant role (teacher, teacher leader, and administrator), and school level (elementary, K–8, middle, 6–12, and high) whenever feasible. Finally, we explored the difference in CoreTools engagement between two groups of teachers: those who completed and taught modules and those who did not appear to complete the design and implementation process.

Modules

We used descriptive statistics (means, standard deviations, and percentages) to analyze overall and subgroup performance for each content area and school level on each of the six dimensions. Additionally, generalizability theory (G theory) was used to examine potential sources of error during the rating process to help determine the validity of the scores as well as the construct validity of the rubrics (see Shavelson & Webb, 1991). Finally, teacher comments during the debriefings were examined to determine other potential issues with the rubrics and/or rating process.

Fidelity of Implementation Analysis

To examine fidelity of implementation we conducted descriptive analyses of a variety of data sources, including a teacher survey, CoreTools data, PLC reflection data, and attendance records for administrator and teacher leader in-person meetings. As outlined in the fidelity matrix (see Appendix G), fidelity levels are set at the teacher, module, school, and program levels. The process for most indicators involves several levels of aggregation, with, for example,

module editing being measured at the teacher level, school level, and program level. School- and program-level scores are typically based on the proportion of teachers or modules that met the threshold for adequate implementation.

Table 2.10

Summary of Fidelity Matrix Indicators and the Criteria for Meeting School- and Program-Level Fidelity

Key component	Indicator	Criterion for meeting fidelity at school level	Criterion for meeting fidelity at program level
Key Component 1: Common Planning Time for LDC Professional Learning Community with Synchronous Coach Support	Teacher attendance at weekly PLC meetings	75% of PLC teachers attended 80% of meetings	75% of schools met fidelity
	Amount of time spent on LDC in PLC sessions	PLC sessions typically met for 60 minutes plus	75% of schools met fidelity
	Exposure to LDC LEARN content during 1st instructional cycle	75% of PLC teachers viewed 60% of sessions in 1st LEARN instructional cycle	75% of schools met fidelity
	Exposure to LDC LEARN content during 2nd instructional cycle	75% of PLC teachers viewed 60% of sessions in 2nd LEARN instructional cycle	75% of schools met fidelity
	Perceived effectiveness of engagement in PLC on teacher competencies	Teacher survey respondents on average reported moderate improvement in key competencies	75% of schools met fidelity
Key Component 2: Asynchronous Support from LDC Coaches	Coach comments on modules	75% of modules developed at the school and linked to LEARN courses received at least two comments from LDC coaches	50% of schools met fidelity
	Coach formative peer review on modules	75% of modules developed at school and linked to LEARN courses received feedback from LDC coaches via peer review rubric	50% of schools met fidelity
	Teacher perception of the helpfulness of coach written feedback on modules	75% of teacher survey respondents reported coach written feedback was at least moderately helpful	50% of schools met fidelity
Key Component 3: Teacher Implementation Activities	Module editing	75% of PLC teachers edited task and either standards or text in at least 1 module	75% of schools met fidelity
	Module implementation	75% of PLC teachers uploaded student work to at least 2 modules	75% of schools met fidelity

An analysis of the relationship between fidelity of implementation and outcomes was also conducted. This analysis utilized the analytic sample from our primary quasi-experimental investigation of the impact of LDC as practiced by teachers with 2 years of LDC experience. Two models produced school and teacher residuals respectively. These residuals were then used to divide the sample into high, medium, and low achieving schools and teachers. Descriptive analysis and one-way ANOVA were used to examine whether mean fidelity scores differed for the three different achievement groups. Additional information on methodology can be found in Chapter 6, Section 7.

Tables 2.10 and 2.11 summarizes the matrix indicators, and the criteria for meeting school- and program-level fidelity. Depending on indicator, the lowest unit of analysis was either a teacher, module, or school. The fidelity analysis produced a school-level fidelity score for each of the indicators. For the Key Component 1, 3, and 4 indicators, program-level fidelity was met if 75% of schools met fidelity. For Key Component 2 indicators, program-level fidelity was met if 50% of schools met fidelity.

Table 2.11

Summary of Fidelity Matrix Indicators and the Criteria for Meeting School- and Program-Level Fidelity

Key component	Indicator	Criterion for meeting fidelity at school level	Criterion for meeting fidelity at program level
Key Component 4: Leadership Support at Different Levels	Frequency of coach/teacher leader monthly meetings	Teacher leaders had at least 9 planning / progress calls with coaches in school year	75% of schools met fidelity
	Administrator attendance at quarterly in-person administrator meetings	School administrator participated in at least 2 out of 3 in-person meetings	75% of schools met fidelity
	Teacher leader attendance at quarterly in-person teacher leader meetings	Teacher leader participated in at least 2 out of 3 in-person meeting	75% of schools met fidelity
	Principal mini-task observation	75% of teacher survey respondents reported having their LDC instruction observed by a school administrator	75% of schools met fidelity

Student Outcomes: Matching and Intervention Exposure

Here we describe (1) our approach to selecting matched schools and students for our quasi-experimental design analyses estimating the effect of LDC on the New York State ELA assessment scores, and (2) our approach for modeling students' exposure to LDC and non-LDC instruction in core content classes.

For all our analyses, we used a two-step matching process to identify a reduced pool of comparison students and teachers at schools with similar characteristics to the schools in the intervention sample. To accomplish this, we first identified up to five of the most similar comparison schools for each intervention school based on a Euclidian distance measure, by using the nearest neighbor analysis option in SPSS 24.0 (see Fix & Hodges, 1951; Wang et al., 2007). The variables used in this process were the percentage of students eligible for free or reduced-price lunch, the percentage of Black students, mean baseline student achievement in ELA, mean baseline student achievement in mathematics, the average attendance rate of teachers, the average years of teaching experience of teachers, and the school grade span where feasible. We generally used all five identified comparison schools to establish the potential matching pool, but for selected LDC schools we only used four of the initial five matches. Once the pool of comparison schools was identified, their students and teachers were also identified, and student-level matching was conducted so that the resulting sample would resemble the type of sample one would expect to obtain through random assignment.

The student-level matching technique we employed was coarsened exact matching (CEM) (Iacus et al., 2011). CEM is a flexible matching approach with many favorable properties and allows the researcher to specify the precise conditions under which students are matched. For categorical variables, such as race/ethnicity or poverty status, this can entail exact matching, while for continuous measures, such as baseline individual student achievement and aggregate class-level achievement, cut-points for matching can be specified. With this approach we were able to set precise cut-points on the most important baseline indicators, such as baseline academic achievement, to ensure that where possible every treatment student was matched with a suitable comparison. Student matching variables we used in CEM included Hispanic, Black, poverty status, female, English language proficiency (English language learner), special education status, mean baseline achievement in mathematics and ELA, and grade level.

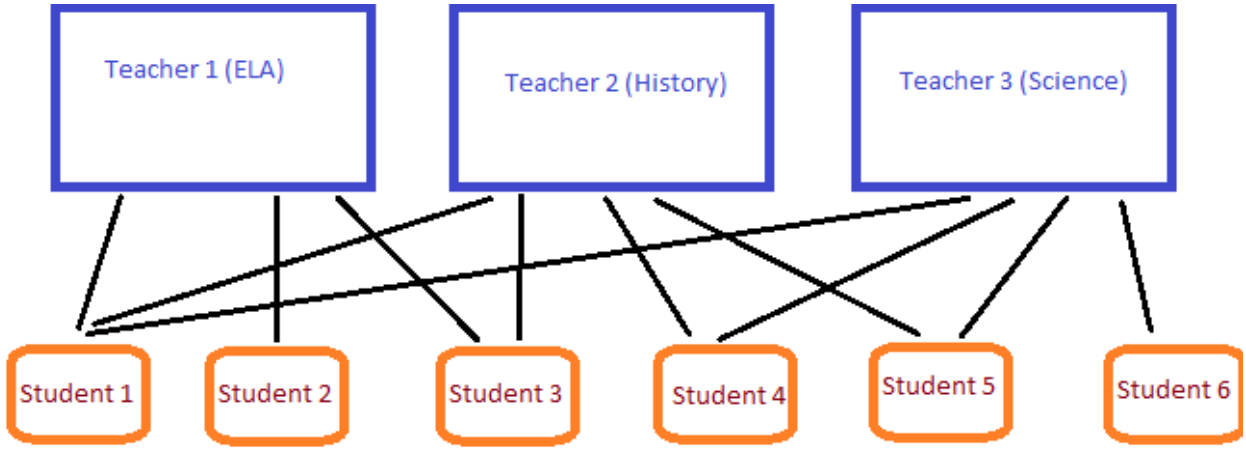
During matching we also included a few variables capturing information on the teachers and peers to which students were exposed. These variables included mean prior ELA achievement of the student's peers in their core content classes, and the average years of teaching experience of student's core content teachers.

The typical structure of course taking at the middle school level involves students potentially being exposed to multiple teachers, with each responsible for a different core content class. Specifically, middle school students in the study had exposure opportunities across three content areas (ELA, social studies/history, and science) taught by intervention teachers. As a result, students were not necessarily nested under individual teachers, but instead were likely to have connections to multiple teachers in the available time period prior to each testing outcome (students at the elementary school level were also sometimes exposed to multiple teachers but to a lesser extent). Therefore, LDC effects were estimated using an extension of the standard multilevel modeling framework known as multiple membership multiple classification (MMMC) models (Browne et al., 2001).

These models can account for complex classification structures, such as the LDC context, in which students are nested within schools but are also members of multiple classes led by different teachers who may or may not be implementing LDC. MMMC has the flexibility to account for this type of complex nesting structure in which students are hierarchically nested under schools but may have one-to-many relationships with teachers. There are three classification levels in the models we employ: students, teachers, and schools. In the MMMC modeling approach, each observation at the lowest level represents one student. Figure 2.1 shows how students can be exposed to teachers in different content areas, who may or may not be participating in LDC. Our MMMC modeling approach can account for this complicated structure.

Figure 2.1

Variation in Student Exposure to Teachers



In the MMMC modeling approach, each observation at the lowest level represents one student. The weight each teacher receives with respect to each student is dependent on the student's exposure to their teachers in each of the three core content areas. The total student exposure adds to a unity (i.e., a possible total exposure of 1) across their courses in the three content areas in a given school year. While this general weighting approach applies to both elementary and middle schools, the course structure of the datasets required us to use different weighting procedures in elementary and middle school.

In both the elementary and middle school datasets, students were linked to teachers through statewide course identifiers and accompanying beginning and ending dates specifying the time each student was enrolled in a given course under a specified teacher. Students could potentially have data records connected to multiple teachers covering varying time periods in the same course. For each of the three core content courses we then collapsed the links into a single measure of the days of potential content exposure preceding the assessment period. The

codes aligning with the three core content areas of interest for our study were based on the School Codes for Exchange of Data (SCED) code handbook. In elementary school, in the event that a student was exposed to more than one teacher, each content area was given equal weight in distributing teacher/student exposure. For example, if a student was enrolled for both ELA and social studies/history under one teacher, then that teacher was coded as .67 for having contributed to two thirds of the students' core curriculum exposure. If the same student enrolled in science with a different teacher than the one who was linked to their course marks in ELA and social studies/history, then that science teacher would have been coded as .33 and all other teachers in the sample would have been coded as zero. This would then result in the student's exposure adding to a unity (1).

In middle school, students' exposure to teachers at the course level in the three core content areas was coded in the same manner as in the elementary grades based on enrolled time preceding the assessment period. A difference in our middle school coding process was that we did not force each core content area into equal weighting. Instead each core content area exposure contributed to a core content area total sum which formed the basis from which the weights were proportioned. Most commonly a student had equivalent days of core instruction exposure in each the three content areas (often 215 days in each content area). In that scenario, if a student had exposure to three different teachers, then each teacher would contribute one third (.33) of the overall core curriculum exposure and all other teachers in the sample would be coded as zero. However, in addition to the typical core science course, extra core science courses were also included in the LDC analysis (for example a Grade 8 student taking biology), which made it possible then for a student to accumulate more units in science than in the other two content areas. The weighting in middle school was always distributed as a proportion of the total exposure days in the three content areas. Therefore, if a student accumulated 300 science days (across two courses), two hundred social studies days, and two hundred ELA days, the base number of instruction days would be 700 days. If, using that same scenario, the same teacher taught both the typical core and biology courses then that teacher would contribute three-sevenths (.43) of the overall core curriculum exposure with the social studies and science teachers contributing two-sevenths (.285) each, again resulting in the student's exposure adding to a unity (1). Tabular versions of the above examples can be seen in Appendix H.

For this study, we modeled the treatment intervention variable as a fixed effect at the student level in two different ways. The first dosage dependent approach takes into account the students' level of exposure to the intervention teachers. In this approach, the treatment was structured as a continuous response variable, coded as zero for comparison students and coded as a positive value for treated students, albeit never exceeding one. The positive value assigned to treated students in the dosage-dependent approach was simply the sum of the intervention teacher weights linked to the treated student. The second approach was dosage independent and classified any student exposed to an intervention teacher via at least one

course as a treated individual. In this approach the treatment variable was dichotomous (coded as one for treated students and zero for comparison students).

Student Outcomes: Analysis Approaches

As with other multilevel models, MMMC accounts for the non-independence of observations within cluster by adjusting the inferences on parameter estimates for the correlations between responses in a cluster. This modeling approach, however, becomes computationally cumbersome using traditional frequentist estimation methods. As recommended by Browne and colleagues (2001), to address this issue we employed Bayesian methods using Markov chain Monte Carlo (MCMC) techniques. Multilevel models incorporate demographic and achievement variables used in the matching design as covariates, making the findings "double robust" in that characteristics can be controlled for in both matching and outcomes analysis stages. Student demographic and baseline achievement variables that were used in the matching process were also included as covariates in the MMMC model. The full specifications for both models can be found in Appendix H.

In Chapter 7, we report on both the primary and supplementary analyses of the impact of LDC. Primary analyses focus on impacts after 2 years of teacher participation in LDC (for both Cohorts 1 and 2), and impacts after 3 years of teacher participation in LDC (for Cohort 1 only). Data from both cohorts was pooled for the primary analyses measuring impact after 2 years of implementation to increase statistical power and to produce more precise impact estimates. For the pooled analyses, the outcome year for Cohort 1 was spring 2018 and for Cohort 2 was spring 2019. To maximize the sample, we also conducted a primary analysis pooling schools, teachers, and students across both cohorts (Cohort 1 and Cohort 2) and school levels (elementary and middle). For this, we assumed that being exposed to LDC in all core content areas at the middle school level was equivalent to being exposed to a single teacher implementing LDC at the elementary level.

The other primary analysis reported on in Chapter 7 examines the impact of LDC as implemented by Cohort 1 teachers with 3 years of LDC experience on student ELA scores in spring 2019. This analysis focuses exclusively on middle school students due to the lack of achievement scores for elementary school students in the 2015–2016 baseline year. We also report supplementary analyses examining (1) the impact of Cohort 2 teachers with 2 years of LDC experience (these groups of elementary and middle school teachers are sub-samples of the pooled group of teachers in our primary analyses); and (2) the impact of LDC on subgroups of students broken down by whether they were exposed to LDC in the prior year, and how much LDC instruction they were exposed to in the outcome year. Where sample allowed, we also conducted analyses examining the impact of teachers who joined existing LDC PLCs in later years.

3.0 Survey Analysis

In this chapter we present the survey results. First, we summarize teachers' responses. We then summarize the teacher leaders' responses, followed by the administrators' responses. Within each of these sections, we organize results by the following domains as specified in the logic model: LDC participation; professional learning community and teacher collaboration; LDC training and support; LDC module implementation; leadership support; impact; and issues of scale-up and sustainability facilitators and barriers. After this we summarize the open-ended responses regarding supports for implementation of LDC. Then we present an exploratory longitudinal analysis of perceived impacts of LDC by teachers who submitted surveys in both 2018 and 2019. We end with a summary of results.

We use acronyms to identify which participants answered specific questions for each domain. We preface teacher items with "T," teacher leader with "TL," and administrator questions with "A." For example, LDC Participation (T1–4) indicates that teacher survey items 1–4 are used to provide information on LDC participation. Survey questions and descriptive results are presented in full in Appendix A for teachers, Appendix B for teacher leaders, and Appendix C for administrators.

3.1 Teacher Survey Results

As noted earlier, 206 teachers spanning 35 schools completed the survey. Among the teachers who completed a survey, the largest proportion taught an elementary school grade while the smallest proportion taught at the 6–12 school level. More specifically, 42% of teachers taught in 11 elementary schools, 19% in eight K–8 schools, 27% in 12 middle schools, and 13% in four grade 6–12 school (see Table 3.1). When examining participation by cohort, 64 (31%) of the teachers were from Cohort 1 and 142 (69%) were from Cohort 2.

Among the 206 teachers who completed the survey, 103 reported teaching at the elementary level, and 103 reported teaching at the secondary level. The secondary teachers reported teaching one to fourteen classes (Mean = 4.30). In addition, the secondary teachers reported that they used LDC materials in zero to eight classes (Mean = 2.54). Among secondary teachers, LDC was most commonly implemented in ELA (42%), social studies (36%), and science (15%), with a handful of teachers implementing in other subject areas such as mathematics (4%), the arts (4%), and Spanish (2%) (see Figure 3.1).

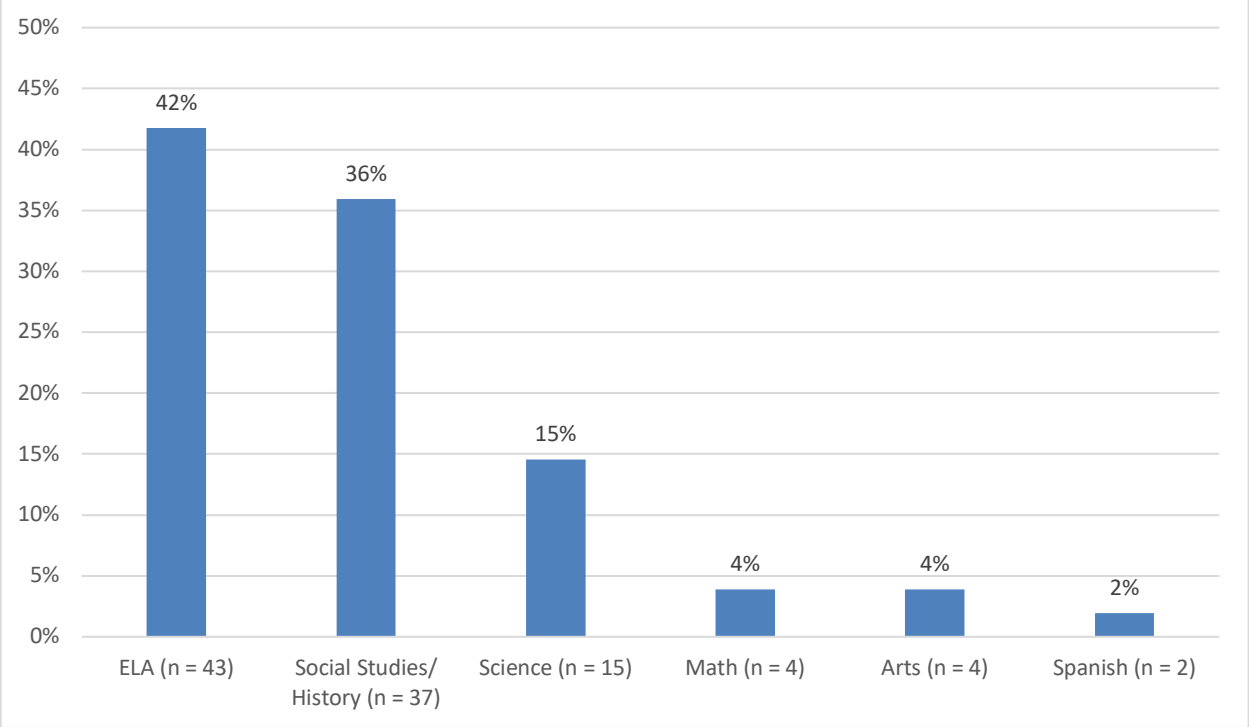
Table 3.1

Number of Schools and Teachers Completing the Survey in 2017–2018

Cohort/start year	Elementary	K–8	Middle	6–12	**Total**
Number of schools	**11**	**8**	**12**	**4**	**35**
Number of teachers					
In Cohort 1 schools and started 2016–2017	6	6	9	7	**28**
In Cohort 1 schools and started 2017–2018	2	0	10	2	**14**
In Cohort 1 schools and started 2018–2019	2	3	9	8	**22**
In Cohort 2 schools and started 2017–2018	34	18	16	8	**76**
In Cohort 2 schools and started 2018–2019	42	12	11	1	**66**
Total	**86**	**39**	**55**	**26**	**206**

Figure 3.1

Secondary Teachers' Content Area Implementations



LDC Participation (T1-T4)

Of the responding teachers, 40% reported that 2018−2019 was their first year of implementing LDC, with the remaining 60% having one or 2 years of previous experience. Among those who were returning to LDC, a great deal of variation was reported about their module implementation prior to the 2018−2019 school year. More specifically, teachers reported implementing at least two modules (Mean = 2.69, Range = 0−15) and about three mini-tasks outside of the context of a module (Mean = 3.39, Range = 0−20) prior to 2018−2019.

All 18 of the teachers who did not participate in a PLC did report using LDC tools in their instructional planning or classroom instruction during the 2018−2019 school year. Of the 17 teachers who provided further information, the most common activities involved using CoreTools to access existing modules or mini-tasks (*n* = 13) and designing modules or mini tasks (*n* = 10). Others stated that they were given modules or mini-tasks by other teachers in their school (*n* = 7) or that they used the LDC online courses (*n* = 6). Finally, one teacher selected other and one additional teacher skipped the question.

Professional Learning Community and Teacher Collaboration (T5−T9)

The vast majority of teachers (90%) participated in a PLC that at least partly focused on implementing LDC. Most of these teachers reported that their PLC met once a week or more (55%) or every other week (21%). Only 24% of these teachers reported that their PLC met once a month or less. The most common reasons stated for not meeting every week included other priorities that competed with LDC (58.3%), PLC time not being protected (21%), and a failure by the school administrator to prioritize LDC (14%), or other reasons not already listed (25%).[2] Other reasons listed primarily focused on scheduling or indicated that the timing of meetings was agreed upon by members of the PLC. The frequency of conversations about LDC that reportedly took place outside of the PLC meetings typically ranged from every other week to twice a week or more (70%). Two-thirds of respondents (66%) stated that PLC meetings typically lasted 45−59 minutes with another 16% stating that they lasted 60 minutes or more.

LDC Training and Support (T10−T13)

More than 80% of the teachers who responded stated that their PLC was moderately to very effective in all aspects listed on the survey. This included creating a comfortable working environment (92%), fostering an environment for sharing instructional plans (91%), helping teachers improve their LDC instructional plans (86%), and allowing space for the sharing of student work (90%).

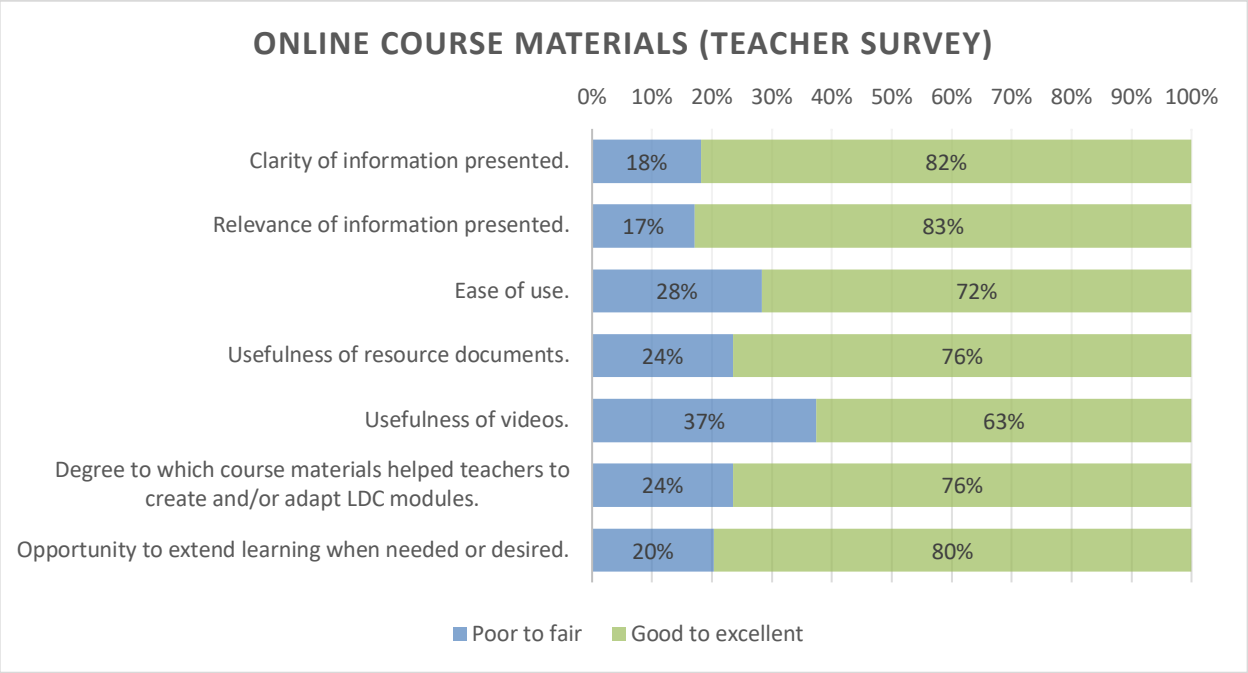
Teachers were asked their opinions of the online course materials in the LEARN tab in LDC CoreTools (see Figure 3.2). Overall, more than 60% of the teachers rated the materials as good to excellent on each aspect. Teachers were particularly enthusiastic about the clarity and

[2] Three additional teachers checked "other" but indicated that it was not applicable (*n* = 1) or that they did actually meet each week (*n* = 2).

relevance of the information provided, as well as the opportunity to extend their learning, with about four out of five teachers rating these aspects as good or excellent. On the lower end, about one-third of teachers gave a rating of poor or fair concerning the usefulness of the videos.

Figure 3.2

Teacher Perceptions of Online Course Materials That LDC Coaches Used or Directed Their Teachers to Use (n = 187).



Teachers were also asked to report on the supports that they received from their LDC coaches. When asked in general, almost all of the teachers reported that they were able to get feedback and support from their LDC coaches (93%) either through CoreTools or in the PLC, including the receipt of written feedback in a timely manner (96%) through CoreTools. Despite this, when asked to rate the usefulness of the coaching, seven teachers did indicate that they did not receive any written feedback from their coach within LDC CoreTools, 36 reported that they did not have any Zoom coaching sessions, and 36 indicated that did not communicate with their coach via email or phone. Of those who did receive the supports, most (79% to 82%) reported that they found it moderately or very helpful (see Figure 3.3). We also had 62 teachers indicate that they received other supports, with most of those who provided an additional comment indicating that they had in person meetings with their LDC coach.[3]

[3] Seven additional teachers provided a response for the other option, but their written comments focused on one-on-one conference calls via Zoom or phone (option 2), email (option 3), or stated not applicable.

Figure 3.3

Teacher Perceptions of the Different Types of LDC Coaching Supports

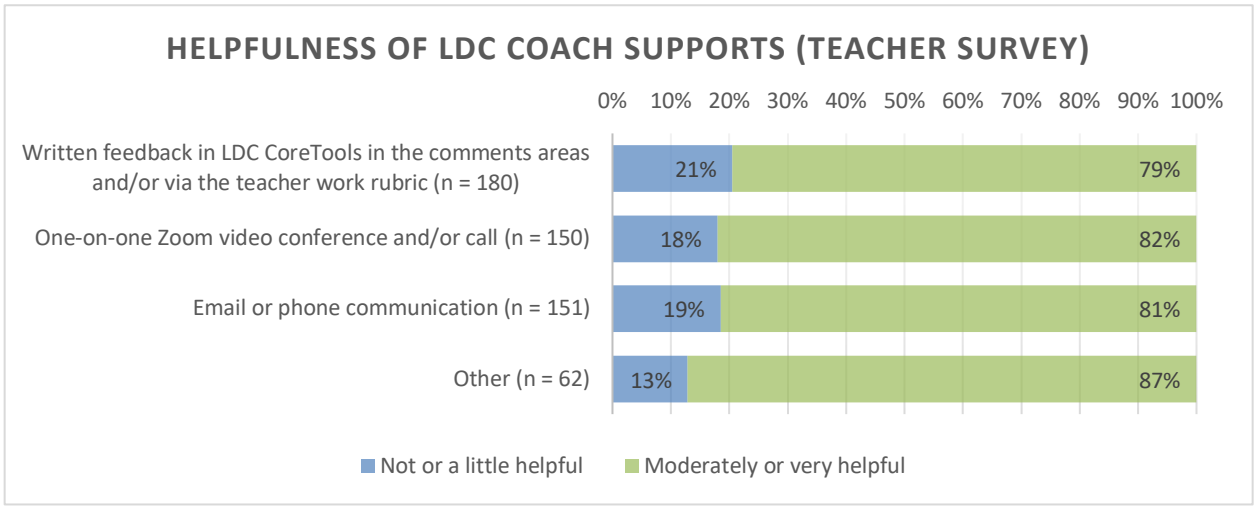
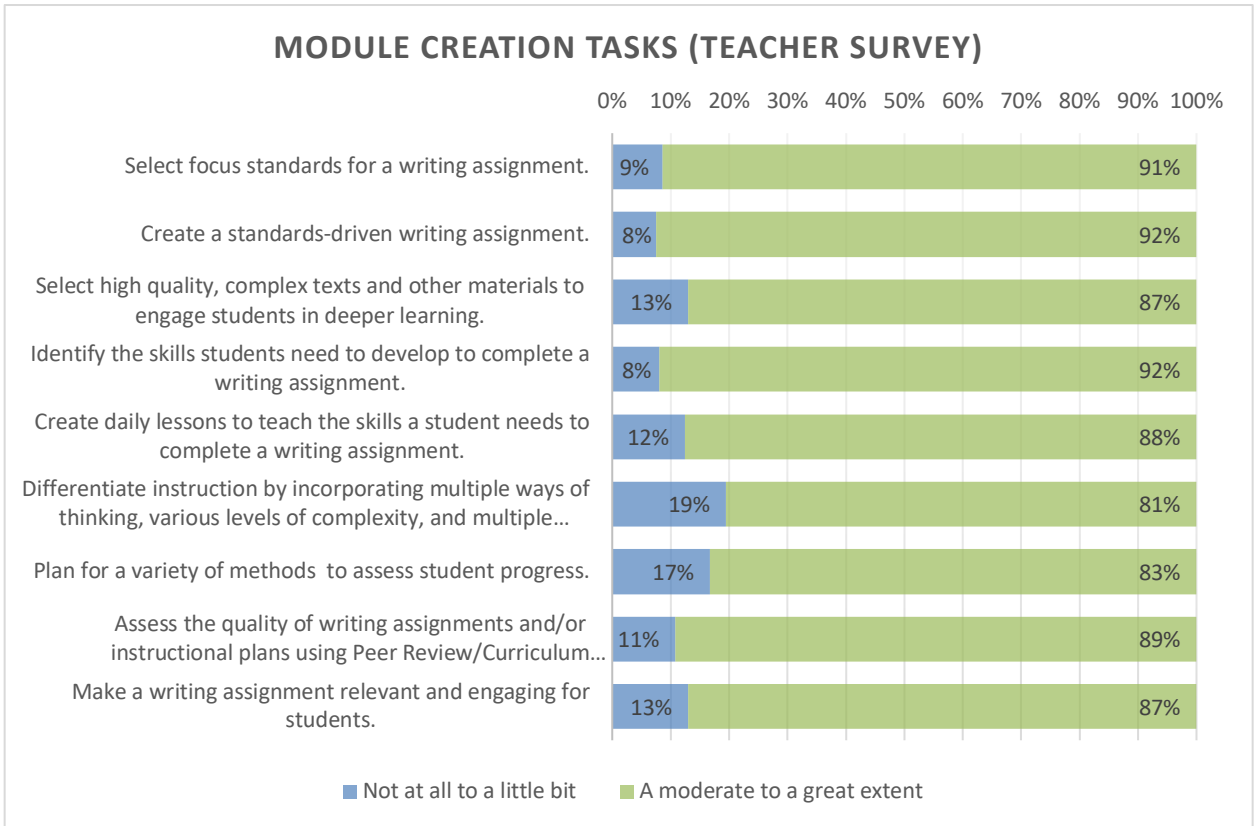


Figure 3.4.

Extent to Which Teachers Completed Various Module Creation Tasks (n = 185)



Module Creation (T14–T17)

Teachers generally adapted (Mean 2.18, Range 0−16) more modules than they created (Mean = 1.43, Range = 0−8). New modules were most likely to be created by two or more teachers (58%), although some did report doing the work with their PLC as a whole (21%) or on their own (36%). In addition, six teachers noted that they only adapted modules at their PLC, three noted that it varies between individual and group work, and two noted that module development is only done by certain people. Most teachers (81% to 92%) also reported that they were able to accomplish most of the module creation tasks to a moderate or great extent. As can be seen in Figure 3.4, teachers generally felt most successful (a moderate extent to a great extent) in regards to selecting standards and creating standards-driven writing assignments, and in identifying the skills students need to develop to complete the writing assignment. The tasks that teachers reported doing the least (i.e., not at all or a little bit) included differentiating instruction and planning a variety of methods to assess student progress.

Classroom Implementation (T18–T26)

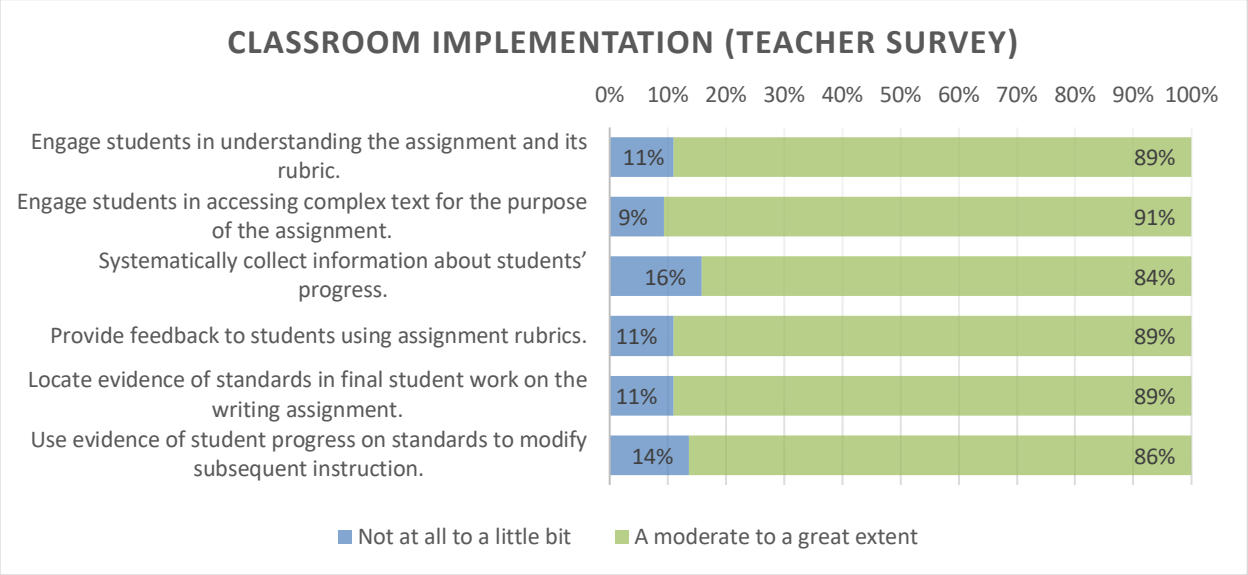
Teachers implemented more modules than stand-alone mini-tasks. More specifically, teachers reported implementing an average of about three modules (Mean = 2.75, Range = 0−15) during the school year, and four additional mini-tasks outside of the context of a module (*M* = 4.20, Range = 0−48). For 60% of the teachers this included implementing a "Find and Teach" module from CoreTools. Of those who completed this activity, about three-fourths reported adjusting the module (74%) and the remaining quarter (26%) reported implementing one of these modules without any changes.

Teachers were also asked to talk about later modules they created or adapted after completing the Find and Teach. In this case, 42% of teachers reported starting from a template in CoreTools, with the remaining 58% adapting an existing module that they found in the LDC Library. Furthermore, 87% of teachers reported that they had already implemented the module by the time they completed their survey. The remaining teachers were planning to implement later during the school year (6%), during the next school year (3%), or were not planning to implement at all (4%).

Finally, teachers were asked to report on what they were able to accomplish when teaching their LDC modules (see Figure 3.5). Overall, the vast majority of teachers (84% to 91%) reported accomplishing each of the activities listed to a moderate to great extent. The strongest opinions focused on accessing complex text (91%) as well as being able to engage students in understanding the assignment and its rubric, providing feedback using rubrics, and locating evidence of standards in student work (89%, respectively). The area where teachers seemed to have the most room to grow involved systematically collecting information about students' progress with three reporting that they did not do this at all and 26 reporting that they only accomplished this a little bit.

Figure 3.5

Activities Completed When Teaching LDC Modules (n = 183).



Module Peer Review (T27–T29)

Overall, the formal review process for modules seemed to be underutilized. First, only about one-quarter of the teachers (29%) who responded to the survey reported attending a peer review or curriculum alignment workshop during the 2018–2019 school year. Second, on average the teachers' submitted less than one module each for the LDC National Peer Review process. Despite this, the 89 teachers who rated their experience tended to find the process moderately to very helpful (63%), and only 4% found the process to be not helpful.

Impact on Teacher Practice and Learning (T30–T31)

Almost all respondents reported that their teaching skills improved during the 2018–2019 school year, and in most cases, this reflected moderate to a great deal of change (see Figure 3.6). The skills with the most ratings of a great deal included creating standards-driven writing assignments (46%), selecting focus standards for a writing assignment (45%), and identifying the skills students need to develop to complete a writing assignment (44%).

Teachers were also asked their perceptions of the impact of LDC using a 4-level agreement scale ranging from strongly disagree to strongly agree. As can be seen in Figure 3.7, the majority of teachers generally agreed or strongly agreed with the different impacts. More specifically, the vast majority of teachers agreed that LDC raised their expectations for students' writing (88%), and helped them learn how to incorporate writing assignments (86%). Furthermore, while 83% of teachers reported that they were now more likely to collaborate when designing instruction, only 66% agreed that they shared their LDC work with colleagues who were not in their LDC PLC.

Figure 3.6

Teacher Perceptions of the Impact of LDC on Their Teaching Practice and Learning (n = 183).

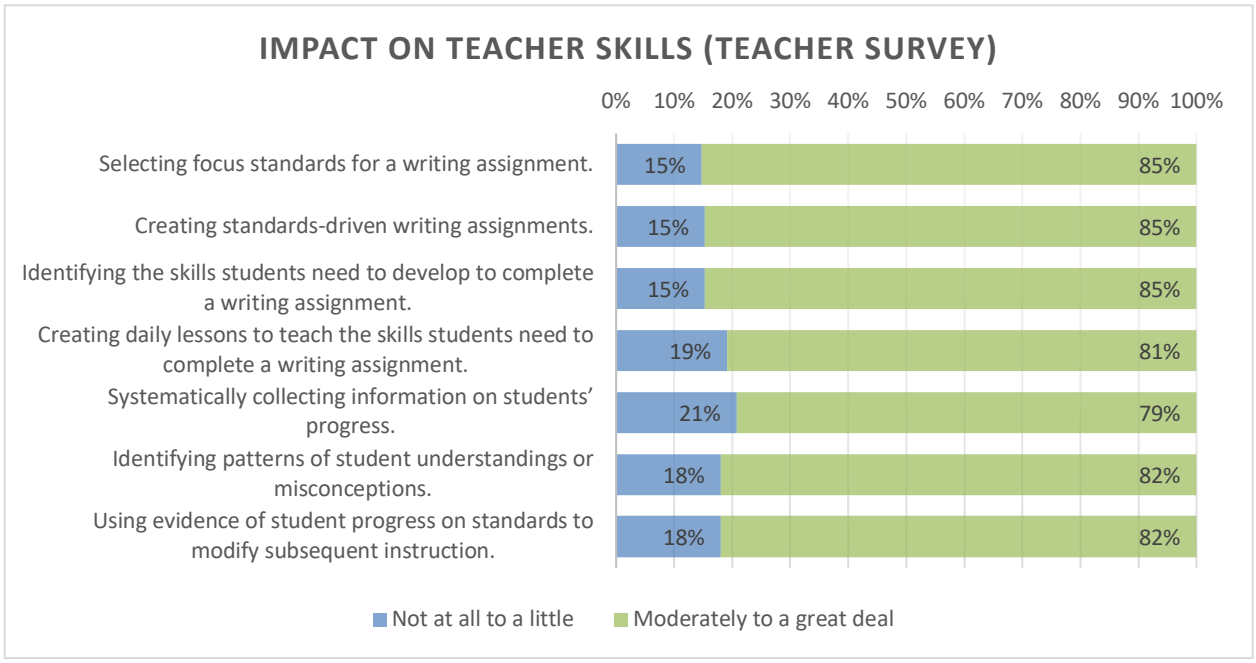
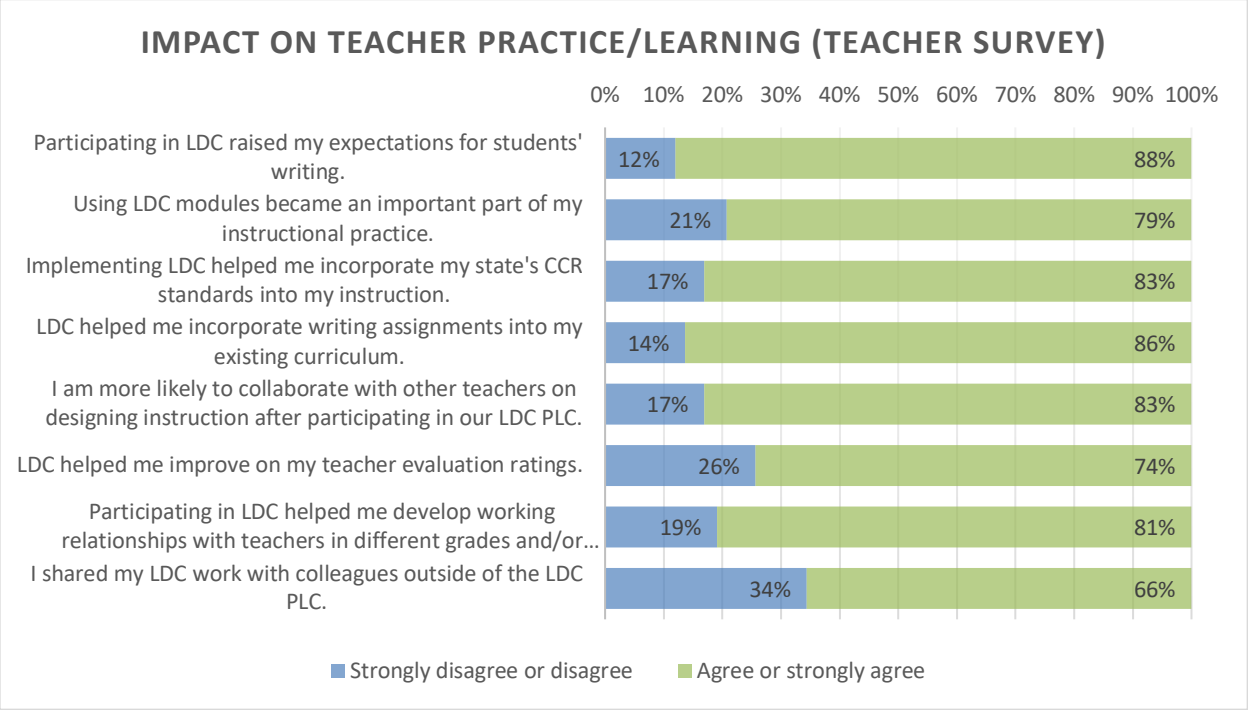


Figure 3.7

Teacher Perceptions of the Impact of LDC on Their Teaching Practice and Learning (n = 183)

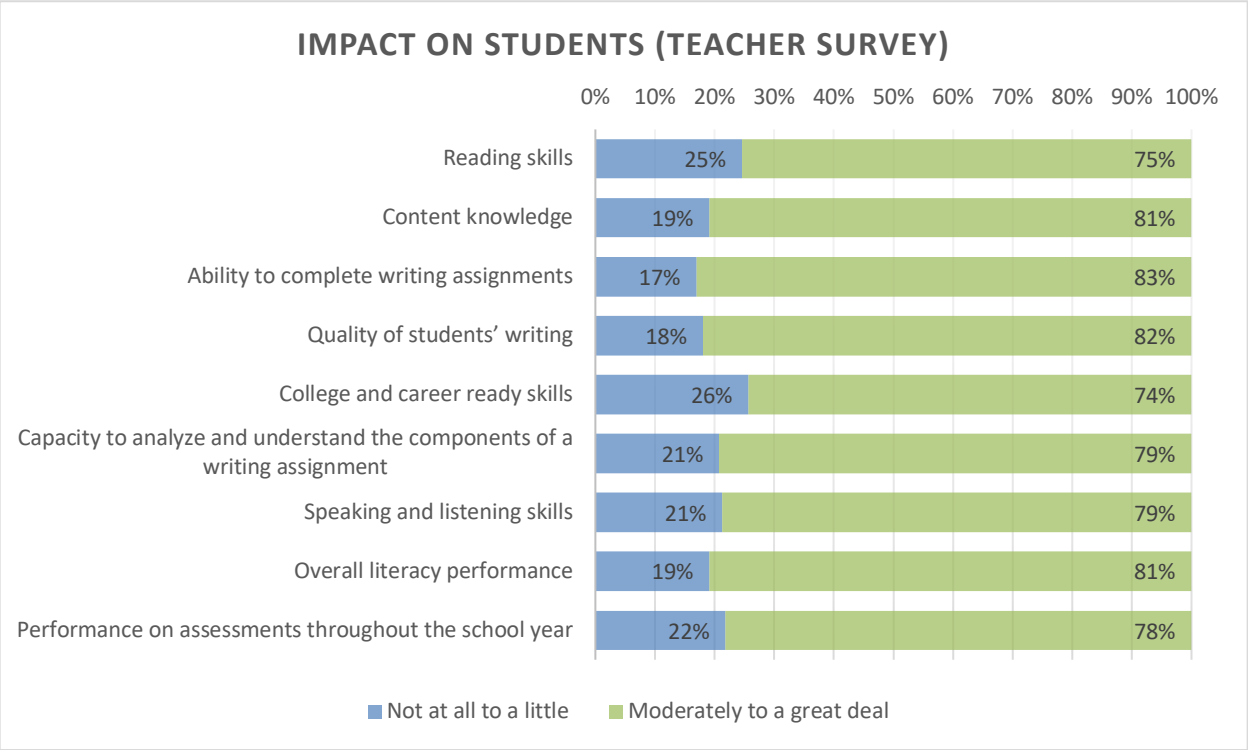


Impact on Student Learning (T32)

Teachers were asked about the impact of LDC on their students using a 4-level scale ranging from not at all to a great deal (see Figure 3.8). Overall, only a few teachers reported that their students received no positive effect in regards to any of the potential impacts listed (2% to 6%). The positive effects that teachers endorsed most strongly (i.e., rated as moderately or a great deal) focused on writing, the obtaining of content knowledge, and overall literacy performance. In contrast, teachers were more likely to say that their students only benefitted a little (19%, respectively) in regards to skills attainment (i.e., reading, college and career ready) and their ability to analyze and understand the components of a writing assignment.

Figure 3.8

Teacher Perceptions of the Impact of LDC on Students (n = 183)



Teacher Leader Support (T33)

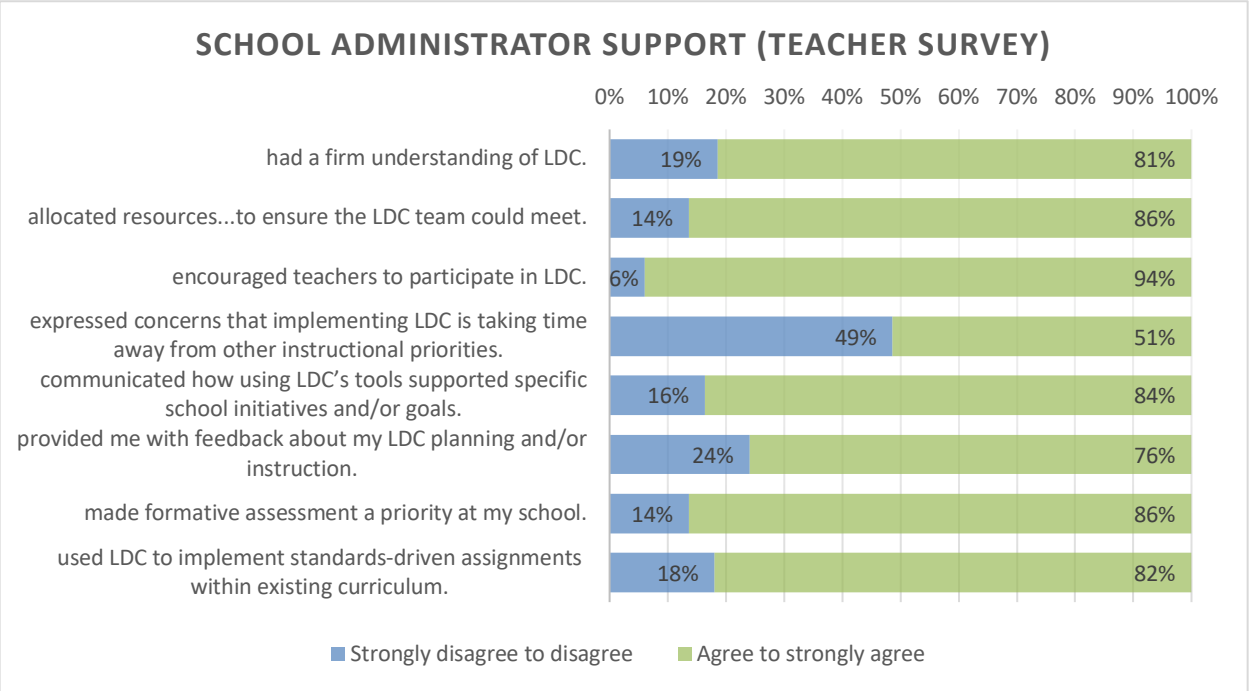
Teachers were asked to report on the support received from the teacher leaders in their respective PLCs. In this case, teacher opinions were overwhelmingly positive, with more than 90% agreeing with each of the five types of support listed, and more than half strongly agreeing. Furthermore, 55% of the teachers strongly agreed that their they were comfortable approaching their teacher leader when they had questions about LDC, and 51% respectively strongly agreed that their teacher leader supported the PLC and/or was effective in inviting teachers to join LDC. Finally, half of the teachers strongly agreed that their teacher leader helped to align LDC with their instructional goals and/or provided useful feedback on modules.

School Administrator Support (T34–T36)

According to teachers, administrators varied in regards to how much they were engaged with the PLC. More specifically, 26% reported that their administrator attended the PLC meetings about three quarters or more of the time, 16% reported that their administrator attended about half of the meetings, and 58% reported that their administrator attended about one-quarter or less of the time. In addition, 38% of the teachers reported that their administrator never observed them teach an LDC mini-task, 25% reported that they were observed once, and 38% reported being observed two or more times.

Figure 3.9

Teacher Perceptions of School Administrator Support (n = 183)



Finally, teachers were asked to rate the support LDC received from school administrators using a 4-level agreement scale ranging from strongly disagree to strongly agree (see Figure 3.9). Teachers generally agreed or strongly agreed that their school administrators supported LDC. For example, 94% indicated that their administrator encouraged teachers to participate in LDC, and 86% each indicated that their administrator allocated resources to ensure that the LDC team could meet and/or made formative assessment a priority at the school. About half of teachers also disagreed or strongly disagreed that their principal expressed concerns about LDC taking time away from other instructional priorities.

Teacher Leadership Role (T37)

Next teachers were asked to report on their own roles as LDC leaders at their schools. As can be seen in Figure 3.10, about two-thirds of the teachers agreed or strongly agreed with each statement. The most commonly reported role involved helping to set instructional goals for the LDC work at their school. Furthermore, while 68% of teachers agreed or strongly agreed that they were interested in learning more about LDC implementation at their school by facilitating with their coach and/or colleagues, 16% strongly disagreed with this statement.

Figure 3.10

Role of Teachers in the Leadership of LDC at Their School (n = 158)

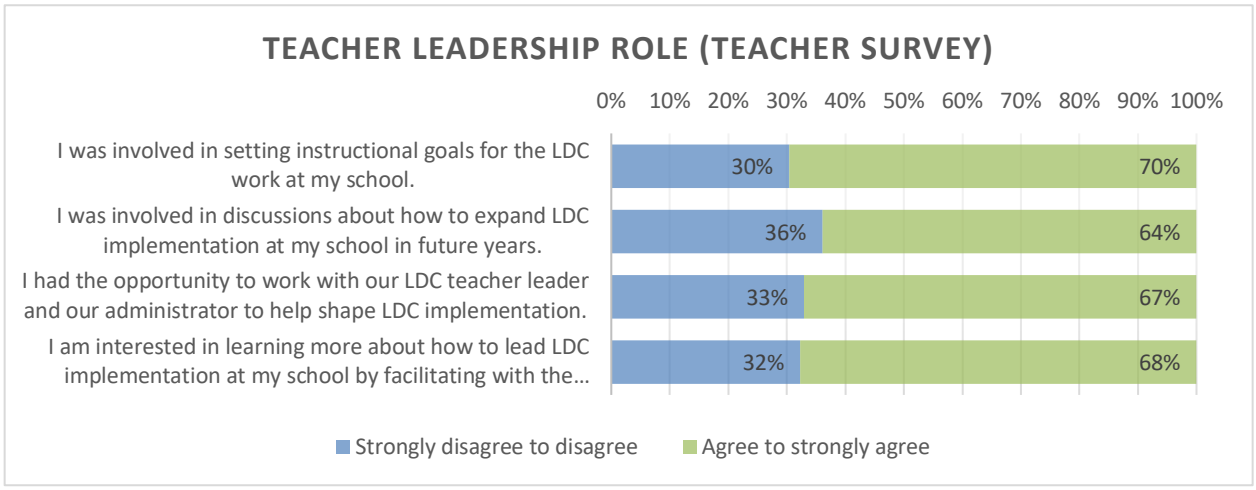
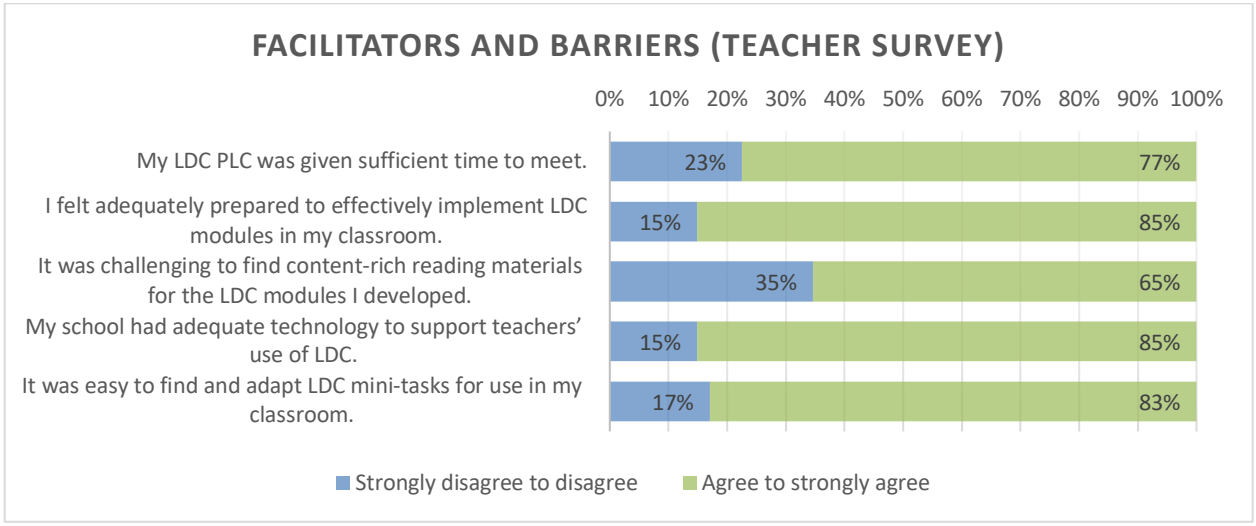


Figure 3.11

Teacher perceptions of facilitators and barriers to LDC implementation (n = 182)



Facilitators and Barriers (T38)

Teachers were asked to rate their level of agreement with five potential facilitators or barriers to the implementation of LDC (see Figure 3.11). As would be hoped for, teachers generally showed positive agreement. More specifically, more than three quarters of the teachers indicated that they had sufficient time to meet in their PLC, that they felt adequately prepared to implement modules, had adequate technology to support the use of LDC, and had an easy time finding and adapting mini-tasks to implement. Finally, 21% of teachers strongly

agreed and 44% agreed that it was challenging to find content-rich reading materials to support their modules.

3.2 Teacher Leader Survey Results

In total, 30 teacher leaders spanning 25 schools completed the survey.

LDC Participation (TL1-TL2)

Only one of the 30 teacher leaders (3%) who responded to the survey reported that 2018−2019 was their first year of implementing LDC. The remaining teacher leaders (97%) all had one or 2 years of previous experience with the program. Among those who were returning to LDC, a great deal of variation was reported about implementation during the 2016−2017 and/or 2017−2018 school years. More specifically, teacher leaders reported implementing two to three modules (Mean = 2.68, Range = 0−6) and about four mini-tasks outside of the context of a module (Mean = 3.90, Range = 0−15).

Professional Learning Community and Teacher Collaboration (TL3−TL6)

Most of the teacher leaders reported that their PLC met every other week (37%) or once or more per week (40%). The most common reason stated for not meeting every week included PLC members having other priorities outside of LDC (61%) and PLC time not being protected (33%). A lot of variation was found concerning conversations outside of the PLC meetings, with 60% reporting that these took place every other week or more and 40% reporting that they took place once a month or less. Finally, more than two-thirds of respondents (70%) stated that PLC meetings typically lasted 45−59 minutes, with another 10% stating that they lasted 60−74 minutes.

Teacher Training and Support (TL7−TL12)

The vast majority of teacher leaders (87% to 93%) who responded stated that their PLC was moderately to very effective in all of the ways listed on the survey. This included creating a comfortable working environment, fostering an environment for sharing instructional plans, helping each other improve their LDC instructional plans, and sharing student work (see Figure 3.12).

Figure 3.12

Teacher Leader Perceptions About PLC Effectiveness (n = 30)

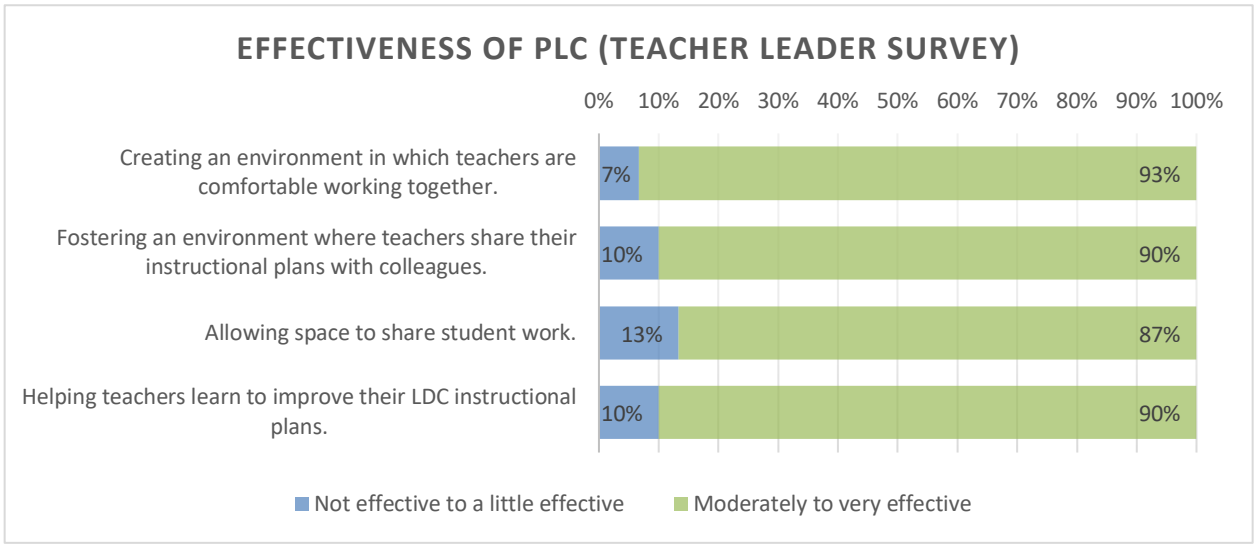
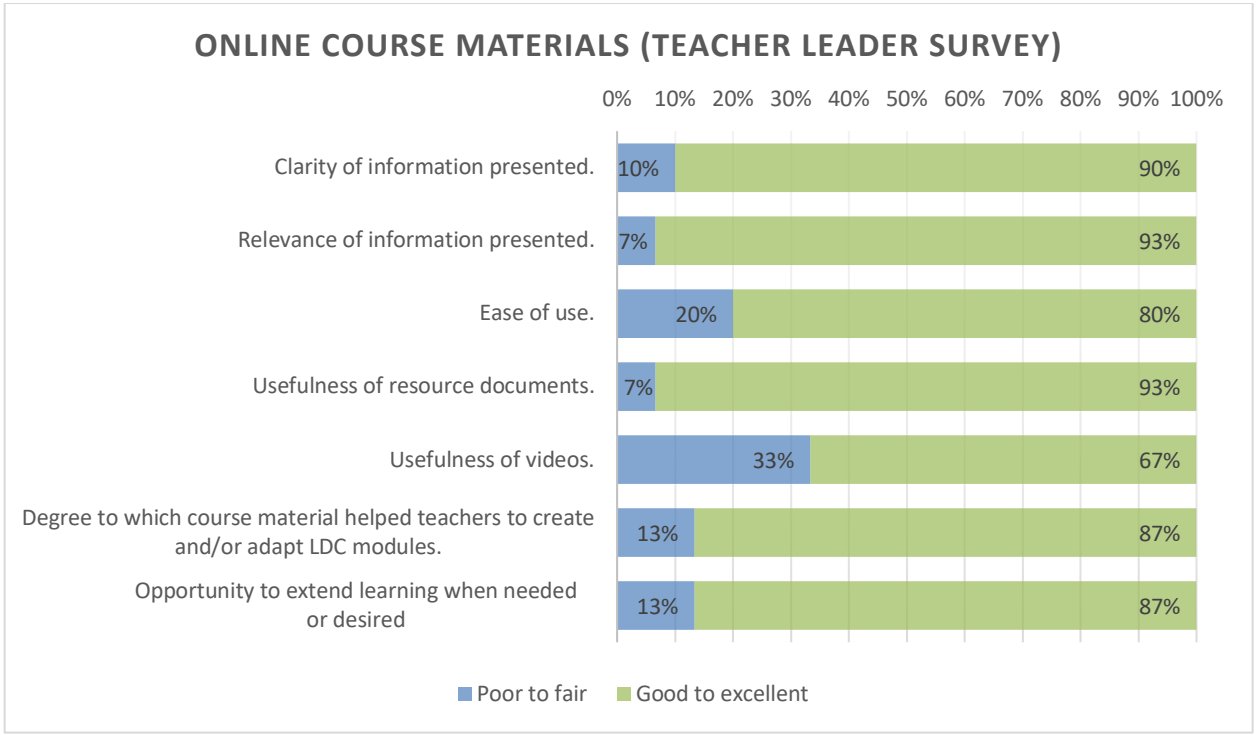


Figure 3.13

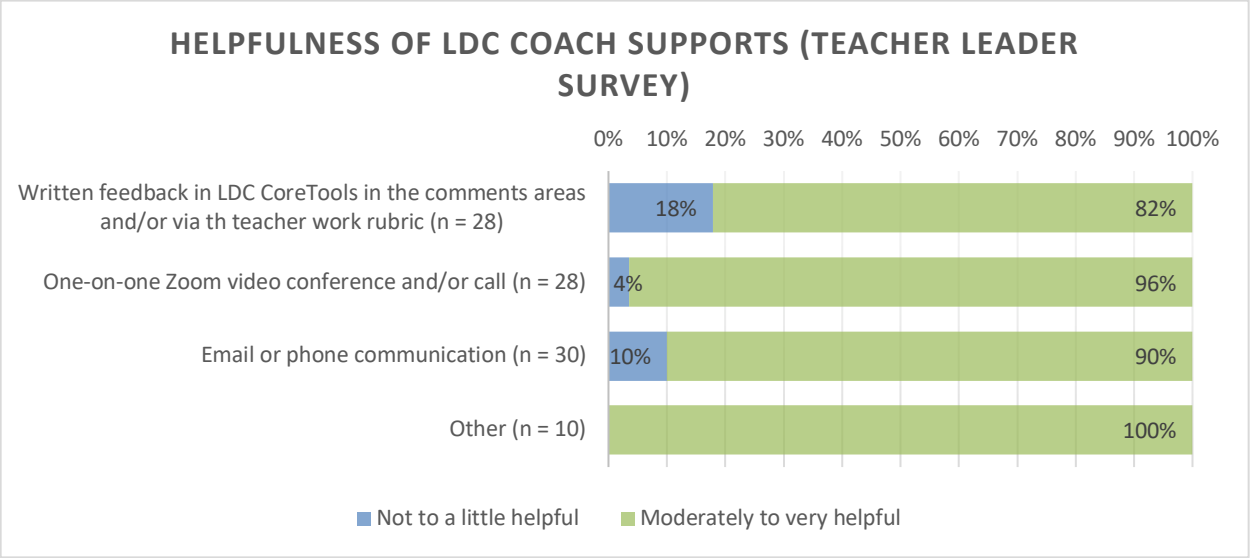
Teacher Leader Perceptions of the Online Course Materials in the LEARN Tab in LDC CoreTools (n = 30)



Teacher leaders were asked their opinions of the online course materials in the LEARN tab in LDC CoreTools (see Figure 3.13). Overall, more than two-thirds of the teacher leaders rated the materials as good to excellent. The most positive reactions were regarding the relevance of the information presented (93%), the usefulness of the resource documents (93%), and the clarity of the information presented (90%). The lowest ratings were for the usefulness of videos (67%) and the ease of use of the site (80%). Teacher leaders were also asked to report on the supports they received from their LDC coaches. When asked in general, almost all respondents said that they were able to get feedback and support from their LDC coach (97%) either through CoreTools or in the PLC, including the receipt of written feedback in a timely manner (97%) through CoreTools. Despite this, 7% reported that they did not receive written feedback in LDC CoreTools from their coach. Of those who did report receiving the different supports, views were positive with 82% or more of teacher leaders reporting them as moderately to very helpful (see Figure 3.14). These included written feedback, Zoom conferences, email or phone communication, or other sources of feedback.

Figure 3.14

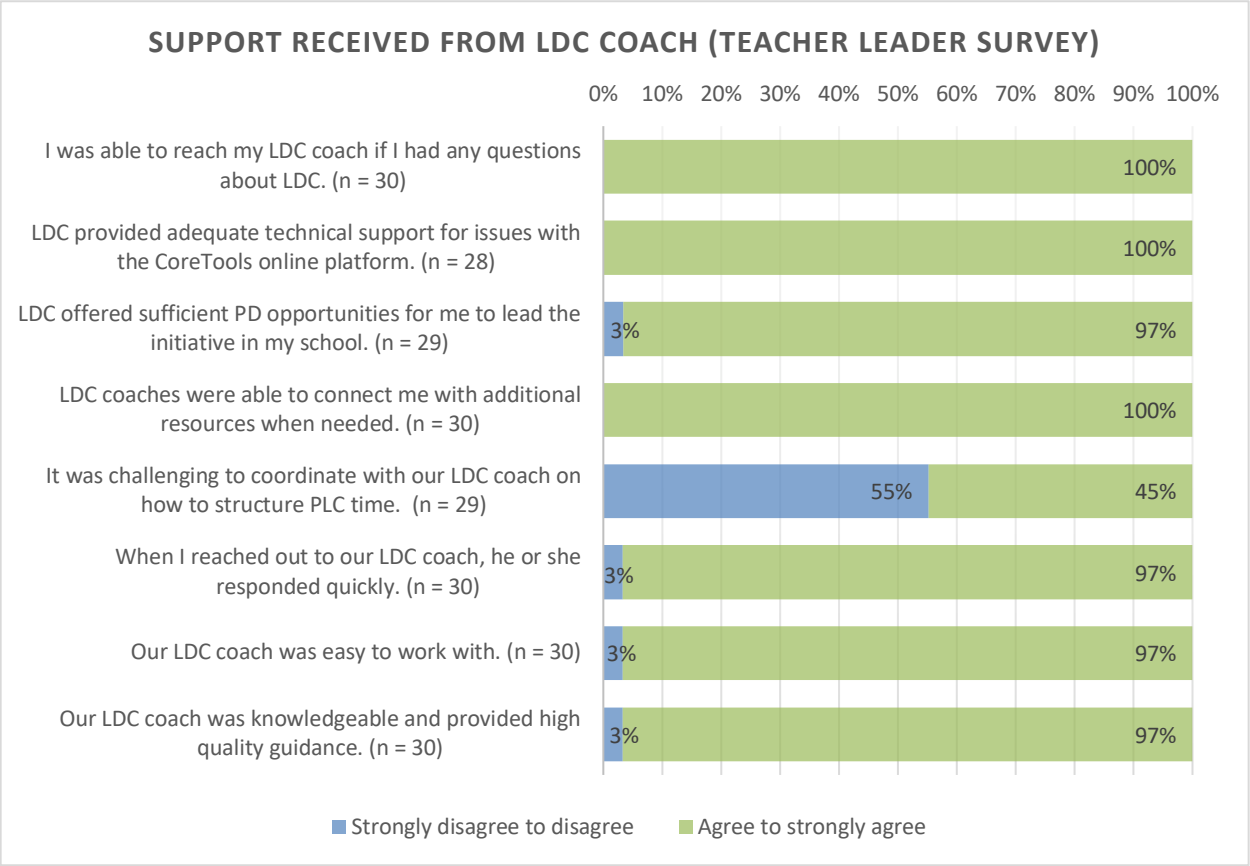
Teacher Leader Perceptions of the Different Types of LDC Coaching Supports



Finally, teacher leaders were asked seven positively oriented items and one negatively oriented item concerning the support they received from their LDC coach (see Figure 3.15). As would be hoped for, almost all teacher leaders (97% to 100%) agreed or strongly agreed to the positively oriented statements. In contrast, only 55% of teacher leaders disagreed or strongly disagreed that it was challenging to coordinate with their LDC coach on how to structure PLC time.

Figure 3.15

Teacher Leader Perceptions of the Support They Received from the LDC Coaches

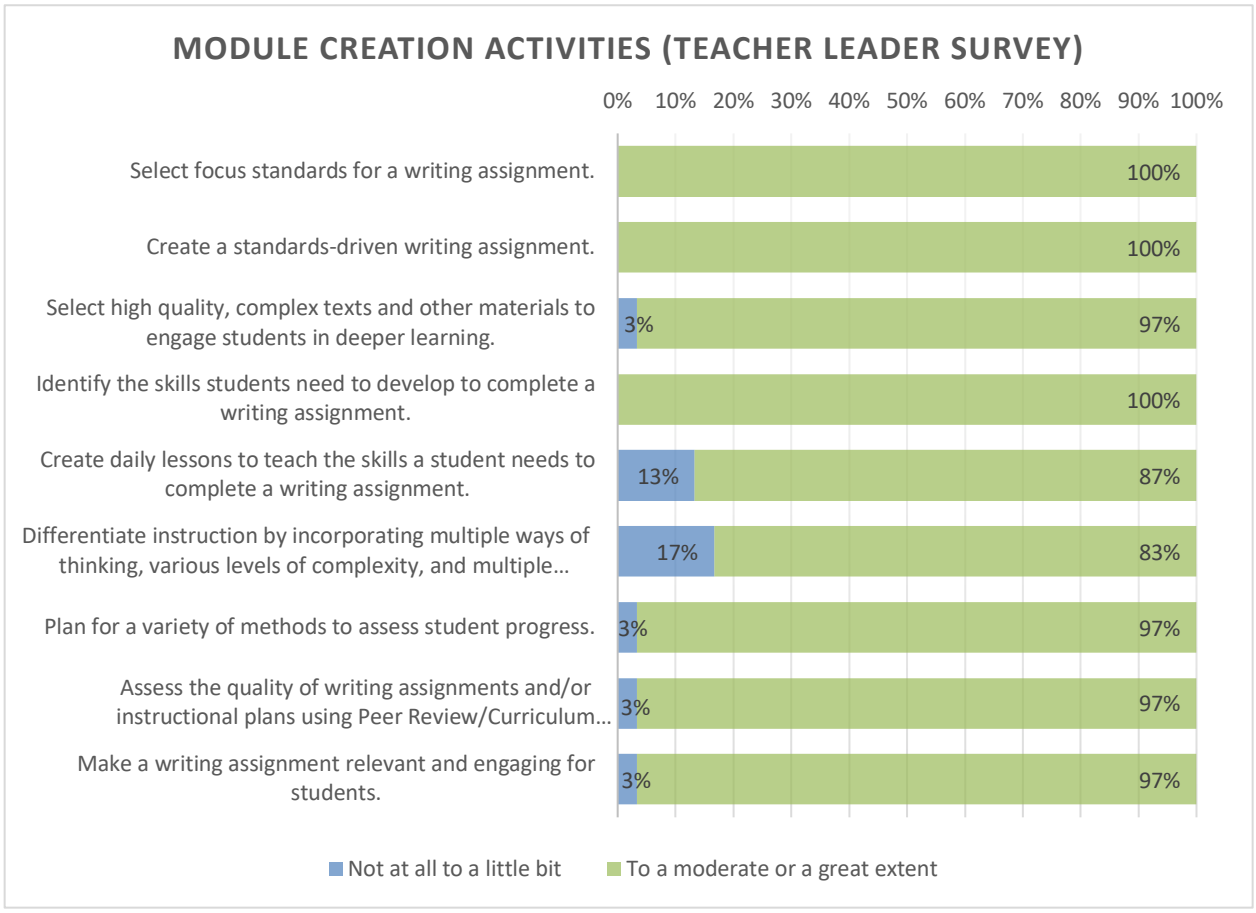


Module Creation (TL13–TL16)

Teacher leaders generally adapted twice as many modules (Mean = 4.10, Range = 0–15) as they created (Mean = 2.50, Range = 0–10). New modules were most likely to be created by teams of two or more teachers (67%), although many reported creating modules individually (47%) or in their PLC as a whole (27%). As can be seen in Figure 3.16, almost all teachers felt successful with regard to each of the module creation tasks. Furthermore, more than half of all respondents agreed to a great extent that they were able to select focus standards for a writing assignment, create a standards-driven writing assignment, and/or select high quality, complex texts, or other materials to engage students in deeper learning. Teacher leaders were a little bit less likely to be confident in their ability to differentiate instruction or to create daily lessons to teach the skills a student needs to complete a writing assignment.

Figure 3.16

Teacher Leader Reports on Module Creation Activities (n = 30)

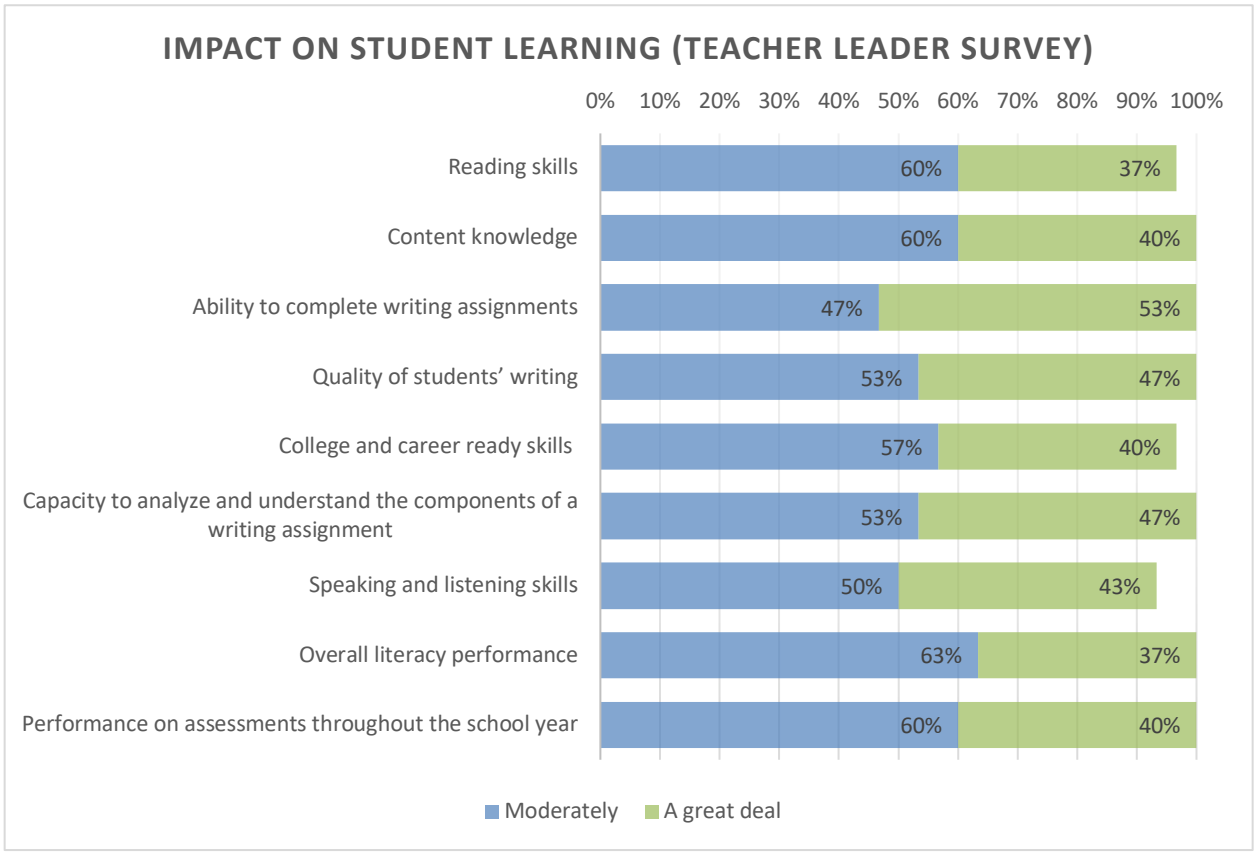


Impact on Student Learning (TL17)

Teacher leaders were asked about the impact of LDC on student learning using a 4-level scale ranging from not at all to a great deal (see Figure 3.17). Almost all teacher leaders felt that students benefitted from LDC in each of the ways listed on the survey. The only item on which anyone reported "not at all" included speaking and listening skills (*n* = 1). In addition, one teacher leader each reported that their students only benefited a little regarding their reading skills, college and career ready skills, and speaking and listening skills. Finally, 53% of the teacher leaders reported that there was a great deal of impact on their students' ability to complete writing assignments.

Figure 3.17

Teacher Leader Perceptions of the Impacts of LDC on Student Learning (n = 30)



School Administrator Support (TL18–TL19)

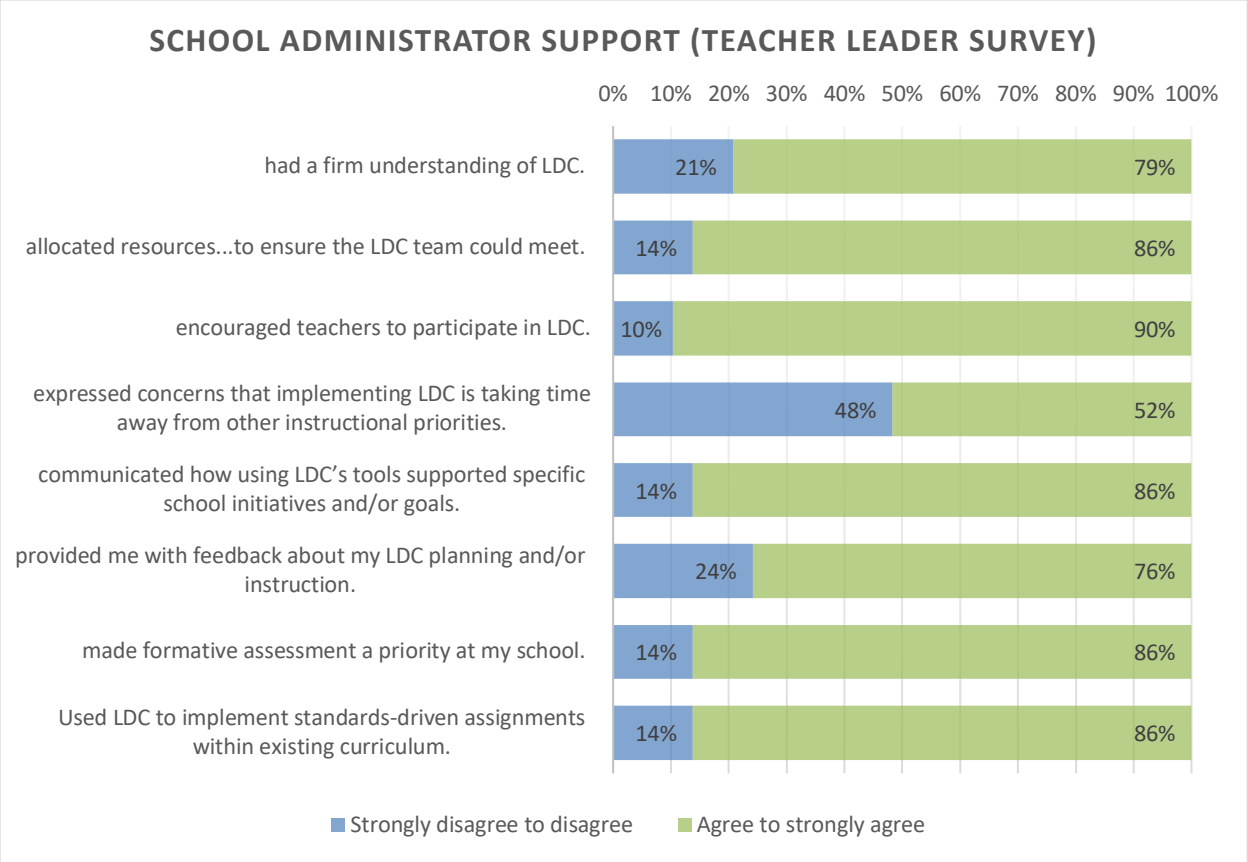
According to teacher leaders, administrators at many of the schools were engaged with their PLC. More specifically, 21% reported that their administrator attended the PLC meetings about three quarters or more of the time, 14% reported that their administrator attended about half of the meetings, and 66% reported that their administrator attended on quarter or less of the time.

Next, teacher leaders were asked to rate seven positively framed questions and one negatively framed question concerning the level of support that their school administrators provide to LDC (see Figure 3.18). Teacher leaders generally agreed or strongly agreed with each of the positively framed questions. For example, almost all respondents indicated that their administrator encouraged teachers to participate (90%), allocated resources to ensure the LDC team could meet (86%), communicated how LDC supports school initiatives/goals (86%), made formative assessment a priority (86%), and used LDC to implement standards-driven assignments (86%). Half of the teacher leaders (48%) also disagreed or strongly disagreed that

their administrator expressed concerns about LDC taking time away from other instructional priorities.

Figure 3.18

Teacher Leader Perceptions of School Administrator Support (n = 29)

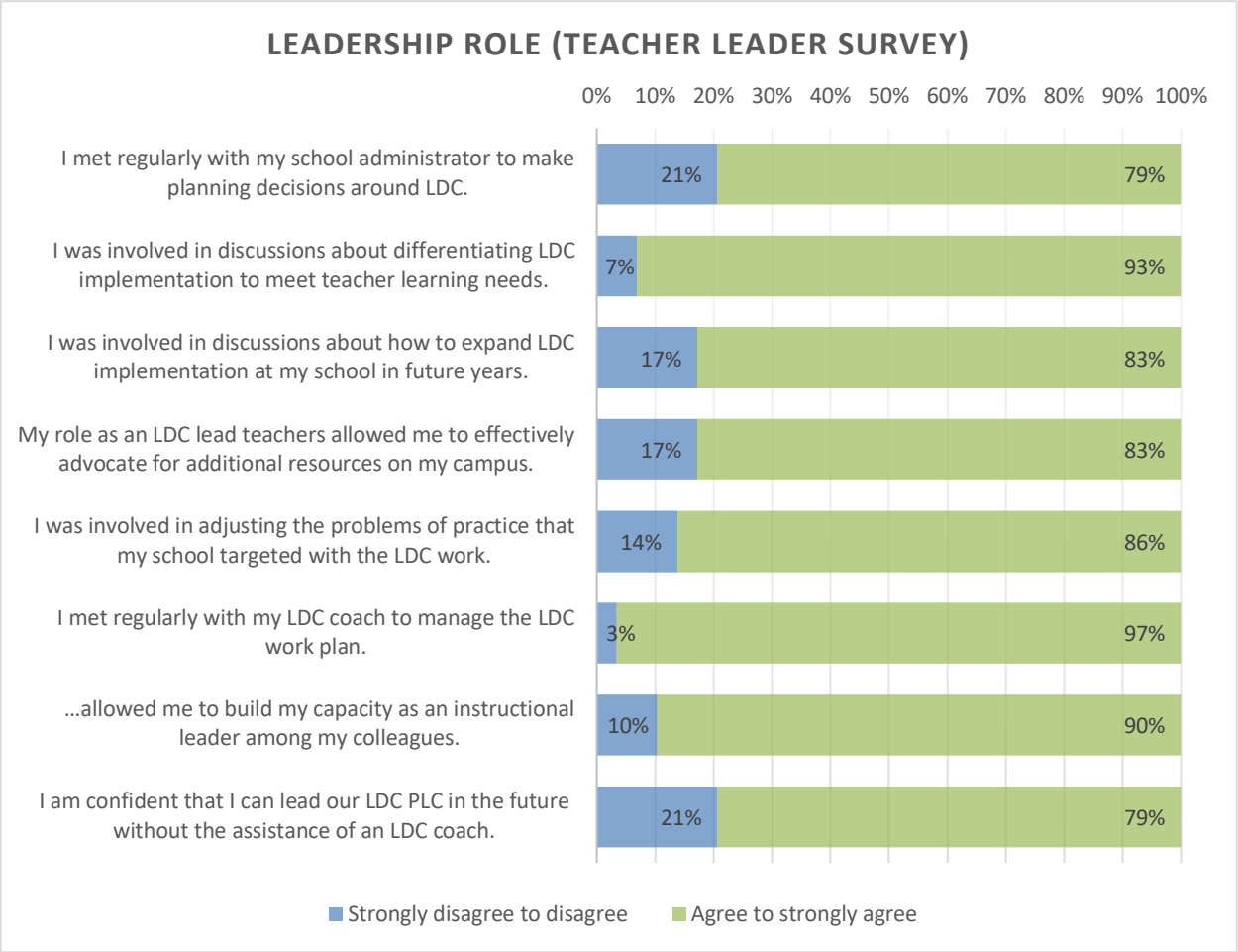


Teacher Leader Leadership Role (TL20)

Next, teacher leaders were asked to report on their own roles as LDC leaders at their schools. As can be seen in Figure 3.19, more than three-fourths of the teacher leaders (79% to 97%) agreed or strongly agreed with each statement. The most commonly reported roles involved meeting regularly with their coach to manage the LDC work plan (97%), differentiating LDC implementation to meet the learning needs of teachers (93%), and building capacity as an instructional leader among colleagues (90%). The lowest levels of agreement involved leading the PLC without the assistance of the LDC coach (79%) and meeting regularly with the school administrator to make planning decisions around LDC (79%), which had three respondents strongly disagree.

Figure 3.19

Leadership Roles of the Teacher Leaders (n = 29)

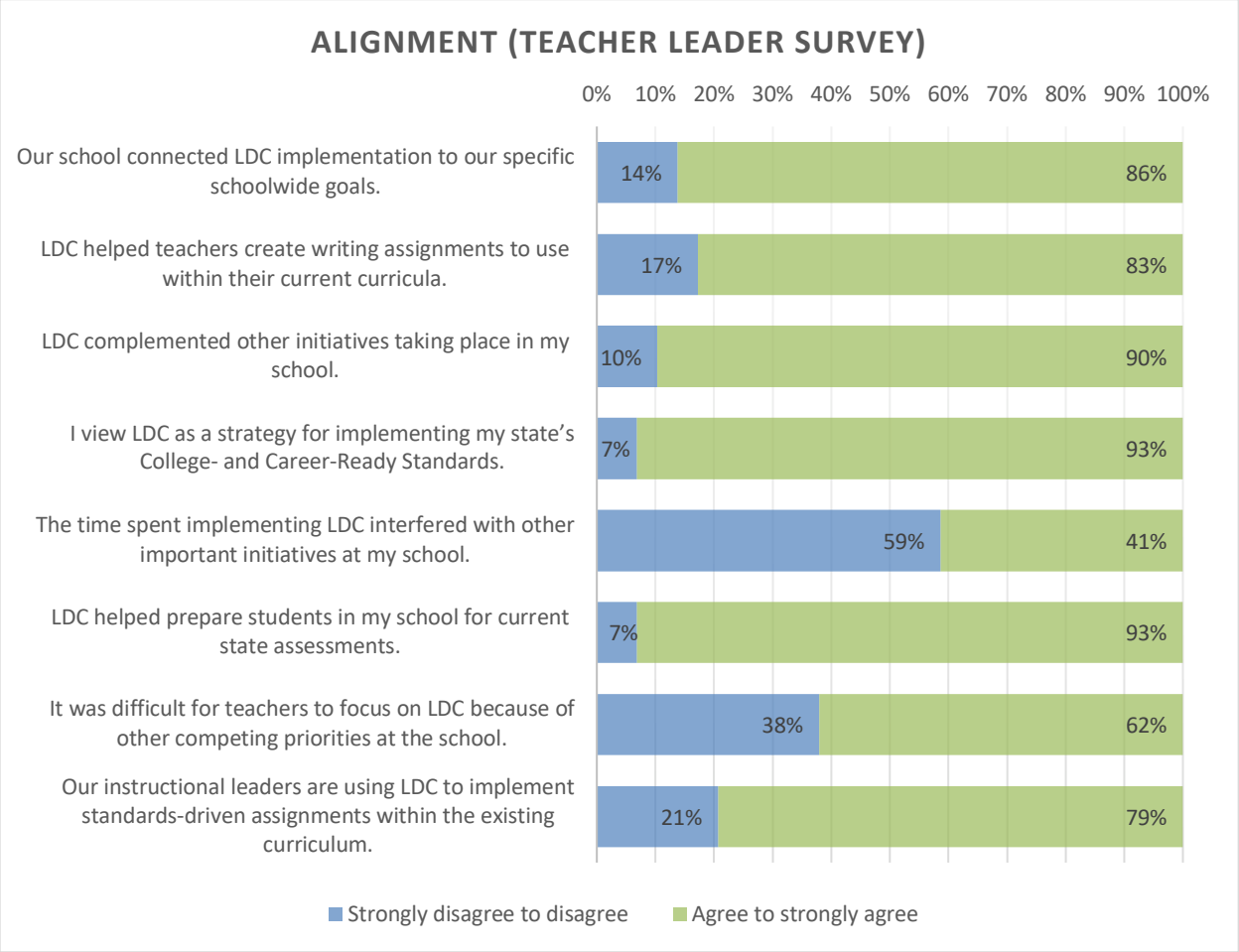


Alignment (TL21)

Teacher leaders were asked to rate their agreement about the alignment of LDC with the goals and initiatives at their schools (see Figure 3.20). In this case, 62% to 93% of respondents agreed or strongly agreed with the six positively framed items. For example, more than 90% of respondents agreed that LDC is a strategy for implementing college and career ready standards, prepare students for current state assessments, and that LDC complements other school initiatives. The lowest levels of agreement were for the negatively framed items with 59% disagreeing that LDC interfered with other initiatives at the school and 38% disagreeing that it was difficult to focus on LDC because of competing school priorities.

Figure 3.20

Teacher Leader Perceptions of the Alignment Between the School and LDC (n = 29)



Scale-Up and Sustainability (TL22)

Teacher leaders showed mixed levels of agreement to five questions that focused on issues of scale-up and sustainability (see Figure 3.21). Among the most positive results, 72% of respondents each indicated that they expected most teachers to continue implementing LDC the next year and/or believed that teachers and administrators were committed to sustaining LDC. In contrast, only 45% of teacher leaders agreed or strongly agreed that the LDC planning process and/or CoreTools was used by teachers at their schools who were not part of the PLC meetings.

Figure 3.21

Teacher Leader Perceptions of the Scale-Up and Sustainability of LDC (n = 29)

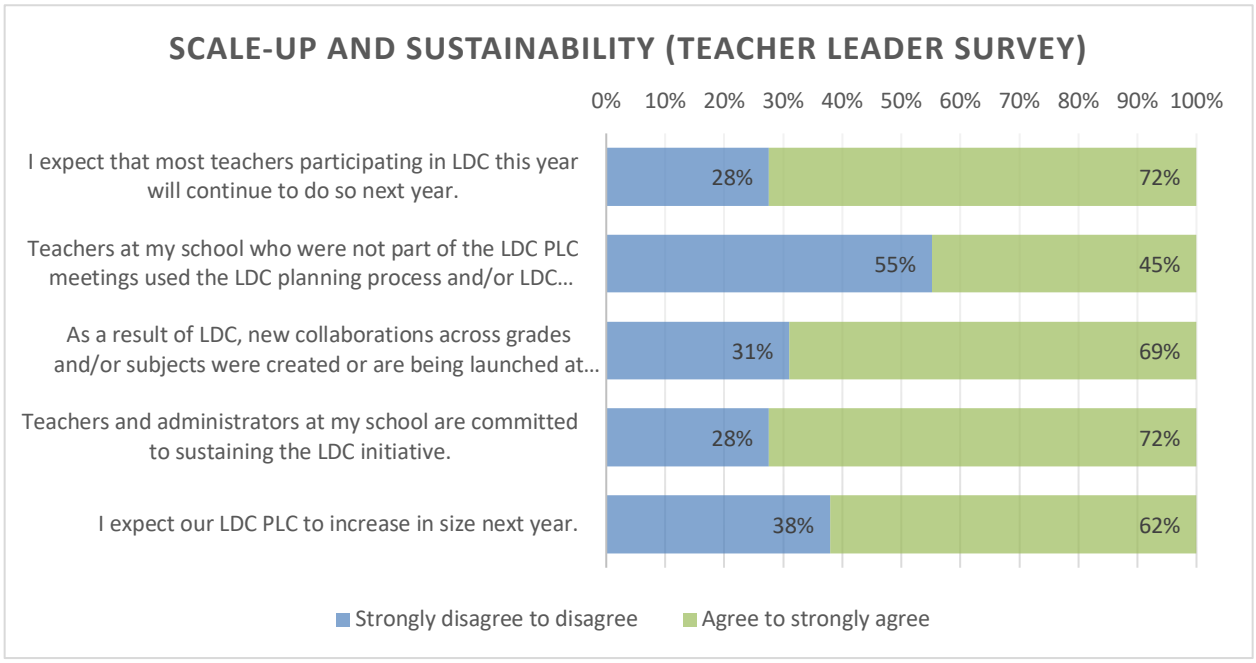
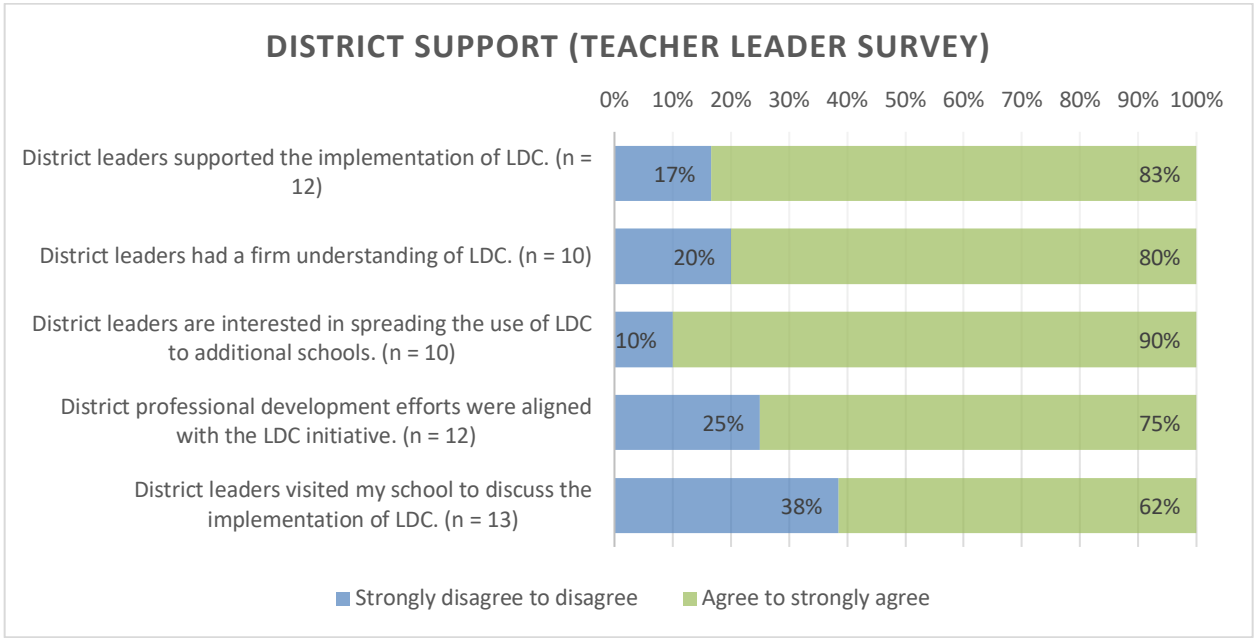


Figure 3.22

Teacher Leader Perceptions of District Support of LDC (n = 37)



District Support (TL23)

Overall, teacher leaders had positive attitudes regarding district support towards LDC (see Figure 3.22). More specifically, 83% of respondents agreed or strongly agreed that district leaders supported LDC implementation. In addition, 90% agreed that district leaders were interested in spreading its use to additional schools, 80% felt that the district leaders had a firm understanding of LDC, and 75% felt that district professional development efforts were aligned with LDC. Finally, only 62% reported that district leaders visited the school to discuss implementation.

3.3 School Administrator Survey Results

In total, 15 school administrators completed the survey, with one additional administrator answering only the first question. These administrators came from 16 different schools. Half were principals and half were assistant principals.

Professional Learning Community (A2)

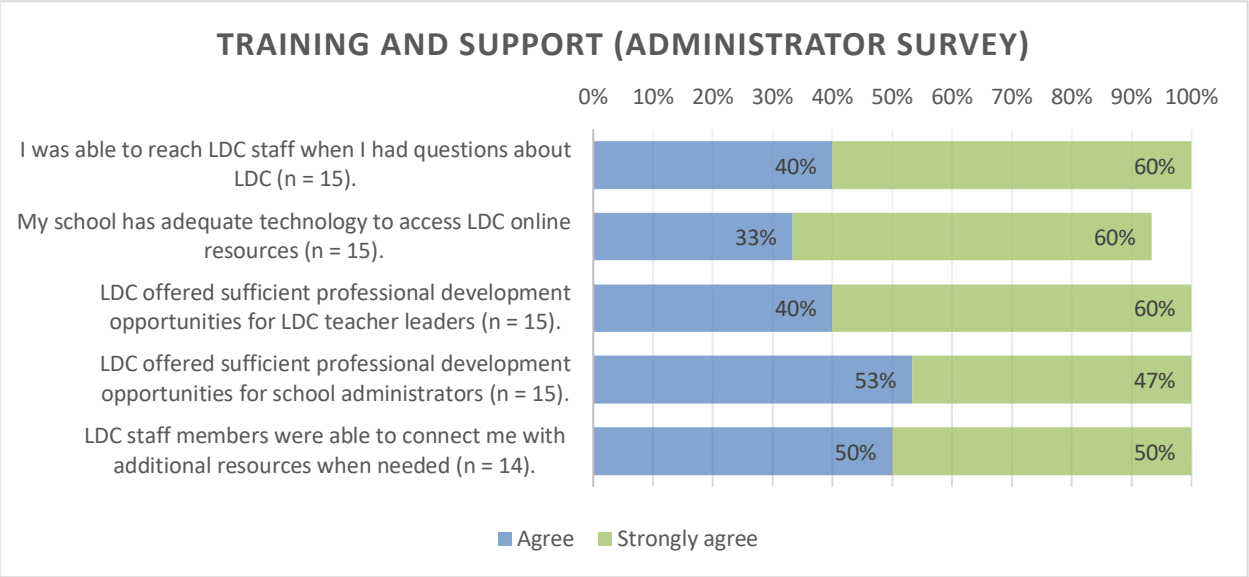
Administrators varied in the proportion of the PLC meetings that they attended. More specifically, one third of administrators reported that they attended about three quarters of more of the meetings. In addition, 20% reported that they attended half of the meetings and another 20% reported attending about one quarter. Finally, 27% indicated that they attended less than one-quarter of the PLC meetings. It is not clear from the question whether any of the administrators failed to attend at all.

Training and Support (A3)

When asked about issues of training and support, all administrators who responded to the survey agreed or strongly agreed to each statement (see Figure 3.23). The strongest levels of agreement focused on whether the administrators were able to reach LDC staff when they had questions, adequate technology to access online resources, and whether their teacher leaders had sufficient PD opportunities (60%, respectively). Finally, about half of the administrators strongly agreed that LDC staff members were able to connect them with additional resources when needed and/or that there were sufficient PD opportunities for school administrators. Furthermore, while administrators attended an average of six in person and/or online sessions, some participated a great deal more or less (0–20).

Figure 3.23

Administrator Perceptions of Training and Support



Note. One administrator responded disagree concerning whether their school had adequate technology.

Classroom Observation (A5–6)

All 15 of the administrators who completed the survey indicated that they observed each member of their PLC teaching an LDC module. Overall, the most common response among administrators was three or more observations per teacher (60%), with about one quarter observing twice (27%), and the remaining reporting observing each teacher once (13%). In addition, administrators were asked how effective they thought the modules they observed were at helping students develop literacy skills. All of these administrators perceived that the modules were moderately (60%) or very effective (40%). None of the administrators reported that the modules were not effective in helping develop students' literacy skills.

Impact on Teacher Practice (A7)

Administrators were asked their perceptions about the level and types of impact that LDC had on teacher practice at their PLC (Figure 3.24). Overall, perceptions were positive with 80% to 100% indicating that LDC had a moderate to a great deal of impact on teachers. Administrators strongest perceptions focused on teachers being able to select focus standards for a writing assignment, creating standards-driven writing assignments, and systematically collecting information on students' progress. The item with the least support involved teachers being able to identify patterns of students' understandings or misconceptions (80%).

Figure 3.24

Administrator Perceptions of the Impact of LDC on Teacher Practice (n = 15)

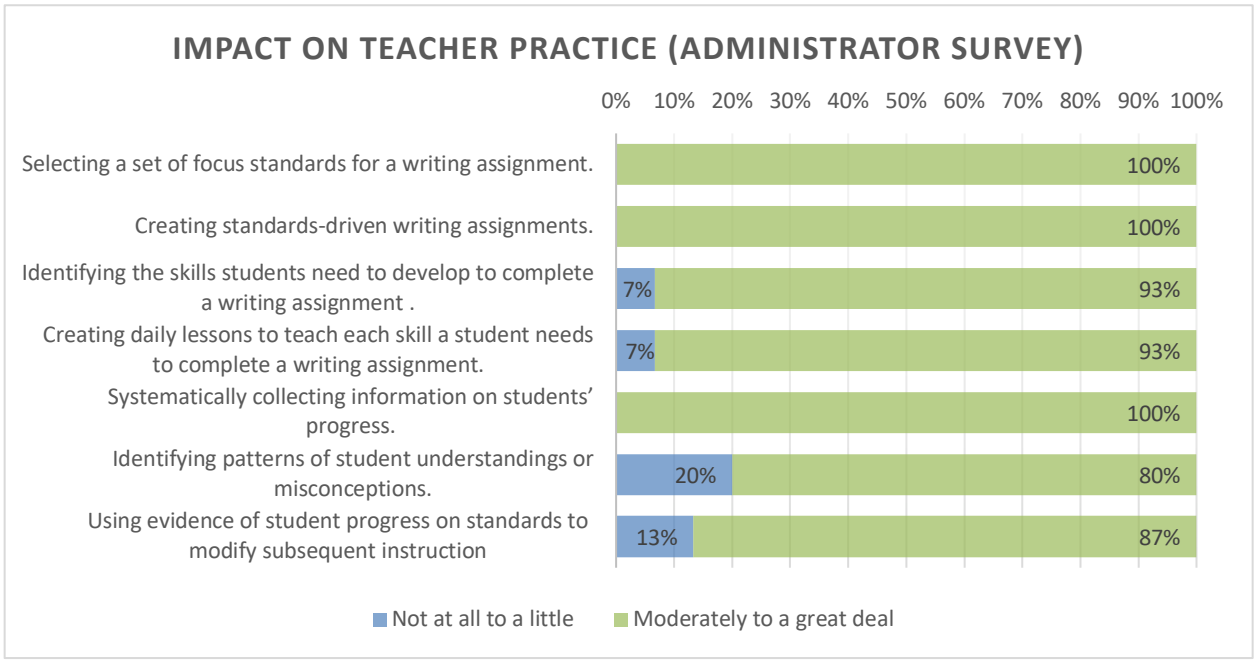
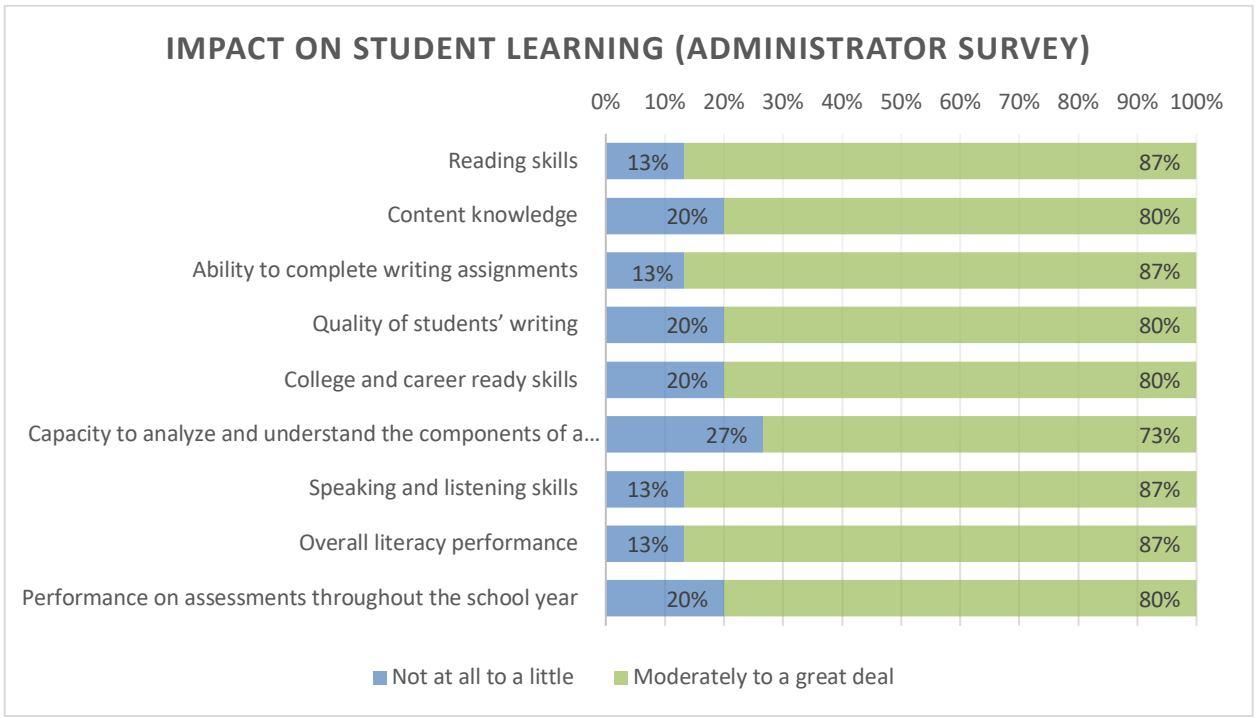


Figure 3.25

Administrator Perceptions of the Impact of LDC on Student Learning (n = 15)



Impact on Student Learning (A8)

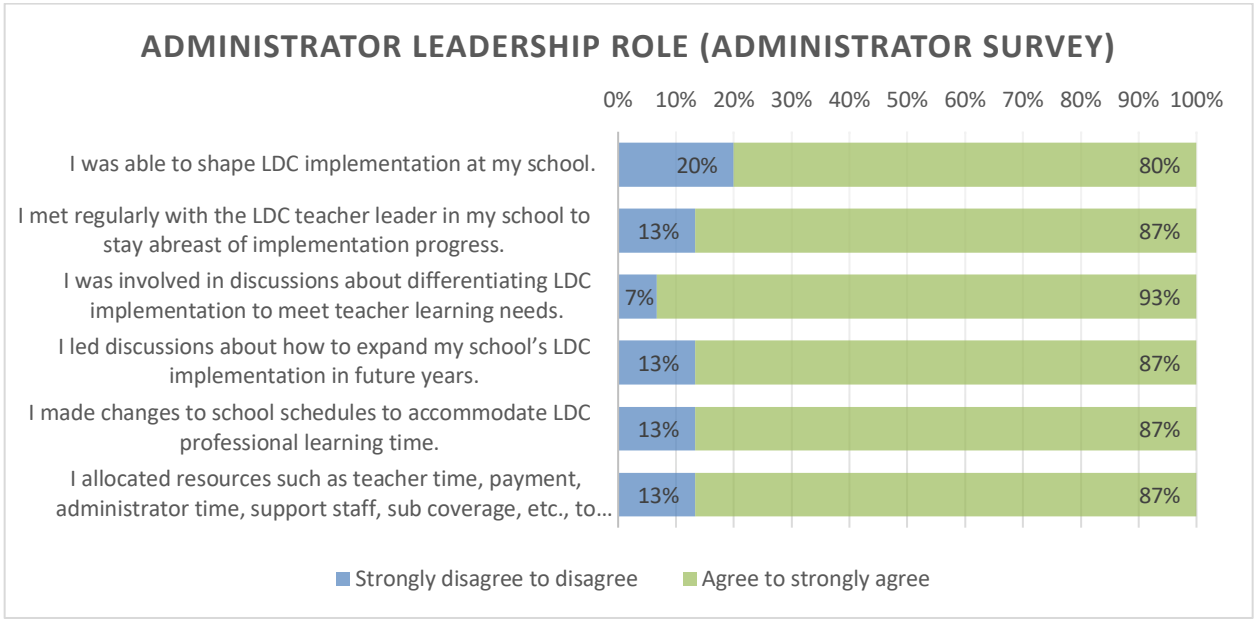
Administrators also perceived a variety of positive impacts on the students whose teachers implemented LDC (Figure 3.25). For example, 87% each indicated that LDC had a moderate to a great deal of impact on their students' reading skills, ability to keep writing assignments, speaking and listening skills, and overall literacy performance. The area where administrators were least likely to perceive a moderate or greater impact (73%) involved the capacity for students to analyze and understanding the components of a writing assignment.

Administrator Leadership Role (A9)

Next, administrators were asked to report on their own roles as LDC leaders at their schools. As can be seen in Figure 3.26, the vast majority (80% to 93%) of administrators who responded agreed or strongly agreed with each statement. The most commonly reported role (93%) involved discussions about differentiating LDC implementation to meet teacher learning needs. In addition, 87% agreed or strongly agreed that they met regularly with the LDC teacher leader, led discussions about how to expand implementation in future years, made changes to school schedules to accommodate PLC time, and allocated resources to ensure the team could meet. Finally, the least common role (80%) involved being able to shape implementation of LDC at his or her school.

Figure 3.26

Administrator Perceptions of Their Leadership Role with LDC (n = 15)

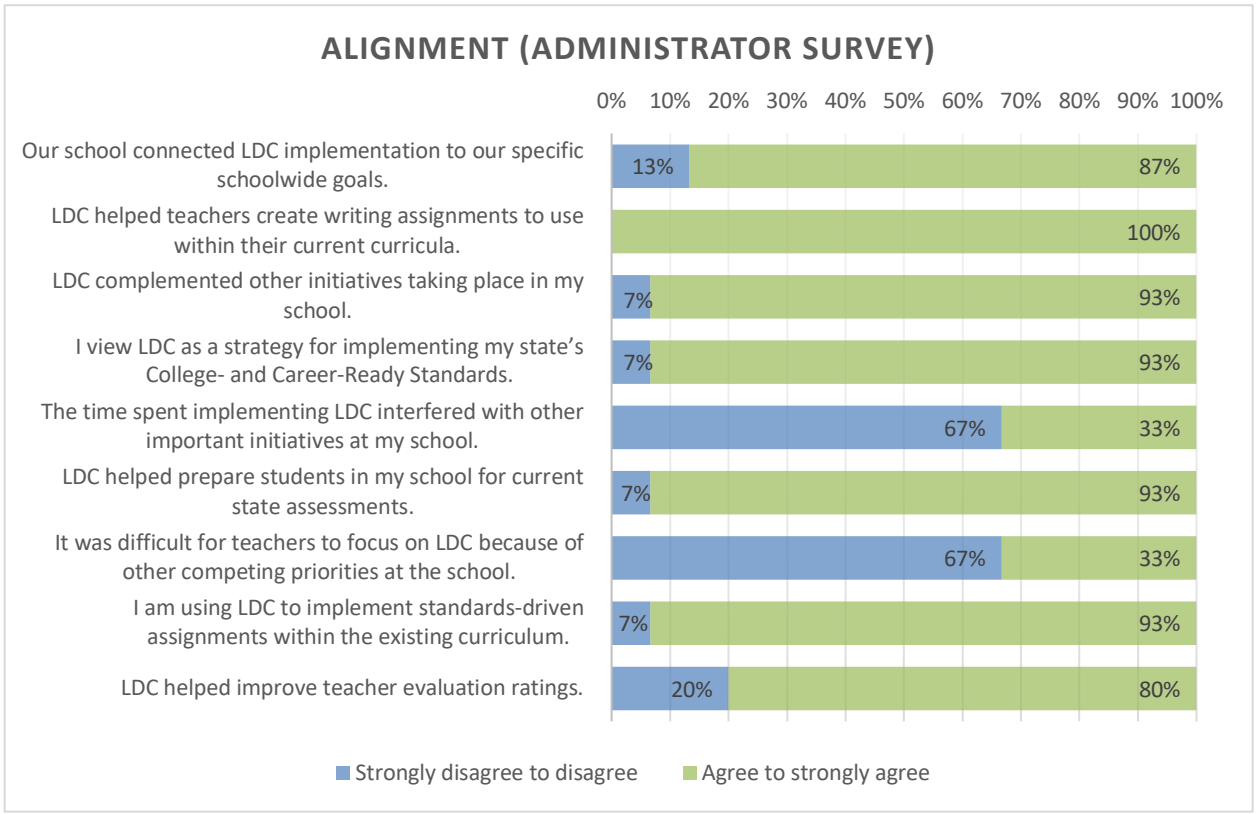


Alignment (A10)

Administrators were also asked to rate their agreement about the alignment of LDC with the goals and initiatives at their schools (see Figure 3.27). In this case, 80% or more of the administrators agreed or strongly agreed with the seven positively framed statements. For example, all administrators agreed or strongly agreed that LDC helped teachers create writing assignments to use within their current curricula. In addition, 93% of respondents agreed that LDC complemented other school initiatives, is a strategy for implementing college and career-ready standards, that they were using it to implement standards-driven assignments, and that it prepares students for current state assessments. finally, only one-third of the administrators agreed with the two negatively framed items, i.e., that time implementing LDC interfered with other important initiatives at the school and that it was difficult to focus on LDC because of other school priorities.

Figure 3.27

Administrator Perceptions of LDC Alignment with the School (n = 15)



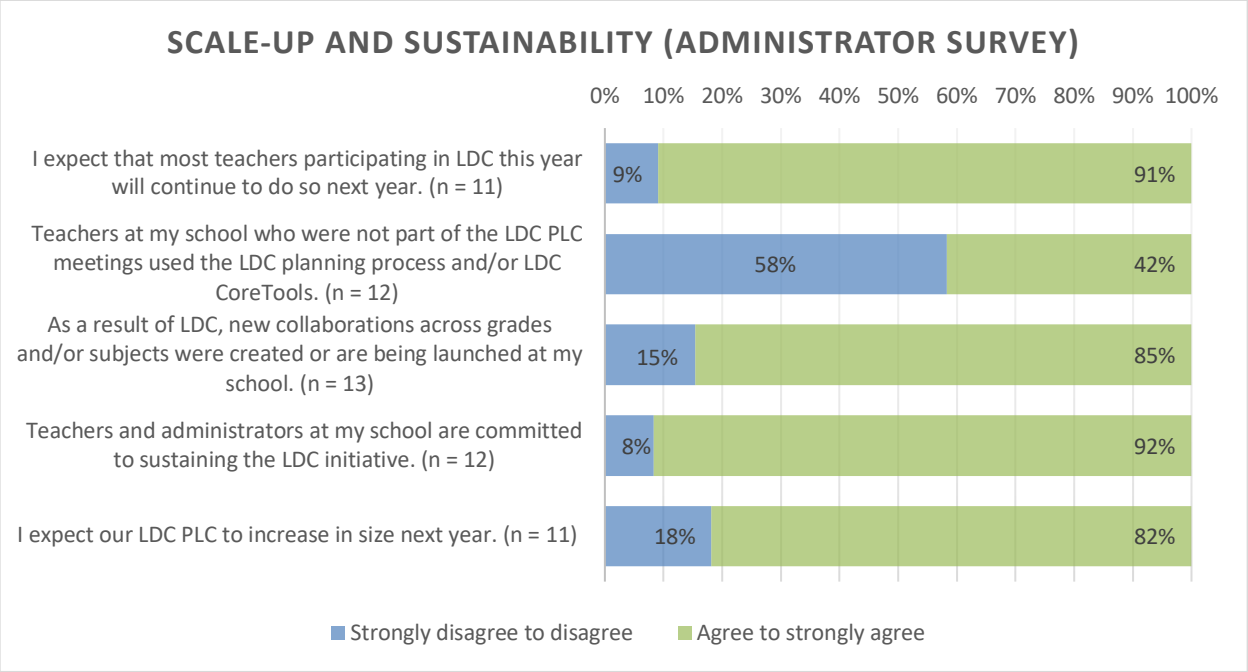
Scale-Up and Sustainability (A11)

Administrators varied regarding to whether they felt qualified to answer each of the five scale-up and sustainability questions (see Figure 3.28). For example, only eleven administrators

expressed an opinion about whether teachers would participate in LDC again next year. Despite this, of those who did respond, opinions were normally very positive. The vast majority agreed that they and their teachers were committed to sustaining LDC, that teachers who were already participating would continue, that collaboration was improved across grades and/or subjects as a result of LDC, and that the PLC would increase in size next year. Finally, only 42% reported that teachers who were not part of the LDC PLC meetings were using the LDC planning process or CoreTools web site.

Figure 3.28

Administrator Perceptions of the Scale-Up and Sustainability of LDC

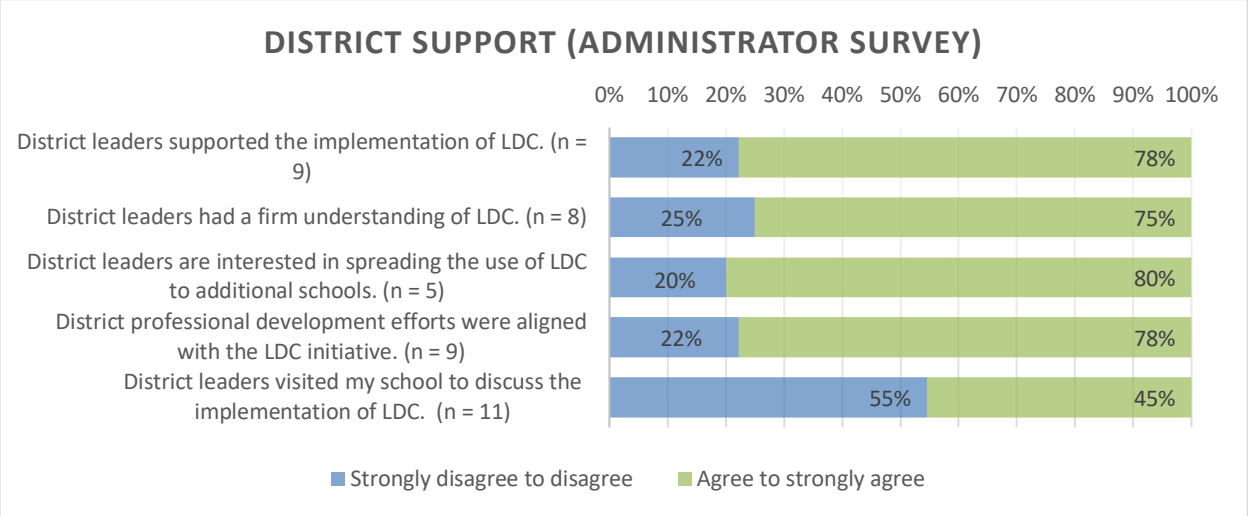


District Support (A12)

Similarly, administrators varied regarding whether they felt qualified to answer each of the five district support items listed in Figure 3.29. For example, only five expressed an opinion about whether district leaders were interested in spreading the use of LDC to additional schools. Despite this, of those who did respond, opinions were generally very positive. More specifically, more than three-quarters of the respondents agreed or strongly agreed that district leaders supported implementation, that district leaders had a firm understanding of LDC, and that district PD was aligned with the LDC initiative. Finally, only 45% or five administrators agreed that district leaders visited their school to discuss implementation of LDC.

Figure 3.29

Administrator Perceptions of District Support of LDC



3.4 Open-Ended Responses for All Participants

Each survey respondent was asked three open-ended questions regarding the supports they received for the implementation of LDC at their school: (a) What supports did you find the most useful and why? (b) What supports were not helpful and why? (c) In what ways could LDC implementation be improved in your school in the future? The following section summarizes the findings for the 158 teachers, 28 teacher leaders, and 14 administrators who responded to the open-ended questions.

Results were analyzed thematically for the supports of coaching, CoreTools, and professional development, all of which were mentioned in the item prompt. In addition, we coded responses for collaboration and other more general issues that did not clearly fit within the other major themes. For example, responses that mentioned meetings but did not explicitly state whether they were for coaching, collaboration, or professional development. Finally, we coded responses that did not answer the question, for example, responses that said *not applicable* or *nothing*, people who only made negative comments when asked to say what was most useful, and individuals who only said something positive in regards to the question about what was least helpful.

General Views

About one-quarter of the open-ended responses (136 comments) did not directly respond to the question being asked. For example, 107 of the responses across the three questions had a neutral statement such as “not applicable” or “nothing.” In addition, 22 of the responses to the question about what was least helpful and six of the responses to the question asking for

suggestions simply provided a positive comment such as noting that the supports were "helpful." Only one response across the three questions made a negative statement.

Table 3.2

Major Themes from Open-Ended Survey Items about LDC Supports

	Teacher		Teacher leader		Administrator		Total	
Supports	#	%	#	%	#	%	#	%
MOST USEFUL								
Collaboration	11	7.0	0	0.0	2	14.3	13	6.5
Coaching	92	58.2	23	82.1	11	78.6	126	63.0
CoreTools	57	36.1	8	28.6	8	57.1	73	36.5
PD	17	10.8	6	21.4	1	7.1	24	12.0
Other	15	9.5	1	3.6	0	0.0	16	8.0
LEAST USEFUL								
Collaboration	3	1.9	0	0.0	0	0.0	3	1.5
Coaching	30	19.0	4	14.3	2	14.3	36	18.0
CoreTools	35	22.2	5	17.9	2	14.3	42	21.0
PD	9	5.7	6	21.4	1	7.1	16	8.0
Other	18	11.4	5	17.9	0	0.0	23	11.5
SUGGESTIONS								
Collaboration	18	11.4	5	17.9	0	0.0	23	11.5
Coaching	16	10.1	3	10.7	3	21.4	22	11.0
CoreTools	22	13.9	4	14.3	1	7.1	27	13.5
PD	13	8.2	0	0.0	2	14.3	15	7.5
Other	80	50.6	15	53.6	7	50.0	102	51.0

Note. Each comment was coded for one or more themes; therefore, percentages exceed 100%.

Collaboration

While not mentioned in the section prompt, a small number of respondents brought up collaboration as a form of support that they considered helpful (13 comments) or that they had suggestions about for the future (23 comments). Specific themes included the value of getting to engage with their colleagues to work together on modules, but also to provide feedback and suggestions, and discuss issues. A number of teachers also specifically mentioned the usefulness of the PLC meetings for the purpose of collaboration. In regards to suggestions, respondents wanted more opportunities to co-plan, share what they learned, observe other teachers, and provide more of a balance in focusing on modules versus student work. A few

respondents also mentioned that they would like the opportunity to collaborate across subject areas or grade levels. Furthermore, some teachers wanted more in person PLC time. Finally, in response to the question about what was not helpful, two teachers indicated that the PLC meetings were not always productive, and another noted that they were not given enough time to co-plan and check-in with their grade level team.

Coaching

Based on the open-ended responses, coaching was the most valued type of support provided for the implementation of LDC (126 comments). The majority of these comments focused on one or more of the modes in which the coaching was provided. More specifically, 26 respondents valued the in-person coaching, 63 valued the virtual coaching, and 19 valued coaching through both of these modes. In some cases, respondents provided extra detail, with 32 noting that they valued using Zoom for the virtual coaching and eight mentioning the use of email. In addition, one respondent noted that they liked the group meetings, and another three pointed out that they preferred to receive their coaching one-on-one. A moderate number of respondents to this question also mentioned the person who provided the coaching for their school (55 comments). For example, respondents mentioned their LDC coach, teacher leader, district lead, or provided the name of an individual who provided coaching. Finally, 25 respondents pointed out that one of the benefits of the coaching was the opportunity to receive written or verbal feedback.

Participants also provided comments about what they felt did not work well or what they would like to have seen regarding the coaching. The most common theme regarding what did not work well involved the virtual coaching (34 comments). Individuals particularly felt that Zoom was problematic (25 comments) with some pointing out that they had technology issues and/or that they were uncomfortable with the pacing or timing of these coaching sessions. Three respondents also mentioned that they did not find the in person coaching helpful, two did not like the one-on-one coaching, and three did not like the group coaching sessions.

The results for the question about suggestions continued many of these themes. That is, we had 13 individuals suggested having more or adding in person coaching, and one suggested having more Zoom meetings. Four respondents were more specific and mentioned their teacher leader or coach, and one mentioned that they needed a new coordinator to continue coaching during the next school year. Finally, two respondents suggested what type of content they would like covered during coaching sessions, and one respondent suggested a change in scheduling.

CoreTools Online Platform

Based on their comments, teachers, teacher leaders, and administrators all felt that there were positive (73 comments) and less positive aspects to the CoreTools platform (42 comments). While some of the respondents who liked the CoreTools did not specify why it was a helpful support, those who did were most likely to highlight the library (18 comments) that

includes different mini-tasks and modules that can be integrated or adapted, the module creator (17 comments), and the LEARN tab (14 comments) that includes various professional development materials. Small numbers of respondents also noted that they liked the feedback features in the CoreTools (8 comments).

For those respondents who felt that there were drawbacks to the CoreTools, the most cited issues involved the ease of use of the platform (16 comments), the LEARN tab (9 comments), and the library (8 comments). In addition, seven respondents noted that they did not find all or part of the module creator to be helpful. Suggestions that respondents made focused on similar themes including the library (9 comments), the ease of use of the platform (7 comments), and the Module Creator (4 comments). In addition, one respondent suggested a change concerning the LEARN tab and another suggested a change concerning module implementation. Among the specific suggestions made were the desire to have more standard specific modules, scoring rubrics for mini-tasks, and making sure that the texts and topics in the library are appropriate for students.

Professional Development

Respondents also tended to point out more positives (24 comments) than negatives (16 comments) regarding the professional development they were offered as part of their implementation of LDC. For the most part this difference was driven by opinions about the in person professional development, with 11 respondents finding it helpful and only one person finding it to be not helpful. In contrast, numbers were similar with other issues. For example, three respondents each liked or did not like the content of the PD, four respondents liked and three disliked the summer session(s), and seven liked and eight disliked the LEARN tab courses. Finally, three respondents noted that they liked the individual who provided the professional development and one respondent noted that they were unsatisfied with the amount of PD and would have liked more.

Suggestions provided by teachers and administrators covered most of the same themes concerning professional development. For example, four noted that they would like more in person professional development opportunities, and one noted that they would like these in person opportunities to be more hands on. Five respondents noted that they wanted more professional development opportunities, and two noted that they wanted more experiences with the LEARN tab courses. Finally, two respondents talked about when they would like training (i.e., summer, out of school time), and two others made suggestions about the content of these trainings (i.e., navigating CoreTools, leadership).

Other General Views

As previously noted, some responses did not clearly align with the four main themes. While these were mostly found in response to the question asking for suggestions (102 comments), some were found for the other two questions (39 comments). The most common themes found across the three questions focused on issues of time (45 comments) and/or

meetings (24 comments). More specifically, individuals noted that they liked the in-person meetings, and some noted that the main drawback was that they did not spend more time meeting, using the LEARN tab, or implementing LDC in general. Similar issues were brought up in the suggestions concerning meetings (17 comments) and time (38 comments), with most focused on wanting more meeting time, more planning time, or time for LDC in general. Moderate numbers of respondents also voiced their interest in having better alignment between LDC and the district or school curricula (17 comments), their desire to expand participation to other grades or subjects (15 comments), and some general issues of support (12 comments). Ten of the participants also voiced that they would like more or better support from their administrators for LDC. Finally, some respondents would like to have seen more attention paid to English language learners (ELLs), special needs students, or primary/elementary school students.

3.5 Exploratory Analysis

To examine change in perceived impacts among returning teachers, survey ratings were compared for teachers who submitted a survey during both spring 2018 and spring 2019. The following presents the results for the 83 teachers who participated at both time points.

When examining the longitudinal results regarding the impact of LDC on their teaching skills, the percentage of teachers who provided a positive rating of moderately to a great deal increased very slightly across the two school years (see Figure 3.30). More specifically, percentages increased by 1% to 5% for each item. Furthermore, by spring 2019, the percentage of teachers providing positive ratings met or exceeded 92% on all items. In addition, as can be seen in Table 3.3, when looking at the direction of change in ratings across the four-point scale (not at all to a great deal), most teachers ratings showed no change (55% to 71%) or increased by one or more levels (14.5% to 26.5%).

Table 3.3

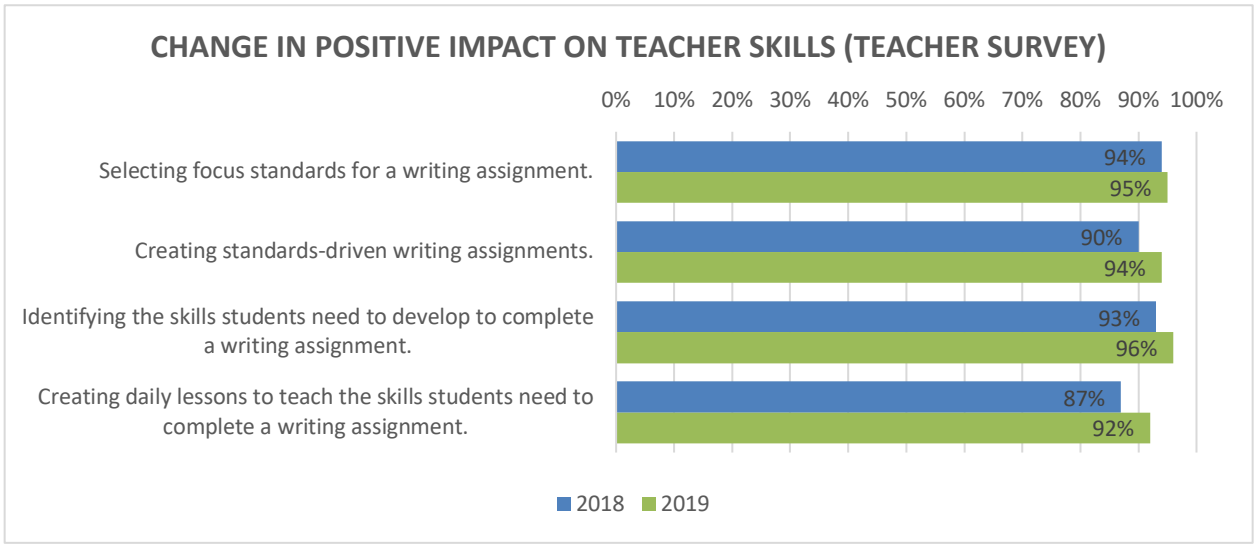
Change in Teacher Perceptions of the Impact of LDC on Teacher Skills (n = 83)

Dimension	Negative		No Change		Positive	
	#	%	#	%	#	%
Selecting focus standards for a writing assignment. (1)	10	12.0	59	71.1	14	16.9
Creating standards-driven writing assignments. (2)	12	14.5	59	71.1	12	14.5
Identifying the skills students need to complete a writing assignment. (4)	13	15.7	48	57.8	22	26.5
Creating daily lessons to teach the skills students need to complete a writing assignment. (5)	16	19.3	46	55.4	21	25.3

Note. Four level agreement scale ranging from not at all to a great deal.

Figure 3.30

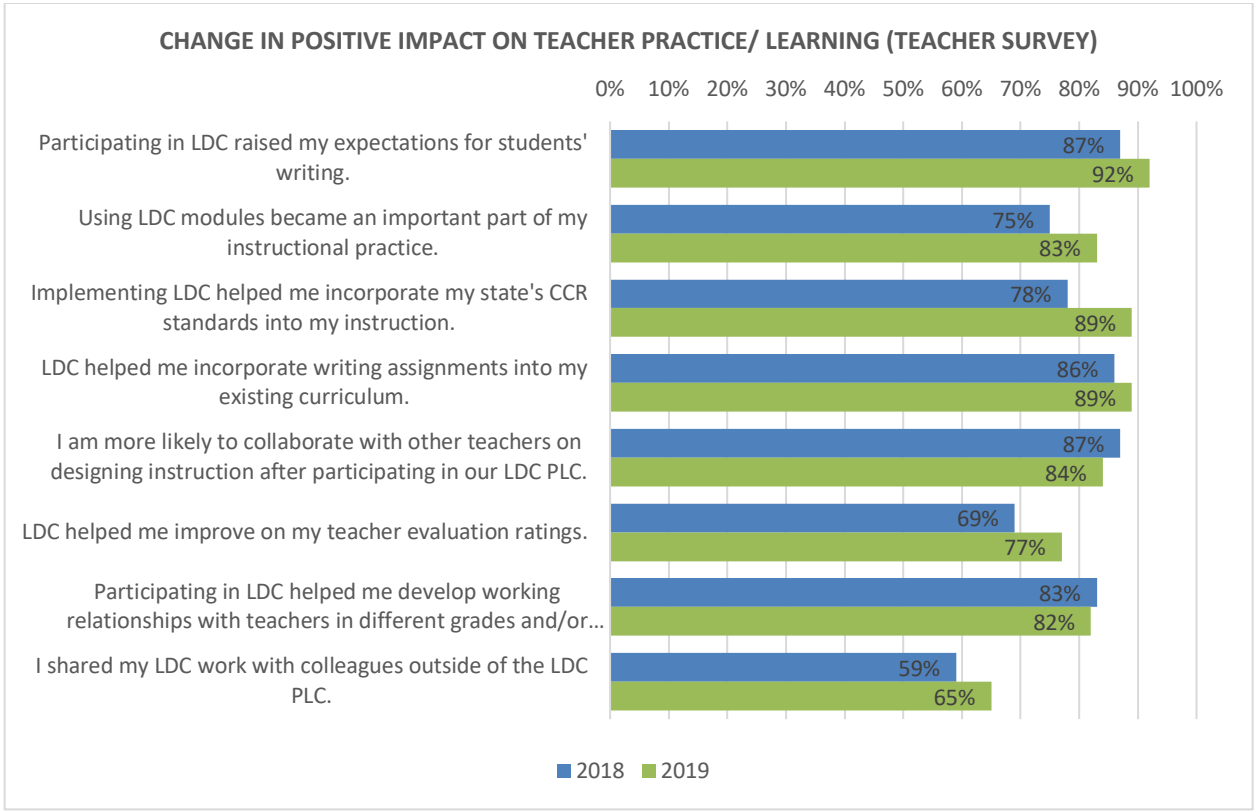
Change in Teacher Perceptions of the Positive Impact of LDC on Teacher Skills (n = 83)



Note. Only four items were asked concerning teacher skills on the survey during both 2018 and 2019.

Figure 3.31

Change in Teacher Perceptions of the Positive Impact of LDC on Teaching Practice and Learning (n = 83)



Positive growth was generally found when examining change in teachers' perceptions about the impact of LDC on various facets of their teaching practice and learning (see Figure 3.31). For example, percentages increased by 3% to 11% on six of the items, with the most growth being found regarding incorporating state standards into instruction, LDC modules being an important part of their instructional practice, and improving their teacher evaluation ratings. The only items in which percentages dropped slightly (1 to 3%) focused on collaboration. Furthermore, by Spring 2019, the percentage of teachers providing positive ratings exceeded 75% on all but one item. Finally, as can be seen in Table 3.4, when looking at the direction of change in ratings across the four-point scale (not at all to a great deal), most teachers ratings showed no change (54% to 64%) or increased by one or more levels (20% to 32%).

Table 3.4

Change in Teacher Perceptions of the Impact of LDC on Teacher Practice and Learning, Counts and Percentages (n = 83)

	Negative		No Change		Positive	
Dimension	#	%	#	%	#	%
Participating in LDC raised my expectations for students' writing.	11	13.3	45	54.2	27	32.5
Using LDC modules became an important part of my instructional practice.	7	8.4	50	60.2	26	31.3
Implementing LDC helped me incorporate my state's CCR standards into my instruction.	9	10.8	49	59.0	25	30.1
LDC helped me incorporate writing assignments into my existing curriculum.	12	14.5	48	57.8	23	27.7
I am more likely to collaborate with other teachers on designing instruction after participating in our LDC PLC.	13	15.7	49	59.0	21	25.3
LDC helped me improve on my teacher evaluation ratings.	11	13.3	47	56.6	25	30.1
Participating in LDC helped me develop working relationships with teachers in different grades and/or subjects.	13	15.7	53	63.9	17	20.5
I shared my LDC work with colleagues outside of the LDC PLC.	14	16.9	47	56.6	22	26.5

Note. Four level agreement scale ranging from strongly disagree to strongly agree.

Figure 3.32

Change in Teacher Perceptions of the Positive Impact of LDC on Students (n = 83)

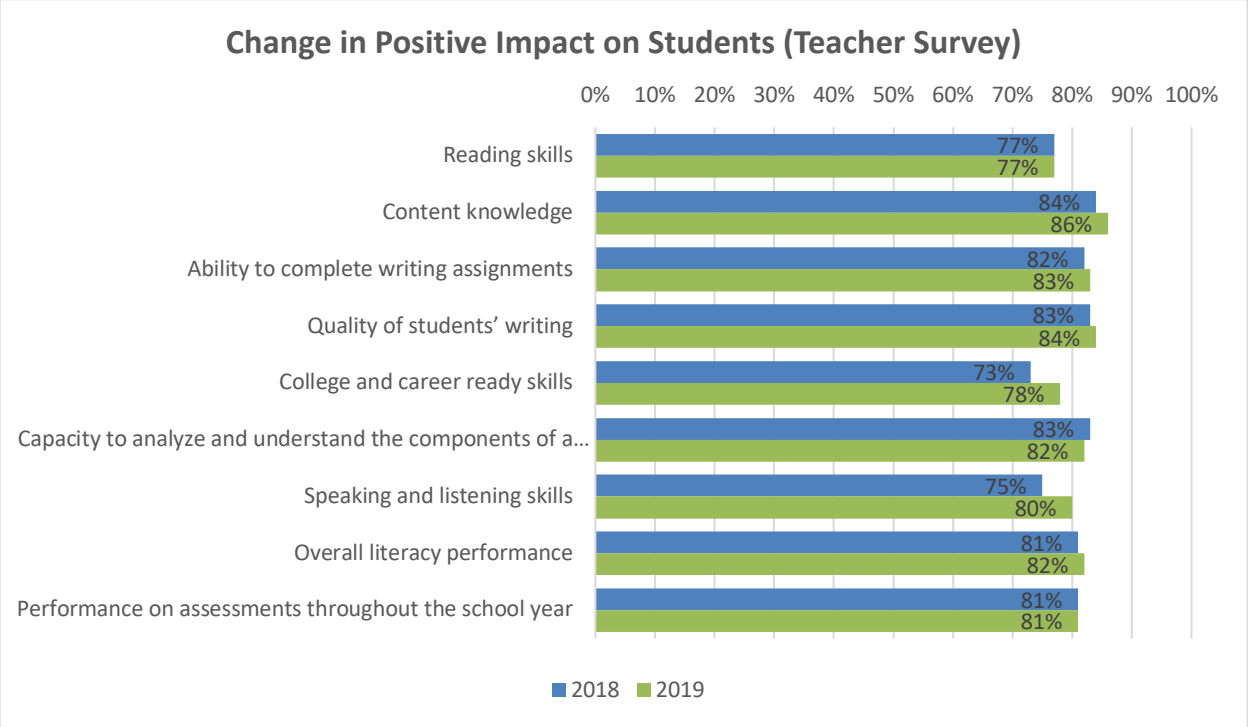


Table 3.5

Change in Teacher Perceptions of the Impact of LDC on Students, Counts and Percentages (n = 83)

Dimension	Negative		No Change		Positive	
	#	%	#	%	#	%
Reading skills	15	18.1	46	55.4	22	26.5
Content knowledge	11	13.3	47	56.6	25	30.1
Ability to complete writing assignments	10	12.0	48	57.8	25	30.1
Quality of students' writing	9	10.8	50	60.2	24	28.9
College and career ready skills	12	14.5	47	56.6	24	28.9
Capacity to analyze and understand the components of a writing assignment	13	15.7	52	62.7	18	21.7
Speaking and listening skills	11	13.3	42	50.6	30	36.1
Overall literacy performance	14	16.9	50	60.2	19	22.9
Performance on assessments throughout...school year	11	13.3	47	56.6	25	30.1

Note. Four level agreement scale ranging from not at all to a great deal.

Finally, we examined changes in teacher ratings concerning the impact of LDC on nine different student outcomes. As can be seen in Figure 3.32, positive ratings (moderately to a great deal) by teachers generally stayed the same or increased slightly between spring of 2018 and spring of 2019. More specifically, the largest growth in positive ratings was found for students' college and career ready skills (5%) and speaking and listening skills (5%). In contrast, ratings went down by 1% concerning students' capacity to analyze and understand the components of a writing assignment, and showed no change concerning reading skills, or regarding students' performance on assessments throughout the school year. Finally, results concerning general changes in ratings mirrored those found for the other two longitudinal analyses (see Table 3.5). More specifically, the largest proportion of teachers showed no change in their ratings for the items between the two survey administrations (51% to 63%), or showed an increase of one or more levels on the agreement scale per item (22% to 36%).

3.6 Summary of Results

This survey captured the responses of 75% of all participants in the district's third year of implementation. Based on the survey analyses, a majority of teachers and teacher leaders implemented LDC as expected. Most reported implementing multiple modules across the school year. The majority of participants also reported that they developed or adapted their module(s) collaboratively and that they primarily adapted existing modules. In their open-ended responses, 43% of participants also noted that they found the CoreTools platform and/or professional development to be helpful. Despite this, some did comment that the CoreTools site in general and the LEARN Tab in specific could be difficult to navigate, and one-third rated the videos in the LEARN tab as less useful. In addition, while the teachers who made use of the National Peer Review process found it helpful, most teachers reported that they did not make use of this LDC feature.

Participants tended to feel supported in their implementation of LDC. At the local level, teachers had very positive opinions of their teacher leaders, frequently reported that their administrator(s) provided encouragement and resources, and some felt that the opportunity to collaborate with their peers was helpful. Most of the teachers and teacher leaders also tended to report positive opinions of the LDC coaches, and more than 60% noted that the coaching was one of their most valued supports. In addition, while teacher leaders and administrators felt that the district supported implementation of LDC, moderate percentages reported that district leaders did not visit their school to discuss implementation of LDC. Some participants also expressed concerns about whether participants in the PLC were committed to sustaining LDC, with the most commonly noted issues involving the lack of use by teachers outside of the PLC and worries about whether new teachers would be recruited into the PLC during the next school year.

Participants perceived multiple positive impacts of the LDC initiative that aligned with the initiative. For example, most teachers, teacher leaders, and administrators felt that the

program helped students to develop their writing and literacy skills. Teachers and administrators felt that teachers improved their ability to select focus writing standards and create standards-driven writing assignments. In addition, most teachers reported improvement in their expectations for their students' writing, their ability to incorporate writing assignments and state standards into the curriculum, and their likeliness to collaborate on the design of instruction. The areas with the least perceived impact for students involved reading skills and college and career ready skills. Respondents also had slightly lower perceptions of the impact of LDC on teachers' skill in systematically gathering evidence of student progress and their ability to identify patterns in student understandings and misconceptions. Finally, less than 75% of teachers reported that their participation impacted their teacher evaluation ratings or their practice of sharing LDC work with their non-participating colleagues.

Finally, an exploratory analysis was conducted to examine change in teachers' perceptions of the impacts of LDC for the 83 teachers who submitted a survey in both spring 2018 and spring 2019. As with the primary analyses for the three scales we examined (teacher skills, teacher practice and learning, and student skills) we primarily found small, but positive results. More specifically, the percentage of teachers who provided positive ratings increased for 15 of the items, stayed the same for two, and decreased slightly for four items. The greatest increases were found for teachers' perceptions of their ability to incorporate standards into instruction (+11%) and improve their teacher evaluation ratings (+8%), and the largest amounts of negative change (-3%) were found for collaboration with other teachers on designing instruction. Finally, when examining general change in ratings across all levels of the agreement scales, we found that most teachers provided the same or a higher rating. In other words, teachers tended to maintain or improve in their positive perceptions about the impact of LDC on their own practice, as well as on their students' skills.

4.0 Analyses of LDC CoreTools Data

In the following section, we report on how participants interacted with LDC's CoreTools online system. We begin by presenting participation rates for key CoreTools activities, including creating a user account, and viewing, editing, and commenting on modules. We then dig deeper into the three CoreTools activities, by providing descriptive statistics for all i3 CoreTools users followed by results broken down by key subgroups (including LDC role, school level, cohort, and content area taught). After that, we compare the level of engagement for i3 CoreTools users who completed and taught a full-length module to those users who did not complete and teach a module during the school year. Finally, we summarize results.

4.1 CoreTools Activity Participation Rates

The four key CoreTools activities we examined include creating a user account as well as viewing, editing, and commenting on modules. Nearly all teachers and teacher leaders created CoreTools user accounts, although administrators not acting as teacher leaders did so at a somewhat lower rate (81%). Among the 289 CoreTools users, 250 were classroom teachers (with 32 of those individuals acting as teacher leaders), three were coaches or coordinators playing the teacher leader role, two were administrators playing the administrator role, and 42 of them were administrators overseeing the LDC work but not acting as teacher leaders.

Table 4.1

CoreTools Feature Participation Rates: 2018–2019 (Counts and Percentages)

Participant type	*N*	User account	Viewed a module	Edited a module	Commented on a module
Teacher	222	218 (98%)	207 (93%)	169 (76%)	97 (44%)
Teacher leader (classroom teacher)	32	32 (100%)	31 (97%)	29 (91%)	25 (78%)
Total teachers	254	**250 (98%)**	**238 (94%)**	**198 (78%)**	**122 (48%)**
Teacher leader (coach/coordinator)	3	3 (100%)	3 (100%)	3 (100%)	3 (100%)
Teacher leader (administrator)	2	2 (100%)	2 (100%)	1 (50%)	0 (0%)
Administrators (principals and assistant principals, not acting as teacher Leaders)	42	34 (81%)	12 (29%)	2 (5%)	2 (5%)
Total participants	301	**289 (96%)**	**255 (85%)**	**204 (68%)**	**127 (42%)**

As seen in Table 4.1, most participants used CoreTools to at least some degree. Ninety-six percent of all participants created a user account, 85% of participants viewed modules, and

68% edited modules. Commenting on modules was a less common activity with only 42% of all participants doing so.

As previously noted, nearly all participants created a CoreTools user account. Significantly, even administrators, who generally were not a part of the regular PLC meetings, created user accounts. This suggests that the vast majority of administrators overseeing LDC PLCs had at least some familiarity with the online platform. Likewise, nearly all PLC teachers and teacher leaders viewed modules in CoreTools. A little less than one third of principals and assistant principals viewed modules in the platform.

We consider editing modules to be the key indicator of deep engagement with the CoreTools module building platform. Seventy-eight percent of participating teachers edited at least one module. In contrast, only three administrators engaged at the level of editing modules.

Overall, adding comments to modules was a much less common activity. About half of classroom teachers and only five coaches, coordinators, or administrators commented. Commenting was, not surprisingly, most common among teacher leaders, whose role was most conducive to giving feedback to PLC members.

4.2 Engagement with Key CoreTools Activities

In this section, we describe participants' level of engagement with three key CoreTools activities: viewing, editing, and commenting on modules. Descriptive statistics are reported for all participants, as well as a number of subgroups. These subgroups capture the role the individual played in LDC (teacher, teacher leader, and administrator), the level of the school at which the participant worked (elementary, K–8, middle, or 6–12), the cohort group describing when the school and individual participant began taking part in LDC, and in the case of teachers, the content area taught (elementary/multiple subjects, secondary ELA, secondary history/social studies, and secondary science). As noted earlier, some participants played multiple roles in the intervention, so the teacher, teacher leader, and administrator groups overlap to some degree as they do in our survey analysis. Descriptive statistics are only reported for groups with five or more members. The samples for the viewing, editing, and commenting analyses are the 289 LDC participants with CoreTools user accounts in 2018−2019 (see Table 4.1).

Module Viewing

In Table 4.2 we present descriptive statistics on how many times i3 participants viewed modules, both overall and by subgroup. We present the minimum and maximum number of views, means and standard deviations, and the sum of total views across participants. Overall, the average participant viewed modules about 41 times, although the range varied greatly from zero to 965 views. There were 34 participants with user accounts who did not view any modules (about 12% of the overall sample).

Table 4.2

Descriptive Statistics for the Number of Times a Participant Viewed a Module in CoreTools, by Participant Subgroup

Subgroup	N	Min	Max	Mean	SD	Sum
All participants	289	0	965	41.3	86.2	11,941
Participant role						
All teachers	250	0	732	43.1	70.3	10,762
All teacher leaders	37	0	965	97.6	191.1	3,611
All administrators	36	0	33	2.7	6.2	96
Cohort						
Cohort 1 / participant started 2016−2017	40	0	732	68.0	146.2	2,720
Cohort 1 / participant started 2017−2018	18	2	206	35.9	45.3	647
Cohort 1 / participant started 2018−2019	27	3	127	37.9	32.9	1,024
Cohort 2 / participant started 2017−2018	120	0	965	40.8	96.3	4,891
Cohort 2 / participant started 2018−2019	84	0	146	31.7	35.2	2,659
School level						
Elementary school participants	110	0	965	46.4	101.8	5,103
K–8 participants	56	0	111	29.0	27.0	1,624
Middle school participants	91	0	206	28.4	37.5	2,587
6–12 participants	32	0	732	82.1	157.1	2,627
Content area taught						
Elementary/multiple subjects	109	0	253	40.3	49.8	4,391
Secondary ELA	47	0	732	68.4	131.6	3,214
Secondary social studies/history	45	0	519	41.5	81.8	1,869
Secondary science	24	0	99	28.4	26.7	682

Differences in module viewing by participant role were dramatic. Teacher leaders viewed over twice the number of modules as teachers on average (97.6 to 43.1). Administrators also viewed modules much less frequently (2.7). Participants who began participating in LDC in the same year their school launched the program viewed more modules than participants who joined PLCs in later years (the difference was particularly pronounced at Cohort 1 schools). Participants in elementary and 6-12 schools viewed more modules than their peers in middle and K-8 schools. Finally, secondary ELA teachers viewed a substantially greater number of modules on average than peers, while secondary science teachers viewed fewer modules.

Module Editing

As shown in Table 4.3, on average participants who engaged in editing modules did so 16 times over the course of the school year. There was a wide range of engagement from editing zero times to making 363 edits to modules. Eighty-vie participants with CoreTools user accounts (29%) did not do any editing of modules.

Table 4.3

Descriptive Statistics for the Number of Times a Participant Edited a Module in CoreTools, by Participant Subgroup

Subgroup	*N*	Min	Max	*Mean*	*SD*	Sum
All participants	289	0	363	15.9	31.2	4,604
Participant role						
All teachers	250	0	173	16.8	24.6	4,205
All teacher leaders	37	0	363	43.3	68.0	1,602
All administrators	36	0	8	0.4	1.5	13
Cohort						
Cohort 1 / teacher started 2016−2017	40	0	173	25.5	44.1	1,019
Cohort 1 / teacher started 2017−2018	18	0	123	16.8	28.3	302
Cohort 1 / teacher started 2018−2019	27	0	63	13.8	15.4	373
Cohort 2 / teacher started 2017−2018	120	0	363	16.9	37.0	2,025
Cohort 2 / teacher started 2018−2019	84	0	60	10.5	13.8	885
School level						
Elementary school participants	110	0	363	14.4	37.8	1,580
K–8 participants	56	0	60	13.4	14.9	752
Middle school participants	91	0	123	15.2	20.4	1,383
6–12 participants	32	0	173	27.8	47.4	889
Content area taught						
Elementary/multiple subjects	109	0	84	12.8	17.5	1,400
Secondary ELA	47	0	173	25.6	35.3	1,201
Secondary social studies/history	45	0	173	18.7	31.5	842
Secondary science	24	0	47	11.3	12.7	271

Subgroup results for the module editing largely mirrored those found for page viewing. There was a dramatic difference between teacher leaders and teachers, with teacher leaders

editing more than twice the number of modules on average (43.3 compared to 16.8). Most administrators did not engage at this level in 2018–2019, with just three administrators making any edits. As with module viewing, participants who began participating in LDC in the same year their school launched the program edited more modules than participants who joined PLCs in later years. Teachers in 6–12 schools as well as those teaching secondary ELA edited modules at greater levels than their peers.

Table 4.4

Descriptive Statistics for the Number of Times a Participant Commented on a Module in CoreTools, by Participant Subgroup

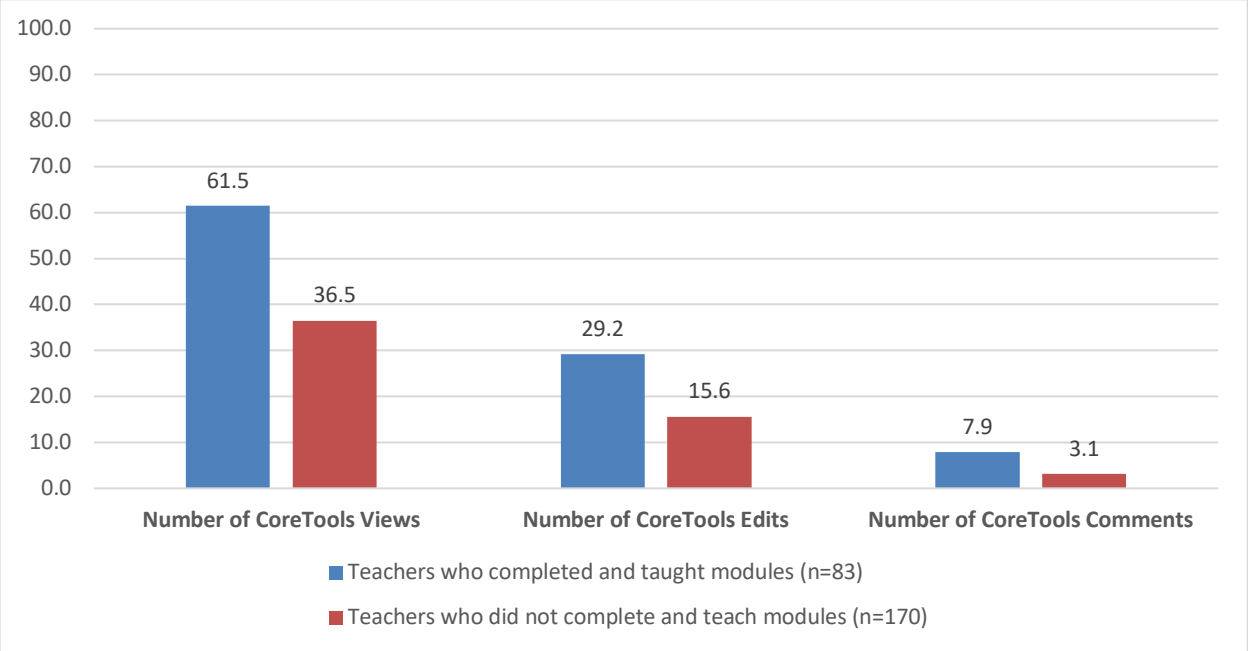
Subgroup	*N*	Min	Max	*Mean*	*SD*	Sum
All participants	289	0	209	3.1	14.3	894
Participant role						
All teachers	250	0	100	2.7	8.0	665
All teacher leaders	37	0	209	11.7	34.8	434
All administrators	36	0	7	0.2	1.2	8
Cohort						
Cohort 1 / teacher started 2016−2017	40	0	100	6.7	17.5	266
Cohort 1 / teacher started 2017−2018	18	0	22	3.4	5.2	61
Cohort 1 / teacher started 2018−2019	27	0	5	1.3	1.5	34
Cohort 2 / teacher started 2017−2018	120	0	209	3.6	19.5	434
Cohort 2 / teacher started 2018−2019	84	0	9	1.2	2.0	99
School level						
Elementary school participants	110	0	209	4.8	22.4	522
K–8 participants	56	0	39	2.5	5.8	141
Middle school participants	91	0	22	1.7	3.3	151
6–12 participants	32	0	20	2.5	5.3	80
Content area taught						
Elementary/multiple subjects	109	0	100	3.0	10.8	323
Secondary ELA	47	0	39	4.2	7.4	195
Secondary social studies/history	45	0	10	1.5	2.7	68
Secondary science	24	0	5	1.3	1.5	32

Module Commenting

Only 127 participants, 44% of all participants, made at least one comment on a module. As shown in Table 4.4, while participants commented between zero and 209 times, the average was just over three times. Across participant roles, teacher leaders had the highest level of engagement, with about 12 comments on average. As with module viewing and editing, participants who began participating in LDC in the same year their school launched the program commented on more modules than participants who joined PLCs in later years. Elementary level and secondary ELA participants made more comments than their peers on average.

Figure 4.1

Mean Number of CoreTools Views, Edits, and Comments Made by Teachers Who Did and Did Not Complete and Teach Module



4.3 CoreTools Engagement as an Implementation Variable

To evaluate the validity of CoreTools engagement as an indicator of LDC implementation, we examined the relationship between the three CoreTools engagement measures and module implementation. As described in the next chapter, CRESST identified full-length modules that i3 teachers created and/or adapted and taught in their classrooms. While all teachers may have taught the module(s) in their classrooms, we took the presence of uploaded student work as evidence of teachers having done so. Figure 4.1 displays the mean number of CoreTools views, edits, and comments for the 83 participants who completed and taught at least one full-length LDC module and their 170 peers for whom we do not have evidence of full module implementation. As shown, teachers who completed and taught full-length LDC modules

exhibited considerably more engagement with CoreTools than their peers, across all three metrics. The results suggest that participants who engage deeply with the module building platform are more likely to complete and teach LDC modules.

4.4 Summary of Results

While descriptive analyses of CoreTools user behavior showed evidence of broad engagement with LDC's module building platform, the depth of that engagement varied greatly across users. Nearly all 2018−2019 LDC participants, including principals, created a CoreTools user account, and the majority of teachers in PLCs viewed and edited modules. The average teacher, however, only made 17 edits to modules within CoreTools. While this might be interpreted as evidence that teachers' engagement in instructional design was somewhat limited, the CoreTools data do not provide any measures of instructional design work conducted offline by individuals or groups of teachers.

Furthermore, this descriptive analysis provides a broad rather than deep look, and does not consider LDC expectations that teachers will do very little design work on their first module and extensive instructional design on their later modules. Teacher leaders on average engaged at higher levels than their peers not playing a leadership role in the LDC intervention. Teachers who began participating in LDC at the same time that their schools launched the program engaged at higher levels than teacher who joined in later years. Participants teaching secondary ELA also engaged at higher levels than their peers.

5.0 Module Artifact Analysis

This section presents results for the analysis of modules that LDC teachers submitted during the 2018–2019 school year. We first present overall results across the grade bands. This is followed by separate results for the elementary and secondary modules. Finally, we present results of an exploratory analysis examining module rating results across time for teachers who submitted modules across the last two school years, the qualitative results, and a summary of the findings. Appendix F has the Generalization theory results.

Table 5.1 shows the overall means and standard deviations by grade band for the module artifact analysis. It is noted that the secondary modules had similar or higher ratings than the elementary modules on most of the dimensions. More specifically, mean ratings for the secondary modules ranged from 3.02 to 3.41, indicating that on average all dimensions were moderately present or realized. The mean ratings for the elementary modules ranged from the high twos to low threes (2.88 to 3.29), with all dimensions or approaching or being moderately present or realized. While the highest mean for the elementary modules was for Dimension 3, which measures fidelity to LDC instruction, this was the lowest for the secondary modules (3.02). Finally, the highest mean for the secondary modules was for Dimension 4, which measures the quality of the instructional strategies (3.41).

Table 5.1

Means and Standard Deviations for the Modules

Dimension	Elementary	Secondary	Overall
Dimensions	*n* = 48	*n* = 61	*n* = 109
1. Effective writing task	3.12 (1.21)	3.08 (1.26)	3.10 (1.23)
2. Standards alignment	2.88 (1.06)	3.23 (0.97)	3.07 (1.02)
3. Fidelity to LDC instruction	3.29 (1.18)	3.02 (1.18)	3.14 (1.18)
4. Quality instructional strategies	3.10 (1.13)	3.41 (1.16)	3.28 (1.15)
5. Coherence/clarity of module	3.12 (1.12)	3.21 (1.03)	3.17 (1.07)
6. Overall impression	3.10 (0.93)	3.28 (0.76)	3.20 (0.84)
Average (Dimensions 1 to 5)	3.10 (0.94)	3.19 (0.75)	3.15 (0.84)

Furthermore, as one would hope to find, the average summary scores for the first five dimensions were similar to the overall impression ratings (Dimension 6) provided by the expert teachers. Finally, when examining the frequencies, about 40% of the elementary and secondary modules, respectively, received ratings of four or five on the different dimensions. Among the elementary modules, the proportion was lower for Dimension 2 (25%) and was higher for

Dimension 3 (50%). Finally, the secondary modules had a higher proportion of ratings of four and five on Dimension 4 (59%). Greater detail about the frequencies can be found in Appendix F.

5.1 Analysis of Elementary Modules

The following section presents descriptive results for the elementary modules disaggregated by content area and then by LDC cohort. Results from the generalizability theory modules as well as the expanded descriptive results for the elementary modules can be found in Appendix F.

Descriptive Results by Content Area

Table 5.2 presents descriptive results for the elementary modules by content area. A few comparative observations can be made. First, most of the means were in the low to mid threes for each of the content areas. The dimensions that received means below three involved Dimension 1 for the ELA sample (2.75) and Dimension 2 for the science and social studies samples (2.54 and 2.92). Furthermore, the science modules received a mean of 4.00 on Dimension 3, which measures fidelity to LDC instruction. Second, the science modules received higher means than the other content areas on all of the dimensions except for Dimension 2. Third, it can be seen that the average ratings across Dimensions 1 to 5 (2.97 to 3.36) were similar to those provided by the expert raters for Dimension 6 (3.00 to 3.27). Finally, the proportion of ratings of four or greater out of a possible five were generally less than 50% for the different dimensions. The exceptions for the science modules involved Dimensions 1 and 3 (64%, respectively) and for the social studies modules also involved Dimension 3 (62%).

Table 5.2

Means and Standard Deviations for the Elementary Modules by Content Area

Dimensions	ELA	Science	Social Studies
	n = 24	*n* = 11	*n* = 13
1. Effective writing task	2.75 (1.33)	3.73 (0.65)	3.31 (1.18)
2. Standards alignment	3.00 (0.88)	2.54 (1.13)	2.92 (1.32)
3. Fidelity to LDC instruction	3.00 (1.14)	4.00 (0.89)	3.23 (1.30)
4. Quality instructional strategies	3.08 (1.25)	3.18 (0.98)	3.08 (1.12)
5. Coherence/clarity of module	3.00 (1.18)	3.36 (1.03)	3.15 (1.14)
6. Overall impression	3.08 (0.97)	3.27 (0.79)	3.00 (1.00)
Average (Dimensions 1 to 5)	2.97 (0.98)	3.36 (0.64)	3.14 (1.10)

Descriptive Results by Cohort

Table 5.3 presents descriptive results for the elementary modules for the three Cohort 1 groups (2016−2017, 2017−2018, 2018−2019) and two Cohort 2 groups (2017−2018, 2018−2019). Because of the large differences in sample sizes, we focus our discussion on the groups with five or greater modules. First, as can be seen, means for the Cohort 2 teachers who started in 2017−2018 (2.61 to 3.04) scored lower than those found for the Cohort 2 teachers who started in 2018−2019 (3.26 to 3.74). Second, when looking at the overall means, the two cohorts had different strengths. More specifically, Cohort 1 modules received the highest means for Dimensions 4 to 6, while Cohort 2 modules received their highest means for Dimensions 1 and 3. Third, when comparing the ratings for Dimension 6 with the average across Dimensions 1 to 5, means are very similar for Cohort 2, but are moderately high for Cohort 1. Finally, when examining the proportion of ratings of four or five, percentages were generally highest for Dimension 3 (see Appendix F).

Table 5.3

Means and Standard Deviations for the Elementary Modules by i3 Cohort Grouping

Dimensions	2016−2017	2017−2018	2018−2019	Total
COHORT 1	*n = 4*	*n = 1*	*n = 1*	*n = 6*
1. Effective writing task	--	--	--	2.50 (0.55)
2. Standards alignment	--	--	--	2.67 (1.03)
3. Fidelity to LDC instruction	--	--	--	2.83 (0.98)
4. Quality instructional strategies	--	--	--	3.17 (1.17)
5. Coherence/clarity of module	--	--	--	3.17 (1.17)
6. Overall impression	--	--	--	3.17 (0.75)
Average (Dimensions 1 to 5)	--	--	--	2.87 (0.66)
COHORT 2	NA	*n* = 23	*n* = 19	*n* = 42
1. Effective writing task	NA	2.96 (1.06)	3.53 (1.43)	3.21 (1.26)
2. Standards alignment	NA	2.61 (1.08)	3.26 (0.99)	2.90 (1.08)
3. Fidelity to LDC instruction	NA	3.04 (1.40)	3.74 (0.80)	3.36 (1.21)
4. Quality instructional strategies	NA	2.83 (1.23)	3.42 (0.96)	3.10 (1.14)
5. Coherence/clarity of module	NA	2.87 (1.29)	3.42 (0.840	3.12 (1.13)
6. Overall impression	NA	2.78 (1.04)	3.47 (0.70)	3.10 (0.96)
Average (Dimensions 1 to 5)	NA	2.86 (1.08)	3.47 (0.73)	3.14 (0.98)

Note. Means not presented for samples of less than five.
Members of Cohort 2 did not participate in LDC during the 2016–2017 school year.

5.2 Analysis of Secondary Modules

The following section presents descriptive results for the secondary modules disaggregated by content area and then by cohort group. Results from the generalizability theory modules as well as the expanded descriptive results for the secondary modules can be found in Appendix F.

Descriptive Results by Content Area

Table 5.4 presents descriptive results for the secondary modules by content area. A few comparative observations can be made. First, the ELA modules generally had higher mean ratings than the ones in the other two content areas. For example, the ELA means ranged from 2.97 to 3.74, indicating that the dimensions were moderately present or realized. In contrast, the science means ranged from 2.80 to 3.50 and the social studies means ranged from 2.40 to 3.20. Second, while the science modules received the highest mean ratings for the first three dimensions, which focused on foundational issues, the ELA and studies modules had higher means for the last three dimensions. Third, when comparing the average ratings across Dimensions 1 to 5 with the expert ratings for Dimension 6, the results showed small differences. Means for Dimension 6 were slightly higher for ELA and social studies, and were slightly low for science. Finally, when looking at the proportion of ratings of four or greater out of a possible five, percentages were fairly large for ELA and science (42% to 77%, 40% to 60%), but were much lower for social studies (15% to 40%).

Table 5.4

Means and Standard Deviations for Secondary Modules by Content Area

Dimensions	ELA	Science	Social Studies
	n = 31	*n* = 10	*n* = 20
1. Effective writing task	3.39 (1.02)	3.50 (1.27)	2.40 (1.35)
2. Standards alignment	3.42 (0.85)	3.30 (1.49)	2.90 (0.79)
3. Fidelity to LDC instruction	2.97 (1.38)	3.30 (1.16)	2.95 (0.82)
4. Quality instructional strategies	3.74 (1.15)	2.80 (1.32)	3.20 (0.95)
5. Coherence/clarity of module	3.48 (0.85)	2.80 (1.32)	3.00 (1.08)
6. Overall impression	3.52 (0.68)	3.00 (1.15)	3.05 (0.51)
Average (Dimensions 1 to 5)	3.40 (0.68)	3.14 (1.15)	2.89 (0.50)

Results by Cohort

Table 5.5 presents descriptive results for the secondary modules for the three Cohort 1 groups (2016−2017, 2017−2018, 2018−2019) and two Cohort 2 groups (2017−2018,

2018−2019). First, most of the mean ratings were in the low to mid threes. The exceptions for Cohort 1 included Dimension 1 for those who started in 2016−2017, and Dimensions 1, 2, and 5 for those who started LDC in 2017−2018. The only exception for Cohort 2 includes Dimension 3 for those who started in 2018−2019. Modules for the two Cohorts also have different strengths and weaknesses. More specifically, the highest means for Cohort 1 were for Dimension 4, which measures quality instructional strategies and were lowest for Dimension 1, which measures the effective writing task. In contrast, for Cohort 2, the lowest means were for Dimension 3, which measures fidelity to LDC instruction. The highest means for Cohort 2 were for Dimension 1 (2017−2018) and Dimension 2 (2018−2019). When comparing results for Dimension 6 with the averages for Dimensions 1 to 5, means generally showed small to very small differences. Finally, when looking at the proportion of ratings of four or greater out of a possible five, percentages were generally over 50% for the Cohort 2 teachers who started LDC in 2017−2018. In contrast, percentages were often below 50% for the other cohort groups (see Appendix F).

Table 5.5

Means and Standard Deviations for the Secondary Modules by i3 Cohort Grouping

Dimensions	2016−2017	2017−2018	2018−2019	Total
COHORT 1	*n = 14*	*n = 14*	*n = 9*	*n = 34*
1. Effective writing task	2.93 (1.14)	2.54 (1.63)	3.00 (1.41)	2.82 (1.36)
2. Standards alignment	3.29 (0.91)	2.73 (0.79)	3.44 (1.01)	3.15 (0.92)
3. Fidelity to LDC instruction	3.00 (1.18)	3.09 (0.83)	3.11 (1.17)	3.06 (1.04)
4. Quality instructional strategies	3.57 (1.34)	3.36 (0.92)	3.47 (1.28)	3.47 (1.16)
5. Coherence/clarity of module	3.50 (1.16)	2.82 (1.08)	3.00 (1.00)	3.15 (1.10)
6. Overall impression	3.43 (0.76)	3.00 (0.63)	3.11 (0.78)	3.21 (0.73)
Average (Dimensions 1 to 5)	3.26 (0.77)	2.91 (0.73)	3.20 (0.72)	3.13 (0.74)
COHORT 2	NA	*n = 17*	*n = 10*	*n* = 27
1. Effective writing task	NA	3.65 (0.93)	3.00 (1.15)	3.41 (1.05)
2. Standards alignment	NA	3.41 (1.06)	3.20 (1.03)	3.33 (1.04)
3. Fidelity to LDC instruction	NA	3.24 (1.44)	2.50 (1.08)	2.96 (1.34)
4. Quality instructional strategies	NA	3.47 (1.28)	3.10 (0.99)	3.33 (1.18)
5. Coherence/clarity of module	NA	3.47 (0.87)	3.00 (1.05)	3.30 (0.95)
6. Overall impression	NA	3.59 (0.80)	3.00 (0.67)	3.37 (0.79)
Average (Dimensions 1 to 5)	NA	3.45 (0.77)	2.96 (0.69)	3.27 (0.77)

Note. Members of Cohort 2 did not participate in LDC during the 2016–2017 school year.

5.3 Exploratory Analysis of Modules

As previously noted, in order to examine potential growth among returning teachers, ratings were compared for teachers who were the first author and submitted complete modules in both the 2017–2018 and 2018–2019 school years. The following presents descriptive results for the last complete module submitted by these teachers. Tables 5.6 and 5.7 present results for the 13 elementary teachers and 30 secondary teachers who submitted complete modules as specified during both school years.

When examining the elementary results, change in performance varied by dimension (see Tables 5.6 and 5.7). More specifically, means increased slightly (0.08 to 0.15) for Dimensions 3 to 5, which measure fidelity to LDC, quality instructional strategies, and coherence and clarity. In addition, more than half of the elementary teachers showed no change or had improved ratings for these three dimensions (53.8% to 76.9%). In contrast, means dropped by about one-half point for Dimension 6 across the two school years, and more than half of the teachers showed a drop in their rating (53.8%). Finally, means dropped by approximately one point for Dimensions 1 and 2 across the two school years. In this case, no teachers showed an improvement for Dimension 1 and only one showed an improvement across the 2 years for Dimension 2.

When examining the secondary results, means were similar across the two school years for most of the dimensions. For example, means increased by 0.03 for Dimensions 2 and 6 and went down by only 0.10 to 0.13 for Dimensions 1, 4, and 5. The only dimension with a moderate decrease (0.33) measured fidelity to LDC instruction (Dimension 3). Furthermore, one-third or more of teachers had an increase in ratings for all of the dimensions except Dimension 3, which measures fidelity to LDC instruction. Moderate percentages of teachers also showed no change across the 2 years for Dimensions 2 to 6 (26.7% to 40.0%).

We also calculated cohort level results for the elementary and secondary teachers. As with the overall elementary results, the Cohort 2 teachers showed mixed results by dimension, with moderate to large decreases (0.56 and 0.89) for the first two dimensions, and a large increase of 0.78 for Dimension 3. In contrast, for the secondary modules the Cohort 1 means showed small to moderate decreases (0.10 to 0.40) and the Cohort 2 means showed small to large increases for all dimensions except Dimension 3. Finally, while half of the secondary Cohort 2 teachers showed decreases for Dimension 3, which measures fidelity to LDC instruction, the other half showed no change or improvement. Despite this, these results should be considered tentative because of the large differences in sample size between the cohorts. See Appendix F for further results.

Table 5.6

Means and Standard Deviations for the Exploratory Analysis of Modules

Dimension	2017—2018	2018—2019	Change
ELEMENTARY (*n* = 13)			
1. Effective writing task	4.15 (0.90)	3.23 (0.83)	-0.92 (0.86)
2. Standards alignment	3.92 (0.95)	2.85 (0.99)	-1.08 (1.04)
3. Fidelity to LDC instruction	3.38 (1.32)	3.54 (1.27)	0.15 (1.91)
4. Quality instructional strategies	3.31 (0.75)	3.46 (1.20)	0.15 (1.40)
5. Coherence/clarity of module	3.46 (0.78)	3.54 (1.27)	0.08 (1.19)
6. Overall impression	3.77 (0.60)	3.31 (0.86)	-0.46 (0.88)
Average (Dimensions 1 to 5)	3.65 (0.58)	3.32 (0.91)	-0.32 (0.90)
SECONDARY (*n* = 30)			
1. Effective writing task	3.27 (1.23)	3.13 (1.31)	-0.13 (1.55)
2. Standards alignment	3.07 (1.08)	3.10 (0.92)	0.03 (1.47)
3. Fidelity to LDC instruction	3.50 (1.25)	3.17 (1.18)	-0.33 (1.27)
4. Quality instructional strategies	3.70 (1.02)	3.60 (1.19)	-0.10 (1.60)
5. Coherence/clarity of module	3.50 (0.82)	3.37 (1.07)	-0.13 (1.25)
6. Overall impression	3.40 (0.86)	3.43 (0.73)	0.03 (1.27)
Average (Dimensions 1 to 5)	3.41 (0.75)	3.27 (0.78)	-0.13 (1.13)
OVERALL (*n* = 43)			
1. Effective writing task	3.53 (1.20)	3.16 (1.17)	-0.37 (1.41)
2. Standards alignment	3.33 (1.11)	3.02 (0.94)	-0.30 (1.44)
3. Fidelity to LDC instruction	3.47 (1.26)	3.28 (1.20)	-0.19 (1.48)
4. Quality instructional strategies	3.58 (0.96)	3.56 (1.18)	-0.02 (1.54)
5. Coherence/clarity of module	3.49 (0.80)	3.42 (1.12)	-0.07 (1.22)
6. Overall impression	3.51 (0.80)	3.40 (0.76)	-0.12 (1.18)
Average (Dimensions 1 to 5)	3.48 (0.71)	3.29 (0.81)	-0.19 (1.06)

Table 5.7

Counts and Percentages for the Exploratory Analysis of Modules

Dimension	Negative		No Change		Positive	
	#	%	#	%	#	%
ELEMENTARY (*n* = 13)						
1. Effective writing task	8	61.5	5	38.5	0	0.0
2. Standards alignment	10	76.9	2	15.4	1	7.7
3. Fidelity to LDC instruction	6	46.2	2	15.4	5	38.5
4. Quality instructional strategies	3	23.1	4	30.8	6	46.2
5. Coherence/clarity of module	5	38.5	2	15.4	6	46.2
6. Overall impression	7	53.8	4	30.8	2	15.4
Average (Dimensions 1 to 5)	7	53.8	2	15.4	4	30.8
SECONDARY (*n* = 30)						
1. Effective writing task	13	43.3	5	16.7	12	40.0
2. Standards alignment	10	33.3	10	33.3	10	33.3
3. Fidelity to LDC instruction	14	46.7	11	36.7	5	16.7
4. Quality instructional strategies	8	26.7	12	40.0	10	33.3
5. Coherence/clarity of module	12	40.0	8	26.7	10	33.3
6. Overall impression	9	30.0	11	36.7	10	33.3
Average (Dimensions 1 to 5)	15	50.0	3	10.0	12	40.0
OVERALL (*n* = 43)						
1. Effective writing task	21	48.8	10	23.2	12	27.9
2. Standards alignment	20	69.8	12	27.9	11	25.6
3. Fidelity to LDC instruction	20	69.8	13	30.2	10	23.2
4. Quality instructional strategies	11	25.6	16	37.2	16	37.2
5. Coherence/clarity of module	17	39.5	10	23.2	16	37.2
6. Overall impression	16	37.2	15	34.9	12	27.9
Average (Dimensions 1 to 5)	22	51.2	5	11.6	16	37.2

5.4 Qualitative Results

Expert raters were asked to write notes about the reasoning behind their ratings for each module. This was done to assist in the consensus making process for all modules coded by more

than one expert teacher, to shed light on the ratings in general, and to suggest potential ways to improve ratings in the future. The following presents key themes that emerged concerning Dimensions 1 through 5, as well as our expert raters' overall impression.

Dimension 1: Effective Writing Task

While more than three-fourths of the modules received ratings of three to five on this dimension, the writing task was not always realized. Modules that received low ratings tended to have less information for the expert raters to evaluate. For example, many modules lacked a background for students, an extension activity, and/or summary information on the coversheet. When provided, these components were not always clear and, in some cases, did not match the rest of the module.

Dimension 2: Standards Alignment

While standards alignment was generally good, higher ratings of four or five were much more common for the secondary modules than for the elementary ones. When providing lower ratings for this dimension, the expert raters noted the following issues. First, modules tended to have reading standards, but were less likely to have key writing, science, or social studies standards that matched the task and instruction. Second, some of the modules had standards at different grade bands—primary and upper elementary or elementary and secondary—but did not always provide an explanation for this misalignment (e.g., special needs classes, remedial coursework, etc.). Third, some modules included standards from other states.

Dimension 3: Fidelity to LDC Module Instruction

One of the goals of Dimension 3 is to examine the distribution of activities and time spent on the four stages of the LDC instructional practice (preparation for the task, reading process, transition to writing, and writing process). Modules that received low ratings tended to be missing skills and mini tasks that our expert teachers thought were necessary to meet the writing task and standards. In some cases, modules had skills listed, but did not provide a mini task, or the mini task(s) provided had scant information about the planned instruction. Low rated modules also lacked additional information in the module summary, background, extension, and/or reflection from which to judge the reason(s) for the omissions.

Dimension 4: Quality Instructional Strategies

Modules that received high ratings of four or five for this dimension were noted to be thorough and detailed, and were sometimes noted to have student work that reflected this quality. In contrast, modules that received low ratings of one or two often had minimal details and/or student work that did not reflect the strategies. In some instances, expert teachers also noted that instructional strategies did not match the task, were not specific to the lesson, and/or did not match the grade level or grade band specified. Finally, raters noted that it was more difficult to determine whether the strategies were realized when only one student work sample was attached, or the attachments only reflected one level (e.g., only advanced).

Dimension 5: Coherence and Clarity of Module

Modules that received low ratings of one or two for Dimension 5 tended to have weaknesses across the other dimensions and components. For example, expert raters tended to notice issues with the quality of the writing task, standards alignment, skills, and instructional strategies. Raters also noted issues with student work not matching other components, or providing limited evidence for the goals of the lesson being met.

Dimension 6: Overall Impressions

Modules that received the highest rating of five for Dimension 6 were frequently described in very positive terms. Expert raters called these modules strong, focused, great, well planned, and thorough. In addition, during debriefings expert raters talked about how these modules were ready to implement. In contrast, modules that received low ratings of one or two tended to receiving comments about being incomplete or missing many or most of the expected components. In some cases, comments started out stronger, but raters found that the skills, instruction, and/or student work did not realize the potentials of the module.

5.5 Summary of Results

Based on the primary analyses, teachers as a whole did not show growth in the quality of their modules over the last two school years. More specifically, average quality for the elementary modules went down by a half point (3.57 to 3.10) and the quality of the secondary modules went down slightly (3.34 to 3.19). As such, the average module was moderately present or realized during both school years. Despite this, moderate proportions of elementary (25% to 50%) and secondary modules (38% to 59%) received ratings of four or five on the dimensions, representing features that are sufficiently to fully present or realized.

Differences in quality were also found when examining results by subgroup. For example, quality for the elementary modules was strongest for science and for Cohort 2 teachers who started during the 2018−2019 school year, and was weakest for ELA and Cohort 2 teachers who started during the 2017−2018 school year. In contrast, differences were found by dimension for the secondary modules. More specifically, means for Dimension 1, which evaluates the writing task, were highest for the science modules and those created by Cohort 2 teachers who begin implementing LDC during 2017−2018. Furthermore, means for Dimensions 4 and 5, which evaluate the instructional strategies as well as coherence and clarity, were highest for secondary ELA and modules developed by Cohort 1 teachers who began LDC during 2016−2017. Despite this, because of the variation in sample sizes, these differences should be considered tentative.

An exploratory analysis was also conducted to examine growth in performance for the 13 elementary teachers and 30 secondary teachers who submitted complete modules with student work during both the 2017−2018 and 2018−2019 school years. As with the primary analysis, the longitudinal analysis showed somewhat different results for the two grade band

samples. More specifically, module quality for the elementary teachers went down by approximately one point (0.92 and 1.08) for Dimensions 1 and 2, and dropped approximately one-half point (0.46) on Dimension 6. Module quality for the elementary teachers also increased slightly (0.08 to 0.15) for Dimensions 3 to 5. In contrast, overall results were generally flat for the secondary modules. In this case, a moderate decrease in quality was found for Dimension 3 (0.33), and very small decreases in secondary module quality were found for Dimensions 1, 4, and 5. In addition, the proportion of modules that showed no change or increased in quality was typically greater for the secondary modules (53.3% to 73.3%) than for the elementary modules (23.1% to 76.9%) on the different dimensions. Finally, some differences were found by cohort for the secondary teachers, with those in Cohort 1 showing decreases in module quality across dimensions and those in Cohort 2 showing increases in quality for all dimensions except Dimension 3.

6.0 Fidelity of Implementation Analysis

This chapter describes the results of a broad analysis of the LDC schools' fidelity of implementation to the LDC model. As part of Department of Education's requirements, UCLA CRESST and LDC collaborated to create a fidelity matrix to measure schools' fidelity of implementation across four key components of the LDC model. Within the matrix, each key component is measured via multiple indicators, with 14 indicators total across the key components. The key components, as depicted in the LDC logic model (see Figure 1.1) and described in Chapter 1 are (a) common planning time for LDC professional learning community with synchronous coach support; (b) asynchronous support from LDC coaches; (c) teacher implementation activities; and (d) leadership support.

The fidelity matrix can be found in Appendix G. The matrix outlines a process whereby fidelity scores on each indicator are computed for each school, and for the program as a whole. The matrix also produces a score for whether the program met fidelity for each of the four components. Although the process produces school level fidelity scores for all indicators, the initial unit of implementation is either teacher, module, or school depending on the indicator. LDC and CRESST staff worked collaboratively to construct the fidelity matrix, with LDC staff setting the thresholds for adequate implementation on each indicator and at each level of implementation (teacher/module, school, and program).

Data for these 14 fidelity indicators come from four sources. Three indicators are based on data collected via CRESST's teacher survey. Data on these selected survey items are used to produce school- and program-level fidelity scores. Three indicators are based on data from the PLC reflection form collected by LDC, which was filled out by teacher leaders at the school level and used to capture information on both full PLC sessions and one-on-one planning and progress calls between teacher leaders and coaches. Two indicators are based on LDC administrative records capturing attendance by teacher leaders and administrators at in-person meetings occurring four times per year. Finally, six indicators are based on LDC's CoreTools analytic data capturing a variety of behaviors including teachers' viewing of LDC online course content in the LEARN portion of CoreTools, editing of modules, and uploading of student work; and coaches' commenting and providing peer review on modules. This report explores and presents the overall amount of editing and commenting behavior of teacher participants in Chapter 4. Here we focus on whether participants edited key portions of the module, as well as the comments provided by coaches on modules as a measure of their asynchronous feedback.

In this chapter, we first present the overall results for the school- and program-level fidelity scores for all the indicators. We then provide more detailed descriptive results with sections for each of the four key components and subsections for each of the 14 fidelity metrics. Next, we compare fidelity of implementation results to the prior year (2017–2018). We then explore the relationship between the fidelity of implementation indicators and the

student ELA outcome scores at both the school and teacher level in 2018–2019. Finally, we summarize results.

6.1 School- and Program-Level Fidelity of Implementation Scores

Table 6.1 provides a summary for how LDC schools performed across the four key components and 14 indicators of fidelity of implementation. As described in detail in the fidelity matrix in Appendix G, schools were rated on 4-point scales (from 0 to 3) on each indicator. At the school level, adequate implementation was defined as a score of at least 2. For many of the indicators, the 4-point scale is based on the proportion of teachers who met a certain implementation threshold. In order for the program as a whole to meet fidelity on a particular indicator, a designated proportion of schools had to meet the school-level threshold of 2. For example, program-level fidelity for the Key Component 2 indicators were each met if half or more of the schools met fidelity. For all the other indicators (under Key Components 1, 3, and 4) program-level fidelity was met if three quarters of schools met fidelity.

As displayed in Figure 6.1, there was great variation across schools in their success in meeting the implementation thresholds. Schools met fidelity on a range of between 0 and 8 indicators. On average schools met fidelity on 4.4 indicators. Furthermore, no schools met fidelity on more than eight indicators, which suggests that all participating schools had substantial room for growth.

Figure 6.1.

Frequency Distribution of Schools Reaching Adequate Implementation on Different Numbers of Fidelity Indicators

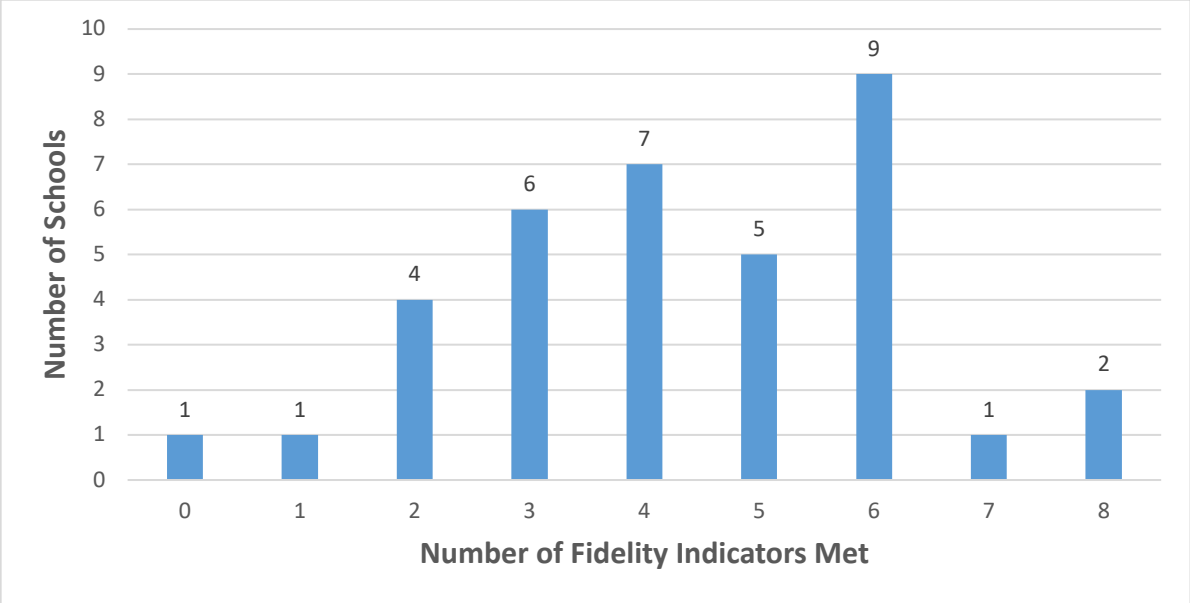


Table 6.1

Summary Table of School- and Program-Level Fidelity Scores by Indicator in 2018–2019

Key component	Indicator	% of schools					Program met fidelity?
		With no data	Level 0	Level 1	Level 2	Level 3	
Key component 1: Common planning time for LDC professional learning community with synchronous coach support	Teacher attendance at weekly PLC meetings	17	50	14	6	14	No
	Amount of time spent on LDC during common planning time	0	17	61	17	6	No
	Exposure to LDC LEARN content during first instructional cycle	0	86	8	3	3	No
	Exposure to LDC LEARN content during second instructional cycle	0	97	0	0	3	No
	Perceived effectiveness of engagement in PLC on teacher competencies	3	25	6	25	42	No
Key component 2: Asynchronous support from LDC coaches	Coach comments on modules	6	14	14	11	56	Yes
	Coach formative peer review on modules	0	92	3	3	3	No
	Teacher perception of the helpfulness of coach written feedback on modules	3	25	8	22	42	Yes
Key component 3: Teacher implementation activities	Module editing	0	64	8	11	17	No
	Module implementation	0	94	3	3	0	No
Key component 4: leadership support at different levels	Frequency of coach/teacher leader monthly meetings	0	3	42	33	22	No
	Administrator attendance at quarterly in-person administrator meetings	0	36	44	14	6	No
	Teacher leader attendance at quarterly in-person teacher leader meetings	0	25	33	17	25	No
	Principal mini-task observation	3	50	3	17	28	No

For fidelity to be met on a key component, the fidelity matrix requires that fidelity be met on each of the indicators for that key component. As a result, the analysis for 2018–2019 concludes that fidelity was not met for the four key components across the LDC schools.

Examining the fidelity scores by indicator, we found that adequate implementation at the program level was met on just 2 of the 14 indicators: coach comments on modules teacher perception of the helpfulness of coach written feedback on modules. A majority of the schools also met the threshold for perceived effectiveness of engagement in PLC on teacher competencies and frequency of coach/teacher leader monthly meetings, although those proportions were not sufficient for the program to be labeled as having adequate implementation on those indicators. For all the other indicators, a minority of the schools met the threshold.

6.2 Key Component 1: Common Planning Time for LDC Professional Learning Community with Synchronous Coach Support

Schools varied greatly in their level of fidelity on the five indicators of Key Component 1, as shown in Figure 6.2. Schools were most successful with regard to teachers' perceptions of the impact of PLC engagement on their skills (*perceived effectiveness of engagement in PLC on teacher competencies*), with 24 out of 36 (67%) of the schools meeting adequate implementation on the indicator. A minority of the schools met fidelity on *teacher attendance at weekly PLC meetings* (19%) and *amount of time spent on LDC during common planning time* (22%). Meeting fidelity on the indicators of exposure to LDC LEARN content was challenging for most schools, with only a few schools reaching the adequate implementation threshold for one of the two metrics.

Teacher Attendance at Weekly PLC Meetings

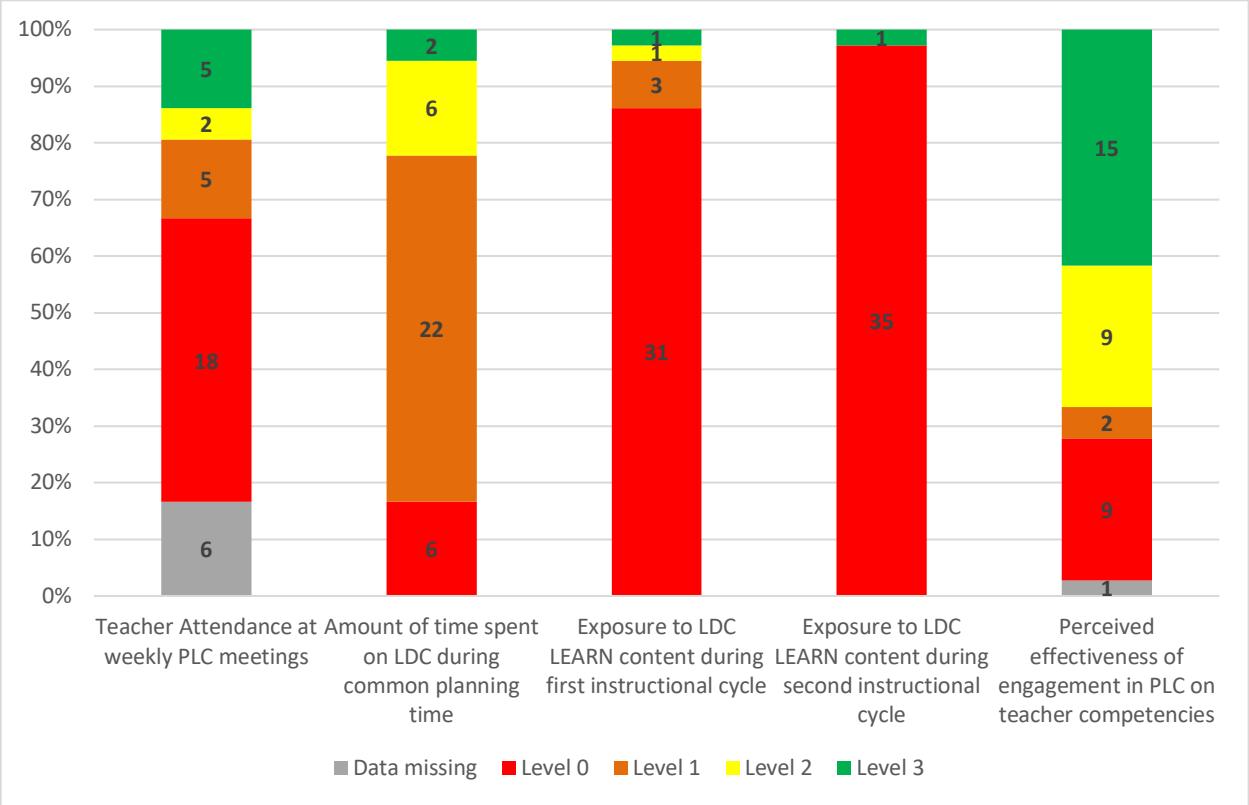
PLC reflection data show that schools varied greatly in terms of the number of times their PLCs met over the course of the 2018–2019 school year. The number of sessions ranged from six to 37 times, with PLCs on average meeting 12.9 times. This is important context for the interpretation of the *teacher attendance at weekly PLC meetings* fidelity indicator. The indicator measures the proportion of teachers who regularly attended sessions, but does not incorporate the number of times that the PLC met across the year.

Attendance rates across the full population of PLC participants varied a great deal, ranging from zero to 100% and averaging 74%. Classroom teachers playing an LDC teacher leader role (n = 28, 87%) attended at higher levels than did classroom teachers not playing a leadership role (n = 187, 72%). Coaches, coordinators, and administrators playing the teacher leader role (n = 4) attended at lower rates than classroom teachers playing the same role. The adequate implementation threshold for individual teacher attendance was 80% or greater, and 115 out of 219 PLC participants (53%) reached this threshold. Only 19% of schools met the threshold of

75% of their PLC participants attending 80% of sessions. A majority of the schools were either at the lowest fidelity level or were missing data as a result of attendance data not being recorded properly.

Figure 6.2

Number of Schools Reaching Different Fidelity Levels for Each Key Component 1 Indicator



Amount of Time Spent on LDC During Common Planning Time

This metric is based on PLC reflection data for the subset of PLC sessions that coaches joined either digitally or in person. In cases where PLC reflection data were not reported accurately, the typical session length was gathered via LDC staff conversations with coaches.

School-level scores were based on the modal (most common) response on the PLC reflection form. For six of the schools that response was under 45 minutes, for 22 schools it was 45–59 minutes, for 6 schools the most common response was 60–74 minutes, and two schools met most frequently for 75–90 minutes. Because of the nature of the data, we cannot ascertain the exact length of the sessions. As such it is possible that many of the sessions recorded as 45–59 minutes came quite close to the desired 60 minutes of PLC time. Nevertheless, according to the thresholds set, a majority of the schools did not meet fidelity on this indicator.

Exposure to LDC LEARN Content During First and Second Instructional Cycles

Here we report on the two indicators measuring PLC participants' engagement with the LEARN online course content (instructional courses that help LDC participants learn how to navigate an LDC instructional cycle). Almost three quarters (74%) teachers and teacher leaders participating in LDC PLCs in 2018–2019 viewed at least one session in each of two instructional cycles. Overall the full population of teachers and teacher leaders on average were exposed to 42% of the LEARN sessions in the first instructional cycle and 28% of the LEARN sessions in the second instructional cycle. This represents a marked improvement over the prior year, when participants on average were exposed to 9% of LEARN sessions in the first instructional cycle and 5% in the second instructional cycle. Despite this improvement in the average exposure, the great majority of teachers and teacher leaders were still not meeting the fidelity threshold of exposure to 60% of instructional cycle sessions. Only 29% of participants met this threshold for the first instructional cycle, and 15% of participants met it for the second instructional cycle.

Overall a total of two schools met the adequate implementation threshold for the first instructional cycle (scoring at Fidelity Levels 2 and 3) and one school met the threshold for the second instructional cycle (the two groups of schools did not overlap). Nearly all the remaining schools scored at the lowest fidelity score level.

Perceived Effectiveness of Engagement in PLC on Teacher Competencies

This indicator is based on the 183 teachers who provided data on Question 30 in the teacher survey (see Appendix A), which asks teachers to report how much their skills had improved in a number of areas aligned with LDC core competencies. Here we base fidelity levels on an index averaging the seven survey items (see Question 30 in Appendix A), which are each measured on a scale of 1 to 4. The threshold for adequate implementation at the teacher level is an index score of 3, corresponding to the survey response reporting moderate improvement in the skill area. Across the whole sample, 9 teachers (5%) had scores of 1 to less than 2 (no to a little improvement), 27 (16%) had scores of 2 to less than 3 (a little to moderate improvement), 83 (48%) had scores of 3 to less than 4 (moderate to great improvement), and 53 (31%) had scores of 4 (great deal of improvement). Over three quarters of respondents in the sample reached the adequate implementation threshold score of 3 or greater on the index.

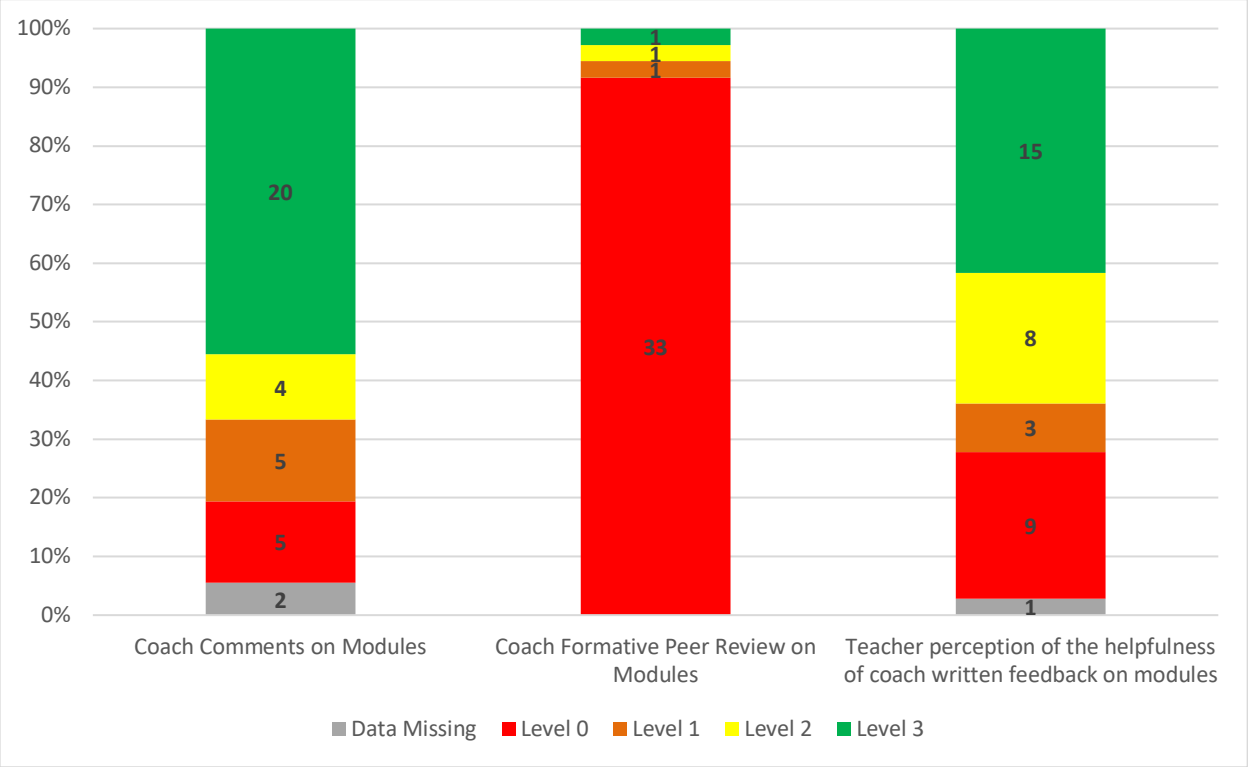
There was a great deal of variation in survey responses both within and across schools. In seven schools, half or fewer of the teachers reported a moderate effect on the competencies. On the other hand, 100% of respondents in 14 schools reported a moderate or greater effect. The variation can be clearly seen in Figure 6.2. Despite nearly 80% of teachers reporting that LDC had an impact on their competencies, only two thirds of the schools had three quarters or more of their teachers report a moderate impact.

6.3 Key Component 2: Asynchronous Support from LDC Coaches

As with Key Component 1, there was a great deal of variation across schools in their level of fidelity on the three Key Component 2 indicators, as shown in Figure 6.3. Nevertheless, a majority of schools met the adequate implementation thresholds for coach comments on modules and teacher perception of the helpfulness of coach written feedback on modules, and as a result the program met fidelity on these two metrics. Coach peer review was a lightly used tool, with almost all of the schools scoring at the lowest fidelity level. Together, the findings suggest that the program was successful with regard to coaches providing useful feedback to LDC participants, although expectations were not being met for the use of the more comprehensive peer review tool as a formative feedback mechanism.

Figure 6.3

Number of Schools Reaching Different Fidelity Levels for Each Key Component 2 Indicator



Coach Comments on Modules

Results on this indicator are based on the universe of modules linked to a LEARN instructional cycle. In total there were 170 modules linked to courses across 34 of the 36 schools, with the number of linked modules per school ranging from 1 to 14 and averaging 5. Those modules in turn received between 0 and 23 comments from coaches (10 modules received 0 comments) and an average of 5.6 comments. An adequate level of feedback on a

linked module was defined as having received two or more coach comments, and 140 out of the total 170 modules (82%) met that threshold. The proportion of modules within schools that met the two-comment threshold varied a great deal across schools, which accounts for the variation in school level fidelity scores as seen in Figure 6.3.

Coach Formative Peer Review on Modules

Results on this indicator are based on the universe of teachers and teacher leaders who co-authored at least one linked course. That population includes 148 participants across 34 schools (two schools did not have any teachers with modules linked to courses). At the teacher level, fidelity was defined as having received at least one peer review from a coach. Only 58 teachers received at least one peer review from their coach, and therefore only 6% of the schools met the school-level fidelity threshold.

Teacher Perception of Helpfulness of Coach Written Feedback on Modules

Across 175 teacher survey respondents, 138 teachers (79%) reported using written feedback on modules and finding it moderately to very helpful. Across schools, the proportion of teachers who reported at least moderate usefulness ranged from 0 to 100% and a mean of 75% (data was not available for one school as a result of a 0% survey response rate at that location). Almost two thirds of schools met the adequate implementation threshold, and therefore the program as a whole met fidelity on this metric.

6.4 Key Component 3: Teacher Implementation Activities

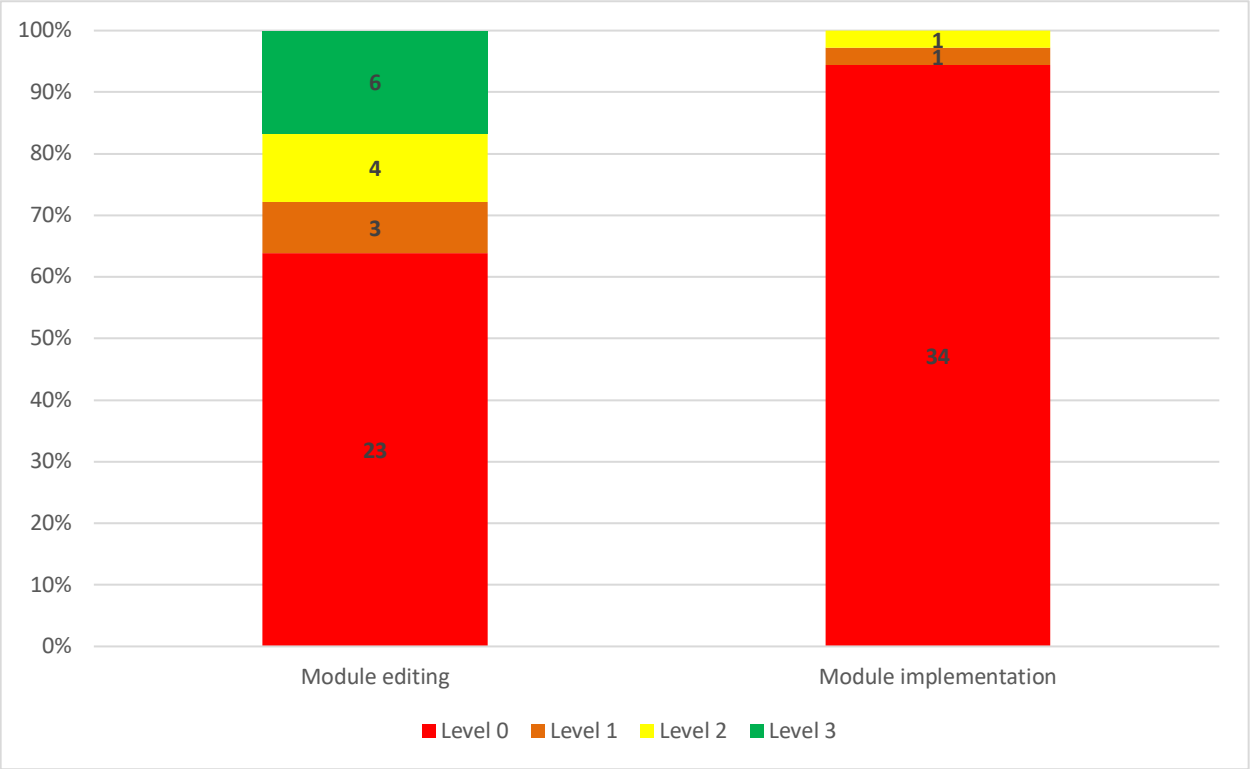
Here we report on indicators related to teachers' engagement with the process of designing and implementing LDC modules. As shown in Figure 6.4, schools were more successful in terms of meeting thresholds for the proportion of their teachers who engaged deeply in the design process by editing key portions of modules, with over a quarter of schools meeting fidelity on this indicator. In contrast, only one of the schools had three quarters or more of their teachers implement two modules, as measured by the uploading of student work samples.

Module Editing

As outlined in the fidelity matrix, teacher fidelity levels are built in a stepladder fashion. Teachers meeting Fidelity Level 1 were required to edit at least one task in a module. Teachers meeting Fidelity Level 2 (adequate implementation) were required to meet Fidelity Level 1 and edit either standards or texts in at least one module; teachers at this level did not edit either skills/mini-tasks or rubrics. Finally, teachers meeting Fidelity Level 3 met the previous two requirements (editing at least one task and standards or texts) and also edited skills/mini-tasks and/or the rubric.

Figure 6.4

Number of Schools Reaching Different Fidelity Levels for Each Key Component 3 Indicator



A total of 119 participants (47%) failed to meet the threshold of editing the teaching task in one module and therefore implemented at a fidelity level of zero. Nineteen participants (7%) edited a task, but did not edit standards or texts, and therefore were at Fidelity Level 1. A total of 118 participants (46%) met the adequate implementation threshold, with 34 (13%) scoring at Level 2 (edited standards or texts) and 84 (33%) scoring at Level 3 (edited standards or texts *and* skills/mini-tasks or rubric). As a result, overall less than half of participants met the teacher-level adequate implementation threshold, and less than one third of schools met the school-level threshold for adequate implementation. It is important to note that in response to teachers collaborating on and implementing common modules in schools, LDC refined its data collection in the summer of 2018 to include tracking engagement data on modules that teachers collaborated on. The fidelity matrix, and CRESST's analyses of editing data, were not designed to capture this shift toward a collaborative model of instructional design in CoreTools, and therefore may not fully capture engagement in the design process.

Module Implementation

For this indicator, our sample includes the 250 classroom teachers who participated in LDC in 2018–2019 (as the metric involves classroom implementation, out-of-classroom staff are excluded). In this case, the uploading of student work served as a proxy for whether the teacher

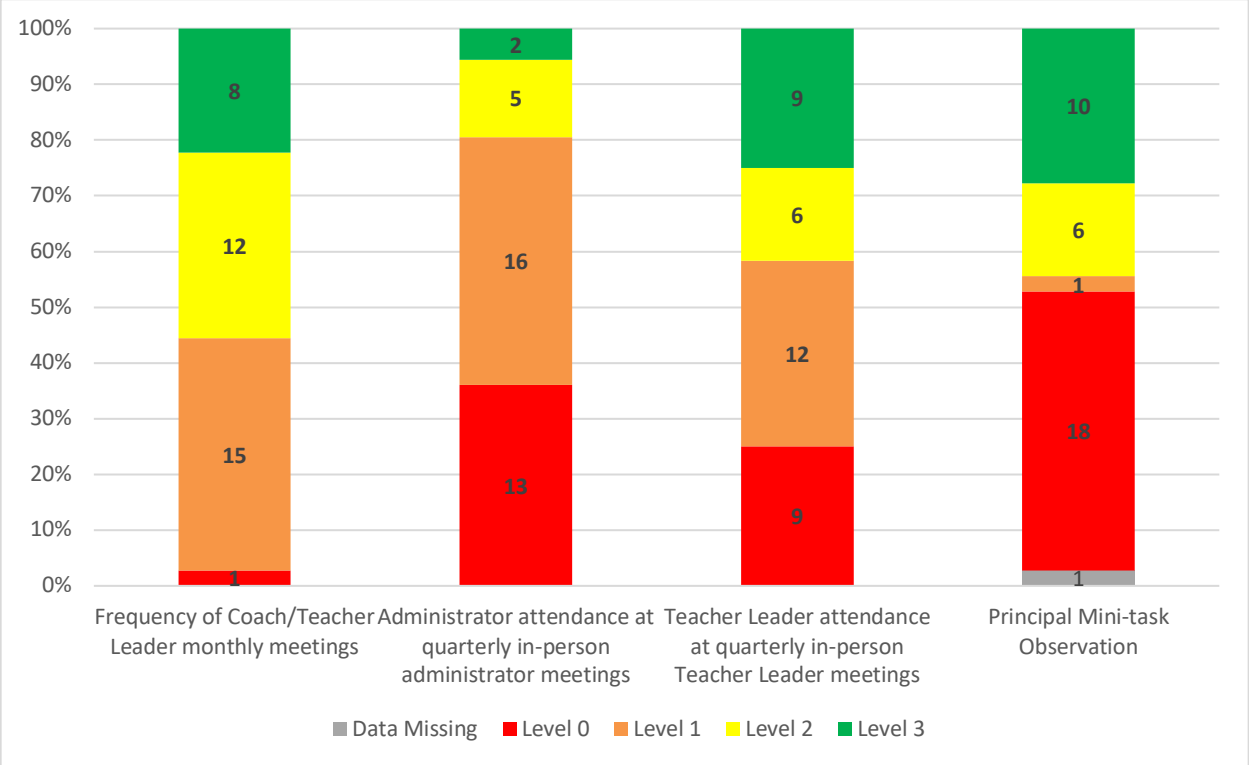
implemented a module in their classroom. The number of modules with uploaded student work ranged from 0 to 5 with a mean of about 0.5. One hundred sixty-seven teachers (67%) didn't upload student work to any modules. Forty (16%) uploaded student work to one module, and 38 (15%) uploaded to two modules. Five teachers (2%) uploaded student work to three or more modules. Overall, just 43 teachers (17%) met the adequate implementation threshold, and as a result only one school met fidelity on the indicator.

6.5 Key Component 4: Leadership Support at Different Levels

As depicted in Figure 6.5, there was a great deal of variation across schools on each of the Key Component 4 metrics. Depending on the metric, between 19% and 56% of schools met fidelity. These results were not positive enough for fidelity to be met at the program level on any of the metrics.

Figure 6.5

Number of Schools Reaching Different Fidelity Levels for Each Key Component 3 Indicator



Frequency of Coach/Teacher Leader Monthly Meetings

Teacher leaders reported meeting with their coach between 3 and 21 times with a mean of 10 times, according to PLC reflection data and communication with coaches. The adequate implementation threshold was set at nine or more coach/teacher leader meetings across the

school year, and 20 of 36 schools (56%) met that threshold. Fifteen of 36 schools (42%) met between four and eight times (low implementation) and one school (3%) met less than four times (very low implementation).

Administrator Attendance at In-Person Administrator Meetings

Administrators had the opportunity to attend three administrator training events. Administrators in 2 schools (6%) attended all three events, in 5 schools (14%) attended two events, in 16 schools (44%) attended one event, and in 13 schools (36%) administrators attended zero events. With the adequate implementation threshold set at two of three events, 7 out of 36 schools (19%) met the threshold.

Teacher Leader Attendance at Quarterly In-Person Teacher Leader Meetings

Teacher leaders also had the opportunity to attend three teacher leader training events. Teacher leaders attended all three events in 9 schools (35%), attended two events in 6 schools (17%), attended one event in 12 schools (33%), and attended zero events in 9 schools (25%). With adequate implementation again set at two of three events, 15 out of 36 schools (42%) met the threshold.

Principal Mini-Task Observation

Teachers were asked to report how many times their administrator observed their teaching of an LDC mini-task. Thirty-eight percent of survey respondents reported never having been observed by an administrator when teaching an LDC mini-task, 24% reported being observed once, 22% reported being observed twice, and 16% reported being observed three or more times. Under the fidelity matrix, 75% of teachers had to be observed for the school to meet fidelity, and only 44% of schools met this threshold.

6.6 Change in Fidelity of Implementation From 2017–2018 to 2018–2019

Here we explore change over time in how the program performed on the 14 different fidelity metrics. Table 6.2 displays the proportion of schools that met fidelity thresholds in 2017–2018 and 2018–2019, and whether the program as a whole met fidelity on the metric in each year. It is important to note that the 2 years of analysis are based on two different samples of schools. Seventeen schools that participated in LDC in 2017–2018 did not continue with the program in 2018–2019. Therefore, the 2018–2019 sample includes 36 schools, compared to 53 schools in 2017–2018.

Table 6.2

Summary Table Displaying Fidelity of Implementation by Metric and Year

		2017–2018		2018–2019	
Key component	Indicator	% of schools that met fidelity threshold (*n* = 53)	Program met fidelity?	% of schools that met fidelity threshold (*n* = 36)	Program met fidelity?
Key component 1: Common planning time for LDC professional learning community with synchronous coach support	Teacher attendance at weekly PLC meetings	49	No	19	No
	Amount of time spent on LDC during common planning time	15	No	22	No
	Exposure to LDC LEARN content during first instructional cycle	0	No	6	No
	Exposure to LDC LEARN content during second instructional cycle	2	No	3	No
	Perceived effectiveness of engagement in PLC on teacher competencies	57	No	67	No
Key component 2: Asynchronous support from LDC coaches	Coach comments on modules	57	Yes	67	Yes
	Coach formative peer review on modules	8	No	6	No
	Teacher perception of the helpfulness of coach written feedback on modules	57	Yes	64	Yes
Key component 3: Teacher implementation activities	Module editing	15	No	28	No
	Module implementation	4	No	3	No
Key component 4: Leadership support at different levels	Frequency of coach/teacher leader monthly meetings	34	No	56	No
	Administrator attendance at quarterly in-person administrator meetings	32	No	19	No
	Teacher leader attendance at quarterly in-person teacher leader meetings	49	No	42	No
	Principal mini-task observation	42	No	44	No

Overall, fidelity was consistent over the 2 years, with the program meeting fidelity on the same 2 of 14 indicators each year: coach comments on modules and teacher perception of the helpfulness of coach written feedback. Trends were mixed with an increase from 2017–2018 to 2018–2019 in the proportion of schools meeting fidelity on 9 of the indicators, and a decrease or the same proportion on 5 of the indicators. Asynchronous support by coaches was a strength of implementation in 2017–2018 and it seemed to be even more so in 2018–2019. Other positive trends included an increase in the proportion of schools with teachers who reported engagement in the PLC was effective in improving their competencies and an increase in engagement around editing modules. Of concern was a decrease in the proportion of schools meeting attendance targets both for PLC sessions and administrator/teacher leader professional development sessions.

6.7 Exploratory Analysis of the Relationship Between Implementation Metrics and Student Outcomes

Here we explore the relationship between fidelity of implementation indicators and student ELA outcome scores at the school level. In order to examine these relationships, we produced school residuals, which are estimates of individual schools' contributions to student ELA scores (i.e., schools' effectiveness in impacting student achievement), holding the other variables in the analysis model constant.

An MMMC model was used to produce individual estimates for each LDC school. The models utilized the analytic sample of Cohort 1 and Cohort 2 elementary and middle school teachers and students reported on in Chapter 7 (the largest sample for our primary quasi-experimental analyses) (see Table 7.3). That model measured outcomes for Cohort 1 teachers in 2017–2018 and Cohort 2 teachers in 2018–2019. The model we used to produce the school residuals was identical to our outcome models with two exceptions: (a) the LDC treatment variable was removed from the equation; and (b) the teacher classification level was removed.

The school residuals were used as the estimates of effectiveness, after adjustment by all the model covariates. These residuals are sometimes referred to as best linear unbiased predictors (BLUPs) in the relevant literature (Robinson, 1991). Because the residuals are obtained from our analytic samples, which exclude many participating schools and teachers for a variety of reasons (e.g., lack of prior or outcome scores; teaching a subject other than ELA, social studies, or science), the resulting estimates represent a subset of all schools that participated in either 2017–2018 or 2018–2019. Residuals were produced for 29 out of 53 schools (55%).

Table 6.3

Mean School-Level Fidelity Scores by Indicator and Achievement Group

Key component	Fidelity indicator	Low-achieving schools (*n* = 10)		Middle-achieving schools (*n* = 9)		High-achieving schools (*n* = 10)		Difference in means significant at 5% level
		M	*N*	*M*	*N*	*M*	*N*	
Key component 1: Common planning time for LDC professional learning community with synchronous coach support	Teacher attendance at weekly PLC meetings	1.44	9	0.75	8	0.63	8	No
	Amount of time spent on LDC during common planning time	1.40	10	0.75	8	0.80	10	No
	Exposure to LDC LEARN content during first instructional cycle	0.40	10	0.00	9	0.10	10	No
	Exposure to LDC LEARN content during second instructional cycle	0.30	10	0.33	9	0.00	10	No
	Perceived effectiveness of engagement in PLC on teacher competencies	2.20	10	1.38	8	1.89	9	No
Key component 2: Asynchronous support from LDC coaches	Coach comments on modules	2.00	10	1.50	8	2.00	10	No
	Coach formative peer review on modules	0.00	10	0.11	9	0.00	10	No
	Teacher perception of the helpfulness of coach written feedback on modules	2.10	10	1.63	8	1.44	9	No
Key component 3: Teacher implementation activities	Module editing	0.60	10	0.56	9	0.70	10	No
	Module implementation	0.10	10	0.00	9	0.00	10	No
Key component 4: Leadership support at different levels	Frequency of coach/teacher leader monthly meetings	2.00	10	0.75	8	1.70	10	Yes
	Administrator attendance at quarterly in-person administrator meetings	0.70	10	1.00	9	1.10	10	No
	Teacher leader attendance at quarterly in-person teacher leader meetings	1.80	10	1.22	9	1.60	10	No
	Principal mini-task observation	2.10	10	0.63	8	1.00	9	Yes

As with the outcome data, fidelity data for this exploratory analysis came from 2 years: 2017–2018 for Cohort 1 schools and 2018–2019 for Cohort 2 schools. For the examination of the relationship between fidelity and outcomes, we included school-level versions of the 14

fidelity matrix indicators, each measured using a 4-point scale of 0 to 3. We examined the distribution of school-level residuals and divided them into three categories: ten low-achieving schools with residuals of less than -0.05, nine middle-achieving schools with residuals between -0.05 and 0.05, and 10 high-achieving schools with residuals greater than 0.05. We then produced mean implementation scores on each indicator for the three achievement groups, which are displayed in Table 6.3. A descriptive examination of the school means did not reveal any consistent pattern between the implementation scores and achievement levels. We also conducted a one-way ANOVA to test whether the differences in means between the three groups were significant. These tests only found statistically significant differences on two indicators, and these results may be an artifact of conducting multiple comparisons. In summary, the analysis provided no evidence of a link between school-level fidelity of implementation on the matrix indicators and school-level effectiveness.

6.8 Summary of Results

In summary, our analysis revealed that none of the schools met fidelity requirements on the four key components in 2018–2019 in New York. The ability of PLCs to set aside common planning time that worked for all teachers varied across schools. The frequency of meetings ranged broadly, as did the attendance rates of the participants. While a handful of schools were able to maintain high attendance rates, most did not meet the desired attendance threshold. When PLCs did meet, they most often met for 45 to 59 minutes, although many sessions also lasted the desired 60 minutes or more. LDC intended for teachers to be exposed to key online course content within PLC time, and this year's fidelity analysis showed substantial improvement at the teacher level on these metrics. The vast majority of schools, however, still did not meet the adequate implementation thresholds for the instructional course exposure metrics. The proportion of schools that met fidelity in terms of teachers' perception of the impact of LDC on their skills increased relative to the prior year; nevertheless, the program as a whole did not meet fidelity on this metric.

Asynchronous support was a strength of implementation in New York. The program met fidelity in both years on coach comments on modules and teachers' perception of the helpfulness of written feedback, and the proportion of schools meeting fidelity on these two indicators increased from 2017–2018 to 2018–2019. Peer review remained a little used function in CoreTools.

Results on module editing suggest that many teachers were not heavily engaged in the design process, with half of teachers not having edited any teaching tasks. Those that did edit the teaching task tended to also edit either standards or texts, and a third of teachers also reached the stage of editing skills/mini-tasks and the rubric. There was evidence that about one quarter of teacher participants implemented at least one module in the classroom, with less than 20% of teachers meeting the adequate implementation threshold of uploading student work for two modules. There was some drop-off in engagement by both administrators and

teacher leaders in professional development meetings from 2017–2018 to 2018–2019. The program was somewhat more successful in 2018–2019 in ensuring regular contact between teacher leaders and coaches and broad engagement by administrators in observing LDC classroom implementation, but overall fidelity was still not met on these indicators.

Variation across schools was substantial. Some schools met fidelity on seven to eight indicators, and on the other end, some schools struggled with nearly every aspect of implementation. No strong patterns emerged for the cohort and school-level subgroups with Cohort 1 and Cohort 2 schools, as well as the elementary and secondary schools meeting similar levels of fidelity, despite great variation within each of the subgroups.

Despite substantial variation across schools and teachers in fidelity of implementation across the different metrics, an exploratory analysis did not find any relationship at the school level between fidelity and effectiveness in impacting student ELA scores.

7.0 Student Outcome Analysis

This section presents the student outcome analysis we conducted to evaluate LDC's impact on student learning in the 2016–2017, 2017–2018, and 2018–2019 school years. As described earlier, our LDC teacher sample included both elementary and middle school teachers from two cohorts of LDC schools in NYCDOE. Our primary analyses examine the impact of LDC as practiced by teachers participating in the program in two consecutive years. These analyses pooled teachers and students from both cohorts of schools, and were conducted for all elementary school teachers, all middle school teachers, and all teachers combined across school levels. Each separate analysis included matching and regression stages.

Another primary analysis examined the impact of Cohort 1 teachers in their third consecutive year of LDC implementation. Additionally, when there was sufficient sample, we conducted supplemental analyses examining cohorts separately and examining teachers who joined existing LDC PLCs in later years.

The following list describes the analyses conducted, including details on cohort, school level, the number of consecutive years that teachers implemented LDC, and the outcome year:

1. Cohorts 1 and 2 elementary school sample: Teachers implementing LDC for 2 consecutive years (Cohort 1: 2016–2017 and 2017–2018; Cohort 2: 2017–2018 and 2018–2019)
2. Cohorts 1 and 2 middle school sample: Teachers implementing LDC for 2 consecutive years (Cohort 1: 2016–2017 and 2017–2018; Cohort 2: 2017–2018 and 2018–2019)
3. Cohorts 1 and 2 elementary and middle school sample: Teachers implementing LDC for 2 consecutive years (Cohort 1: 2016–2017 and 2017–2018; Cohort 2: 2017–2018 and 2018–2019)
4. Cohort 1 middle school sample: Teachers implementing LDC for 3 consecutive years (2016–2017, 2017–2018, and 2018–2019)
5. Cohort 1 elementary school sample: Teachers implementing LDC for 1 year (2016–2017)
6. Cohort 1 middle school sample: Teachers implementing LDC for 1 year (2016–2017)
7. Cohort 1 middle school sample: Teachers implementing LDC for 2 consecutive years (2017–2018 and 2018–2019)
8. Cohort 1 middle school sample: Teachers implementing LDC for 1 year (2017–2018)
9. Cohort 2 elementary school sample: Teachers implementing LDC for 1 year (2017–2018)
10. Cohort 2 elementary school sample: Teachers implementing LDC for 2 consecutive years (2017–2018 and 2018–2019)

11. Cohort 2 middle school sample: Teachers implementing LDC for 1 year (2017–2018)
12. Cohort 2 middle school sample: Teachers implementing LDC for 2 consecutive years (2017–2018 and 2018–2019)
13. Cohort 2 middle school sample: Teachers implementing LDC for 1 year (2018–2019)
14. Additional analyses based on the Cohorts 1 and 2 middle school sample: LDC students with or without prior exposure to LDC teachers and LDC students with high or low LDC dosage in the outcome year

LDC's theory of action predicts that it will take 2 years of experience with LDC before teachers have a measurable impact on student learning. As such, the first four analyses listed constitute this study's primary tests of the impact of LDC. Analyses numbered 5 through 14 are considered supplementary. All supplementary analyses, with the exception of the 14th, examine Cohorts 1 and 2, and elementary and middle school separately. Analyses explore impacts after 1 and 2 years of teacher participation, and explore the effectiveness of teachers who joined LDC as it was being launched at their schools and later in the initiative. The 14th set of analyses break the Cohorts 1 and 2 middle school sample (listed as number 2 above) into subgroups based on whether students were exposed to LDC in the prior year and how much LDC instruction they were exposed to in the outcome year. The complete set of sample, matching, and analysis results tables for each supplemental analysis are presented in Appendix I.

We could not conduct analyses for certain groups of teachers because of sample sizes. More specifically, we could not conduct meaningful analyses of the impact of Cohort 1 elementary teachers who joined in 2016–2017 in their second year of implementation (2017–2018) or Cohort 1 elementary teachers who joined LDC in 2017–2018 or 2018–2019. We were also unable to conduct meaningful analyses of Cohort 1 middle school teachers or Cohort 2 elementary teachers who joined LDC in 2018–2019.

We begin this chapter by describing the process we used to define the LDC student samples for each analysis and to construct matched comparison samples. We then present descriptive statistics for the treatment and comparison groups. Next, we report the estimated impact of LDC on students as measured by their New York State Assessment ELA scores for our primary and supplementary analyses. Finally, we summarize and contextualize the results.

7.1 LDC Sample and the Matching Process

For each analysis, the eligible LDC sample includes all students (a) who were enrolled in one school campus for the entire outcome year under the instruction of at least one of the participating LDC teachers and (b) for whom baseline achievement scores, outcome year achievement scores, and demographic data were available. Achievement and demographic data were used in the matching process. Matching was conducted for each sample/analysis. Here we include the results of the matching for the primary analysis samples (elementary teachers with 2 years of LDC, middle school teachers with 2 years of LDC, combined elementary

and middle school teachers with 2 years of LDC, and Cohort 1 middle school teachers with 3 years of LDC). The matching results for the supplementary analyses are included in Appendix I.

Cohorts 1 and 2 Elementary School Sample (Teachers with 2 years of Implementation)

Across Cohorts 1 and 2, there were 11 LDC schools serving elementary grades and 19 LDC teachers with 2 years of LDC implementation in their classrooms. These 19 teachers were linked to 388 eligible students prior to the CEM process. After the student-level matching, our final pooled elementary LDC sample included 363 students and the same number of teachers and schools prior to matching (see Table 7.1).

Prior to matching, the potential elementary school comparison sample consisted of 781 schools, 8,149 teachers, and 112,663 students. This comparison sample was substantially reduced during the first stage of matching, which identified up to five schools that closely resembled each of the LDC schools. After student-level CEM, a workable analytic comparison sample consisted of 47 schools, 274 teachers, and 363 students.

Table 7.1

Before and After Matching Sample Sizes: Cohorts 1 and 2 Elementary School Analysis for Teachers with 2 Years of LDC Implementation

	LDC sample			Comparison sample		
Stage	Schools	Teachers	Students	Schools	Teachers	Students
Stage 1						
Before school matching	11	19	388	781	8,149	112,663
After school matching	11	19	388	54	432	3,662
Stage 2						
After student matching	11	19	363	47	274	363

Cohorts 1 and 2 Middle School Sample (Teachers with 2 Years of Implementation)

As reported in Table 7.2, the resulting LDC sample for the pooled middle school teachers with 2 years of implementation included 19 schools, 48 teachers, and 2,508 students prior to the CEM process. After the CEM student-level matching, our final pooled middle school LDC sample was reduced to 2,355 students.

Prior to matching, the potential comparison sample consisted of 529 schools, 12,194 teachers, and 213,393 students. This comparison sample was substantially reduced during the first stage of matching, which identified up to five schools that most closely resembled each of the LDC schools. After student-level CEM, a workable analytic comparison sample of 74 schools, 1,212 teachers, and 2,355 students was constructed.

Table 7.2

Before and After Matching Sample Sizes: Cohorts 1 and 2 Middle School Analysis for Teachers with 2 years of LDC Implementation

	LDC sample			Comparison sample		
Stage	School	Teacher	Student	School	Teacher	Student
Stage 1						
Before school matching	19	48	2,508	529	12,194	213,393
After school matching	19	48	2,508	79	1,929	24,076
Stage 2						
After student matching	19	48	2,355	74	1,212	2,355

Cohorts 1 and 2 Elementary and Middle School Sample (Teachers with 2 Years of Implementation)

We also conducted an analysis which pooled teachers with 2 years of LDC experience across cohorts and school levels. As shown in Table 7.3, the resulting LDC sample included 29 schools, 66 teachers, and 2,896 students prior to the CEM process. Note that one LDC school with teachers who participated in two consecutive years spanned elementary and secondary grades. After the CEM student-level matching, our final secondary LDC sample was reduced to 2,718 students.

Table 7.3

Before and After Matching Sample Sizes: Cohorts 1 & 2 Elementary and Middle School Analysis for Teachers with 2 years of LDC Implementation

	LDC sample			Comparison sample		
	Schools	Teachers	Students	Schools	Teachers	Students
Stage 1						
Before school matching	29	66	2,896	1,121	19,597	281,643
After school matching	29	66	2,896	129	2,216	27,651
Stage 2						
After student matching	29	66	2,718	118	1,475	2,718

Prior to matching, the potential comparison sample consisted of 1,121 schools, 19,597 teachers and 281,643 students. This comparison sample was substantially reduced during the

first stage of matching, which identified up to five schools that closely resembled each of the LDC schools. After student-level CEM, a workable analytic comparison sample of 118 schools, 1,475 teachers, and 2,718 students was constructed.

Cohort 1 Middle School Sample for Teachers with 3 Years of LDC Implementation

For Cohort 1 middle schools that started their LDC implementation in 2016–2017, we conducted an additional analysis examining the impact of teachers who had 3 years of LDC experience. As shown in Table 7.4, the resulting Cohort 1 LDC middle school sample included six schools, eleven teachers, and 451 students prior to the CEM process. After the CEM student-level matching, our final secondary LDC sample was reduced to 406 students.

Table 7.4

Before and After Matching Sample Sizes: Cohort 1 Middle School Analysis for Teachers with 3 Years of LDC Implementation

	LDC sample			Comparison sample		
	Schools	Teachers	Students	Schools	Teachers	Students
Stage 1						
Before school matching	6	11	451	480	9,965	153,981
After school matching	6	11	451	25	471	5,613
Stage 2						
After student matching	6	11	406	23	271	406

Prior to matching, the potential comparison sample consisted of 480 schools, 9,965 teachers and 153,981 students. This comparison sample was substantially reduced during the first stage of matching, which identified up to five schools that closely resembled each of the LDC schools. After student-level CEM, a workable analytic comparison sample of 23 schools, 271 teachers, and 406 students was constructed.

7.2 Primary Outcome Analysis: Descriptive Results on the Matched Analytic Samples

Tables 7.5 through 7.8 present the characteristics of the LDC students and comparison students in the four sets of primary analyses respectively. Treatment and comparison samples matched very closely. Exact matching was achieved on some variables, and all demographic variables were within five percentage points. We used the spring 2019 New York State Assessment ELA scores as our outcome measures in all analyses except when we combined Cohorts 1 and 2 schools; for those pooled analyses, spring 2018 test scores were used as the outcome measures for Cohort 1 students. Additionally, the Cohort 1 analyses used the spring

2016 New York State Assessment ELA scores as one of the matching variables while the Cohort 2 analyses used the spring 2017 New York State Assessment ELA scores.

For the baseline and outcome achievement variable, we standardized New York State Assessment ELA scale scores at each grade level relative to district performance, based on the district mean and standard deviation for the ELA test at each grade level. Standardizing scores in this way enabled us to easily compare our samples' performance relative to the district's and to compare scores across grades and years more easily. A standardized scale score of zero, for example, indicates that the student scored at the mean for all other students in the district who took the same test. A standardized scale score of 1.0 meant that the student scored one standard deviation higher than the district mean. Conversely, a standardized scale score of -1.0 indicated that the student scored one standard deviation lower than the district mean.

The pooled LDC elementary school student sample after matching was composed mainly of Hispanic and Black students who were economically disadvantaged (see Table 7.5). English language learners represented 15.4% of this sample, while special education students represented another 15.4%. The sample was also comprised of students in third grade (100.0%) in the baseline year (and therefore in fifth grade in the outcome year). Mean performance on the baseline year assessments was about 30% of a standard deviation below the districtwide performance levels in both mathematics and ELA.

The pooled LDC middle school student sample (see Table 7.6) was mostly composed of Hispanic and Black students, and 83.6% of the middle school students were economically disadvantaged. English language learners represented one eighth of this sample, while special education students represented about 25% of the sample. In addition, mean performance on the baseline year assessments was slightly lower for LDC students, as compared to districtwide performance levels in mathematics and ELA.

Table 7.7 reports the sample information for the students taught by the final pooled LDC sample across both cohorts and school levels. As can be seen, this sample included a very large proportion of Black and Hispanic students (86.6%), and students who were economically disadvantaged (84.4%). English language learners represented about one eighth of this sample, while special education students were roughly a quarter of the sample. A majority of the sample was composed of students in middle school grades during the outcome year. In addition, mean performance on the baseline year assessment was slightly lower for LDC students as compared to districtwide performance levels in mathematics and ELA.

Table 7.8 reports the sample information for the students taught by Cohort 1 middle school teachers with 3 years of LDC. This LDC sample consisted mostly of Black and Hispanic students (93.1%) and students who were economically disadvantaged (87.4%). English language learners represented slightly more than one sixth of this sample, and about one fifth of the students were in special education. In addition, mean performance on the baseline year

assessments was about one half of a standard deviation lower for LDC students as compared to districtwide performance levels in mathematics and ELA.

Table 7.5

Baseline Characteristics of the Pooled Group of Treated Students Taught by Cohort 1 and 2 Elementary School Teachers Participating in LDC in Two Consecutive Years and Comparison Students After Matching

Student characteristic	Treatment group (*n* = 363)	Comparison group (*n* = 363)
Race/ethnicity		
Hispanic (%)	60.3	60.3
Black (%)	34.4	34.7
Asian (%)	4.1	4.1
White (%)	0.3	0.6
Other (%)	0.8	0.3
Female (%)	47.7	47.7
Special programs status		
Poverty (%)	90.1	90.4
English language learner (%)	15.4	16.3
Special education (%)	15.4	15.4
Student baseline achievement		
Mean baseline year mathematics Z score	-0.290	-0.313
Mean baseline year ELA Z score	-0.262	-0.276
Class and teacher characteristics		
Mean baseline ELA Z score of current peers	-0.286	-0.300
Teacher years of experience	13.5	13.4
Grade level at baseline year		
Grade 3 (%)	100	100

Table 7.6

Baseline Characteristics of the Pooled Group of Treated Students Taught by Cohort 1 and 2 Middle School Teachers Participating in LDC in Two Consecutive Years and Comparison Students After Matching

Student characteristic	Treatment group (*n* = 2,355)	Comparison group (*n* = 2,355)
Race/ethnicity		
Hispanic (%)	45.6	45.6
Black (%)	39.7	39.7
Asian (%)	6.2	5.4
White (%)	7.3	8.1
Other (%)	1.2	1.2
Female (%)	50.9	51.4
Special programs status		
Poverty (%)	83.6	83.7
English language learner (%)	12.7	13.2
Special education (%)	25.3	23.9
Student baseline achievement		
Mean baseline year mathematics Z score	-0.458	-0.434
Mean baseline year ELA Z score	-0.374	-0.376
Class and teacher characteristics		
Mean baseline ELA Z score of current peers	-0.404	-0.364
Teacher years of experience	8.8	8.4
Grade level at baseline year		
Grade 4 (%)	25.4	25.4
Grade 5 (%)	40.7	40.7
Grade 6 (%)	33.9	33.9

Table 7.7

Baseline Characteristics of the Pooled Group of Treated Students Taught by Cohort 1 and 2 Elementary and Middle School Teachers Participating in LDC in Two Consecutive Years and Comparison Students After Matching

Student characteristic	Treatment group (*n* = 2,718*)*	Comparison group (*n* = 2,718)
Race/ethnicity		
Hispanic (%)	47.6	47.6
Black (%)	39.0	39.1
Asian (%)	5.9	5.2
White (%)	6.3	7.1
Other (%)	1.2	1.1
Female (%)	50.5	50.9
Special programs status		
Poverty (%)	84.4	84.6
English language learner (%)	13.1	13.6
Special education (%)	24.0	22.7
Student baseline achievement		
Mean baseline year mathematics Z score	-0.436	-0.418
Mean baseline year ELA Z score	-0.359	-0.363
Class and teacher characteristics		
Mean baseline ELA Z score of current peers	-0.388	-0.356
Teacher years of experience	9.4	9.1
Grade level at baseline year		
Grade 3 (%)	13.4	13.4
Grade 4 (%)	22.0	22.0
Grade 5 (%)	35.3	35.3
Grade 6 (%)	29.4	29.4

Table 7.8

Baseline Characteristics of the Pooled Group of Treated Students Taught by Cohort 1 Middle School Teachers Participating in LDC in Three Consecutive Years and Comparison Students After Matching

Student characteristic	Treatment group (n = 406)	Comparison group (n = 406)
Race/ethnicity		
Hispanic (%)	44.3	44.3
Black (%)	48.8	52.5
Asian (%)	6.2	2.2
White (%)	0.3	0.3
Other (%)	0.4	0.7
Female (%)	72.2	72.2
Special programs status		
Poverty (%)	87.4	85.5
English language learner (%)	17.5	13.3
Special education (%)	19.2	19.2
Student baseline achievement		
Mean baseline year mathematics Z score	-0.557	-0.555
Mean baseline year ELA Z score	-0.406	-0.416
Class and teacher characteristics		
Mean baseline ELA Z score of current peers	-0.417	-0.418
Teacher years of experience	8.0	7.9
Grade level at baseline year		
Grade 3 (%)	19.5	19.5
Grade 4 (%)	32.0	32.0
Grade 5 (%)	48.5	48.5

7.3 Primary Outcome Analysis Results: Teachers Participating in LDC for Two Consecutive Years Across Cohorts

Here, we examine the impact of LDC as practiced by teachers with 2 consecutive years of experience with the program. We first present the results for the elementary and middle schools separately, after which we present the results of an analysis pooling the two groups of schools together. As discussed in detail in Chapter 2, students could be exposed to between zero and three different LDC teachers at the elementary school level. In contrast, middle school

students could be exposed to between zero and six different LDC teachers in a given year. Using a MMMC design, each observation at Level 1 represented one student. Weights across teachers for each student summed to a unity (1).

Two different approaches were used to model the LDC treatment intervention variable as a fixed effect at the student level. The first model was dosage dependent, and considered variation in students' level of exposure to LDC teachers. In this approach, the treatment variable was structured as a continuous response variable between zero and one, based on exposure to LDC teachers. In contrast, the second approach was modeled as dosage independent, and considered any student exposed to any LDC intervention teacher to be a treated individual. In this latter approach the treatment variable was dichotomous, coded as one for LDC treated students and zero for comparison students.

Table 7.9

Effect Estimates of Cohort 1 and 2 Elementary School Teachers Participating in LDC in Two Consecutive Years on New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD*)	Dosage-independent model coefficient (*SD*)
Level 2 LDC teacher treatment	0.041 (0.139)	0.025 (0.091)
Level 1 student characteristics		
Hispanic	-0.099 (0.126)	-0.100 (0.125)
Black	-0.258 (0.130)*	-0.259 (0.130)*
Other ethnicity	-0.372 (0.357)	-0.365 (0.357)
Poverty	-0.049 (0.086)	-0.049 (0.086)
Female	0.134 (0.053)*	0.134 (0.053)*
English language learner	0.058 (0.079)	0.058 (0.079)
Special education	-0.336 (0.077)*	-0.336 (0.077)*
Teacher experience	0.011 (0.007)	0.011 (0.007)
Baseline peer ELA Z score	0.073 (0.081)	0.074 (0.081)
Baseline year mathematics Z score	0.198 (0.043)*	0.198 (0.043)*
Baseline year ELA Z score	0.560 (0.046)*	0.560 (0.046)*
Cohort 2 schools	0.216 (0.140)	0.219 (0.140)

Note. Based on the dosage-dependent model, the average treated student received a 0.567 treatment dosage. Because of this, using the dosage-dependent model we could estimate the ATET at (0.567 × 0.041) = 0.023.

*CI two tailed probability ≥ .95

In Table 7.9, we present results of both the dosage dependent and dosage independent models, estimating the impact of LDC on Cohort 1 and Cohort 2 elementary students (Grade 5 students in the outcome year). As can be seen, model results for the LDC effect on elementary student outcomes are in the positive direction, but are not statistically significant for either model. In other words, neither model provided sufficient evidence to conclude that elementary students taught by LDC teachers performed better on the ELA assessment than did their matched peers in the comparison group.

The significant effects of the covariates on student performance were similar under the two models and were in the expected directions. Baseline ELA performance was the strongest predictor and baseline mathematics performance also helped explain the outcome. In addition to baseline achievement, three student level demographic variables helped predict performance statistically and significantly: 1) Black students performed at significantly lower levels than students who were White or Asian, 2) females performed at higher levels than did males, and 3) special education students performed at lower levels than regular students.

In Table 7.10, we present results of both the dosage dependent and dosage independent models, estimating the impact of LDC on Cohort 1 and Cohort 2 students in middle schools. As can be seen, model results for the LDC effect on middle school student outcomes are in the positive direction, but are not statistically significant for either model. As with the elementary analysis, neither model provided sufficient evidence to conclude that middle school students taught by LDC teachers performed better on the ELA assessment than did their matched peers in the comparison group.

The significant effects of the covariates on student performance were similar under the two models and were in the expected directions. Baseline ELA performance was the strongest predictor and baseline mathematics performance also helped explain the outcome. In addition to baseline achievement, four student level demographic variables helped predict performance statistically and significantly: 1) Black students had lower scores than White students, 2) students who were economically disadvantaged had lower scores than did students who were not, 3) females had higher scores than males, and 4) special education students had lower scores than students who were not classified as special education.

Table 7.10

Effect Estimates of Cohort 1 and 2 Middle School Teachers Participating in LDC in Two Consecutive Years on New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD*)	Dosage-independent model coefficient (*SD*)
Level 2 LDC teacher treatment	0.005 (0.092)	0.020 (0.038)
Level 1 student characteristics		
Hispanic	-0.048 (0.042)	-0.048 (0.042)
Black	-0.135 (0.044)*	-0.135 (0.044)*
Asian	0.081 (0.054)	0.081 (0.054)
Other ethnicity	0.141 (0.092)	0.142 (0.092)
Poverty	-0.093 (0.026)*	-0.093 (0.026)*
Female	0.178 (0.019)*	0.178 (0.019)*
English language learner	-0.021 (0.032)	-0.021 (0.032)
Special education	-0.107 (0.025)*	-0.107 (0.025)*
Teacher experience	0.002 (0.003)	0.002 (0.003)
Baseline peer ELA Z score	0.296 (0.026)*	0.297 (0.026)*
Baseline year mathematics Z score	0.178 (0.015)*	0.179 (0.015)*
Baseline year ELA Z score	0.564 (0.016)*	0.564 (0.016)*
Grade 5 at baseline	0.047 (0.031)	0.048 (0.031)
Grade 6 at baseline	0.095 (0.033)*	0.095 (0.033)*
Cohort 2 schools	0.026 (0.035)	0.026 (0.035)

Note. Based on the dosage-dependent model, the average treated student received a 0.341 treatment dosage. Because of this, using the dosage-dependent model we could estimate the ATET at (0.341 × 0.005) = 0.002.

*CI two tailed probability ≥ .95

Table 7.11 displays the dosage dependent and dosage independent analysis results when we combine elementary and middle school students from both cohorts. As can be seen, model results for the LDC effect on elementary and middle school student outcomes are in the positive direction, but are not statistically significant for either model. In other words, neither model provided sufficient evidence to conclude that elementary and middle school students taught by LDC teachers performed better on the ELA assessment than did their matched peers in the comparison group.

The significant effects of the covariates on student performance were similar under the two models and were in the expected directions. Baseline ELA performance remained the

strongest predictor and baseline mathematics performance also helped explain the outcome. In addition to baseline achievement, Black, female, poverty, and special education were all significant predictors of ELA performance and were in the expected directions.

Table 7.11

Effect Estimates of Cohort 1 and 2 Elementary and Middle School Teachers Participating in LDC in Two Consecutive Years on New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (SD)	Dosage-independent model coefficient (SD)
Level 2 LDC teacher treatment	0.019 (0.075)	0.020 (0.035)
Level 1 student characteristics		
Hispanic	-0.047 (0.042)	-0.046 (0.042)
Black	-0.145 (0.044)*	-0.145 (0.044)*
Poverty	-0.091 (0.025)*	-0.091 (0.025)*
Female	0.174 (0.018)*	0.174 (0.018)*
English language learner	-0.013 (0.030)	-0.014 (0.030)
Special education	-0.128 (0.024)*	-0.128 (0.024)*
Teacher Experience	0.004 (0.003)	0.004 (0.003)
Baseline peer ELA Z score	0.276 (0.025)*	0.276 (0.025)*
Baseline year mathematics Z score	0.179 (0.014)*	0.179 (0.014)*
Baseline year ELA Z score	0.563 (0.015)*	0.563 (0.015)*
Grade 4 baseline	-0.071 (0.047)	-0.072 (0.048)
Grade 5 baseline	-0.024 (0.045)	-0.024 (0.045)
Grade 6 baseline	0.022 (0.046)	0.022 (0.046)
Cohort 2 schools	0.029 (0.034)	0.028 (0.034)

Note. Based on the dosage-dependent model, the average treated student received a 0.371 treatment dosage. Because of this, using the dosage-dependent model we could estimate the ATET at (0.371 × 0.019) = 0.007.
*CI two tailed probability ≥ .95

7.4 Primary Outcome Analysis Results: Cohort 1 Teachers Participating in LDC for Three Consecutive Years

In this section, we examine the impact of LDC as practiced by middle school teachers with 3 consecutive years of experience with the program (the elementary analysis is not possible because of the 3-year gap between the baseline and outcome year, and because outcome

scores are only available for third grade and higher). As can be seen in Table 7.12, model results for the LDC effect on student outcomes were in the positive direction, but were not statistically significant for either model. In other words, neither model provided sufficient evidence to conclude that middle school students taught by LDC teachers with 3 years of LDC experience performed better on the ELA assessment than did their matched peers in the comparison group.

Table 7.12

Effect Estimates of Cohort 1 Middle School Teachers Participating in LDC in Three Consecutive Years on New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD*)	Dosage-independent model coefficient (*SD*)
Level 2 LDC teacher treatment	0.125 (0.250)	0.010 (0.090)
Level 1 student characteristics		
Hispanic	-0.318 (0.118)*	-0.318 (0.118)*
Black	-0.472 (0.113)*	-0.471 (0.114)*
Poverty	-0.077 (0.072)	-0.077 (0.072)
Female	0.190 (0.061)*	0.191 (0.061)*
English language learner	0.154 (0.075)*	0.154 (0.075)*
Special education	-0.159 (0.069)*	-0.158 (0.069)*
Teacher experience	-0.006(0.008)	-0.005(0.008)
Baseline peer ELA Z score	0.394 (0.068)*	0.396 (0.068)*
Baseline year mathematics Z score	0.141 (0.038)*	0.142 (0.038)*
Baseline year ELA Z score	0.507 (0.041)*	0.507 (0.041)*
Grade 4 at baseline	0.035 (0.079)	0.034 (0.079)
Grade 5 at baseline	0.092 (0.076)	0.091 (0.076)

Note. Based on the dosage-dependent model, the average treated student received a 0.268 treatment dosage. Because of this, using the dosage-dependent model we could estimate an ATET at (0.268 × 0.125) = 0.034.
*CI two tailed probability ≥ .95

The significant effects of the covariates on student performance were similar under both models and were in the expected direction. Once again, baseline ELA performance was the strongest predictor and baseline mathematics performance also helped explain the outcome. In addition, Black and Hispanic students performed at lower levels than did their peers, female students performed higher, and special education students performed at a lower level than students not classified as special education. One interesting result was that English language

learners in this analysis were found to have statistically significant higher ELA scores than non-English language learner students.

7.5 Supplementary Outcome Analysis Results: Cohort 1 Elementary Teachers

Here we report the effect of LDC as practiced by Cohort 1 elementary teachers in their first year of participation, 2016–2017. Due to small sample sizes, no analyses were conducted for the Cohort 1 elementary teachers who newly joined the LDC program in 2017–2018, for those Cohort 1 elementary teachers who implemented LDC in both 2016–2017 and 2017–2018, or for Cohort 1 elementary teachers who joined LDC in 2018–2019.

Table 7.13

Effect Estimates of Cohort 1 Elementary School Teachers Participating in LDC for One Year on 2016–2017 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage Dependent model coefficient (*SD*)	Dosage independent model coefficient (*SD*)
Level 1 - LDC teacher treatment	0.084 (0.147)	-0.059 (0.118)
Level 2 - Student characteristics		
Hispanic	-0.110(0.163)	-0.113(0.163)
Black	-0.195 (0.152)	-0.191 (0.152)
Asian	-0.143 (0.148)	-0.144 (0.148)
Other	-0.306 (0.208)	-0.302 (0.208)
Poverty	-0.058 (0.065)	-0.055 (0.065)
Female	0.171 (0.053)*	0.169 (0.053)*
English language learner	-0.034 (0.107)	-0.030 (0.107)
Special Education	-0.169 (0.089)	-0.168 (0.089)
Grade 4 at baseline	-0.121 (0.105)	-0.126 (0.104)
Teacher experience	0.001 (0.010)	0.001 (0.010)
Baseline peer ELA Z score	0.152 (0.092)	0.144 (0.092)
Baseline year mathematics Z score	0.166 (0.044)*	0.167 (0.044)*
Baseline year ELA Z score	0.528 (0.051)*	0.528 (0.051)*

Note. Since the average treatment student received a 0.724 treatment dosage we could estimate an average treatment effect on the treated (ATET) at 0.724 * 0.084 = 0.061. This effect was not statistically significant. Inclusion rules led to removal of ELL students and students with disabilities variables from the model.

*CI two tailed probability ≥ .95

Table 7.13 reports the model results for the effect of LDC teachers in 2016–2017 on student outcomes (matching sample sizes and results can be found in Tables I1 and I2). The outcome variable for both models was students' 2017 New York State assessment scores in ELA. As reported, the dosage dependent effect is in the positive direction and the dosage independent effect is in the negative direction, but neither effect was statistically significant. In other words, neither model provided sufficient evidence to conclude that students taught by LDC teachers performed at levels different than their matched peers in the comparison group.

The effects of the covariates on student performance were similar under both models and were in the expected directions (although most were not statistically significant). Prior ELA performance was the strongest predictor and prior mathematics performance also helped explain the outcome. In addition to prior achievement, one demographic variable (gender) helped predict performance. Females performed at significantly higher levels than males.

7.6 Supplementary Outcome Analysis Results: Cohort 1 Middle School Teachers

For Cohort 1 middle schools, we conducted analysis for teachers who implemented LDC in 2016–2017, who joined existing PLCs in 2017–2018, and who implemented in both 2016–2017 and 2017–2018. Due to small sample size, no analysis was conducted for teachers who newly joined LDC PLCs in Cohort 1 middle schools in 2018–2019.

In Table 7.14 we present results of both the dosage dependent and dosage independent models on middle school students' ELA performance in 2016–2017 after being taught by teachers in their first year of LDC implementation (matching sample sizes and results can be found in Tables I4 and I5). Model results show no statistically discernible LDC effect on student outcomes for either model. In other words, both analyses showed that students taught by LDC teachers scored similarly on the ELA test to their matched peers in the comparison group. The effects of the covariates on student performance were similar in direction to those in the elementary school models for the same cohort and outcome year, although due to the larger sample size more demographic variables were significant in the middle school analyses. Prior ELA and mathematics performance, as well as ELL status, special education status, Black ethnicity, Other Ethnicity, and gender were significant predictors of ELA performance. Additionally, the average prior achievement of a student's peers was also a significant predictor of ELA performance in the expected direction.

Table 7.14

Effect Estimates of Cohort 1 LDC Middle School Teachers Participating in LDC for One Year on 2016–2017 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD)*	Dosage-independent model coefficient (*SD*)
Level 2 - LDC teacher treatment	-0.016 (0.066)	-0.019 (0.042)
Level 1 - student characteristics		
Hispanic	-0.069 (0.036)	-0.069 (0.036)
Black	-0.126 (0.038)*	-0.126 (0.038)*
Asian	0.047 (0.046)	0.047 (0.046)
Other	-0.165 (0.083)*	-0.165 (0.083)*
Poverty	-0.039 (0.022)	-0.039 (0.022)
Female	0.094 (0.015)*	0.094 (0.015)*
English language learner	-0.101 (0.027)*	-0.101 (0.027)*
Special education	-0.147 (0.020)*	-0.147 (0.020)*
Grade 6 at baseline	0.054 (0.032)	0.054 (0.032)
Grade 7 at baseline	0.108 (0.035)*	0.108 (0.035)*
Content Exposure Weeks	-0.003 (0.002)	-0.003 (0.002)
Teacher Experience	-0.005 (0.003)	-0.005 (0.003)
Baseline Peer ELA Z score	0.155 (0.030)*	0.155 (0.030)*
Baseline year mathematics Z score	0.179 (0.012)*	0.179 (0.012)*
Baseline year ELA Z score	0.658 (0.013)*	0.658 (0.013)*

Note. Since the average treatment student received a 0.506 treatment dosage we could estimate an average treatment effect on the treated (ATET) at 0.506 * -0.016 = -0.008. This effect was not statistically significant.
*CI two tailed probability ≥ .95

We also conducted student outcome analysis based on the 2017–2018 ELA scores for those students taught by LDC teachers who had 2 years of experience with LDC (matching sample sizes and results can be found in Tables I7 and I8). As can be seen in Table 7.15, model results for the LDC effect on student outcomes are in the positive direction, but are not statistically significant for either model. In other words, neither analysis provided sufficient evidence to conclude that students taught by LDC teachers performed better on the ELA test than did their matched peers in the comparison group.

Table 7.15

Effect Estimates of Cohort 1 Middle School Teachers Participating in LDC in Two Consecutive Years on 2017–2018 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD)*	Dosage-independent model coefficient (*SD*)
Level 2 - LDC teacher treatment	0.001 (0.133)	-0.009 (0.056)
Level 1 - student characteristics		
Hispanic	-0.084 (0.049)	-0.084 (0.049)
Black	-0.180 (0.053)*	-0.180 (0.054)*
Asian	0.110 (0.073)	0.109 (0.073)
Other	0.147 (0.123)	0.147 (0.123)
Poverty	-0.114 (0.035)*	-0.114 (0.035)*
Female	0.195 (0.025)*	0.195 (0.025)*
English language learner	-0.008 (0.040)	-0.008 (0.040)
Special education	-0.104 (0.032)*	-0.104 (0.032)*
Grade 5 at baseline	0.107 (0.042)*	0.108 (0.042)*
Grade 6 at baseline	0.112 (0.045)*	0.112 (0.045)*
Teacher Experience	0.002 (0.004)	0.002 (0.004)
Baseline Peer ELA Z score	0.284 (0.035)*	0.283 (0.035)*
Baseline year mathematics Z score	0.179 (0.019)*	0.179 (0.019)*
Baseline year ELA Z score	0.579 (0.021)*	0.579 (0.021)*

Note. Based on the dosage-dependent model, the average treated student received a 0.344 treatment dosage. Because of this, using the dosage dependent model we estimate an average treatment effect on the treated (ATET) at (0.345 * 0.001) = 0.0003.
*CI two tailed probability ≥ .95

The significant effects of the covariates on student performance were similar under the two models and were in the expected directions. Prior ELA performance was the strongest predictor and prior mathematics performance also helped explain the outcome. In addition to prior achievement, a number of demographic variables helped predict performance: 1) Black students performed at lower levels than White students, 2) students in special education performed at lower levels than students not in special education, 3) females performed at significantly higher levels than males, and 4) students with low socio-economic status performed at lower levels than did their peers with higher socio-economic status.

In Table 7.16 we present the analysis results for students taught by Cohort 1 teachers who newly joined existing LDC PLCs in 2017–2018 (these teachers had 1 year of LDC experience but

their schools were in their second year of LDC implementation). Matching sample sizes and results can be found in Tables I10 and I11. As can be seen in Table 7.16, the LDC effect on student ELA outcomes are in the negative direction, but are not statistically significant for either model. In other words, neither model provided sufficient evidence to conclude that students taught by LDC teachers performed differently on the ELA assessment than did their matched peers in the comparison group.

Table 7.16

Effect Estimates of Cohort 1 Middle School Teachers Joining LDC in 2017–2018 on 2017–2018 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD)*	Dosage-independent model coefficient (*SD*)
Level 2 - LDC teacher treatment	-0.120 (0.204)	-0.061 (0.077)
Level 1 - student characteristics		
Hispanic	-0.060 (0.138)	-0.060 (0.139)
Black	-0.167 (0.142)	-0.168 (0.142)
Asian	0.240 (0.208)	0.239 (0.207)
Other	-0.610 (0.325)	-0.604 (0.323)
Poverty	-0.006 (0.056)	-0.005 (0.056)
Female	0.231 (0.031)*	0.231 (0.031)*
English language learner	-0.043 (0.053)	-0.043 (0.053)
Special education	-0.105 (0.042)*	-0.104 (0.041)*
Grade 5 at baseline	0.052 (0.059)	0.053 (0.059)
Grade 6 at baseline	0.138 (0.062)*	0.142 (0.062)*
Content Exposure Weeks	-0.009 (0.008)	-0.009 (0.008)
Teacher Experience	-0.007 (0.006)	-0.007 (0.006)
Baseline Peer ELA Z score	0.240 (0.046)*	0.240 (0.046)*
Baseline year mathematics Z score	0.175 (0.026)*	0.174 (0.026)*
Baseline year ELA Z score	0.540 (0.027)*	0.540 (0.027)*

Note. Based on the dosage-dependent model, the average treated student received a 0.281 treatment dosage. Because of this, using the dosage dependent model we estimate an average treatment effect on the treated (ATET) at (0.281 *- 0.120) = -0.034.
*CI two tailed probability ≥ .95

The significant effects of the covariates on student performance were similar under the two models and were in the expected directions. Prior ELA performance was the strongest

predictor and prior mathematics performance also helped explain the outcome. In addition to prior achievement, gender and special education status also helped predict the outcome.

Table 7.17

Effect Estimates of Cohort 1 Middle School Teachers Who Began Participating in LDC in 2017–2018 on 2018–2019 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD)*	Dosage-independent model coefficient (*SD*)
Level 2 - LDC teacher treatment	0.421 (0.297)	0.133 (0.139)
Level 1 - student characteristics		
Hispanic	-0.019 (0.118)	-0.022 (0.118)
Black	-0.092 (0.126)	-0.093 (0.126)
Poverty	0.125 (0.064)	0.125 (0.064)
Female	0.231 (0.044)*	0.232 (0.044)*
English language learner	0.174 (0.076)*	0.170 (0.076)*
Special education	-0.102 (0.065)	-0.101 (0.065)
Grade 4 at baseline	0.078 (0.107)	0.090 (0.108)
Grade 5 at baseline	0.069 (0.107)	0.067 (0.108)
Teacher Experience	-0.002 (0.010)	-0.002 (0.010)
Baseline Peer ELA Z score	0.394 (0.075)*	0.392 (0.075)*
Baseline year mathematics Z score	0.148 (0.038)*	0.149 (0.038)*
Baseline year ELA Z score	0.513 (0.039)*	0.513 (0.039)*

Note. Based on the dosage-dependent model, the average treated student received a 0.355 treatment dosage. Because of this, using the dosage dependent model we estimate an average treatment effect on the treated (ATET) at (0.355*0.421) = 0.149.
*CI two tailed probability ≥ .95

We also conducted student outcome analysis based on the 2018–2019 New York ELA scores for those students taught by Cohort 1 middle school teachers who began participating in 2017–2018 and continued through 2018–2019 (matching sample sizes and results can be found in Tables I13 and I14). As can be seen in Table 7.17, model results for the LDC effect on student outcomes are in the positive direction, but are not statistically significant for either model. In other words, neither analysis provided sufficient evidence to conclude that students taught by LDC teachers performed better on the ELA assessment than did their matched peers in the comparison group.

The significant effects of the covariates on student performance were similar under the two models and were in the expected directions. Prior ELA performance was the strongest

predictor and prior mathematics performance also helped explain the outcome. In addition to prior achievement, females performed at significantly higher levels than did males. One interesting result was that English language learners in this analysis were found to have statistically significant higher ELA scores than did the non-English language learner students.

7.7 Supplementary Outcome Analysis Results: Cohort 2 Elementary Teachers

We conducted analyses for Cohort 2 elementary teachers who implemented LDC in 2017–2018 and who implemented in both 2017–2018 and 2018–2019. Due to small sample size, no analyses were conducted for Cohort 2 elementary teachers who newly joined existing LDC PLCs in 2018–2019.

Table 7.18

Effect Estimates of Cohort 2 LDC Elementary School Teacher Participating in LDC for 1 year on 2017–2018 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage Dependent model coefficient (*SD*)	Dosage independent model coefficient (*SD*)
Level 1 - LDC teacher treatment	-0.048 (0.066)	-0.003 (0.034)
Level 2 - Student characteristics		
Hispanic	-0.077 (0.073)	-0.076 (0.073)
Black	-0.110 (0.074)	-0.110 (0.074)
Asian	0.015 (0.094)	0.015 (0.094)
Other	-0.028 (0.121)	-0.029 (0.121)
Poverty	-0.056 (0.039)	-0.056 (0.039)
Female	0.079 (0.025) *	0.079 (0.025) *
English Language Learner	-0.160 (0.040) *	-0.161 (0.040) *
Special education	-0.154 (0.036) *	-0.154 (0.036) *
Teacher experience	0.001 (0.004)	0.001 (0.004)
Baseline peer ELA Z score	0.100 (0.039) *	0.099 (0.039) *
Baseline year mathematics Z score	0.235 (0.022) *	0.234 (0.022) *
Baseline year ELA Z score	0.593 (0.022) *	0.593 (0.022) *

Note. All students were in Grade 3 at baseline year. Based on the dosage-dependent model, the average treated student received a 0.642 treatment dosage. Because of this, using the dosage-dependent model we could estimate an average treatment effect on the treated (ATET) at (0.642 * -0.048) = -0.031.
*CI two tailed probability ≥ .95

Table 7.18 presents results of both the dosage dependent and dosage independent models on Cohort 2 elementary school students' ELA performance in 2017–2018 after being taught by

teachers with 1 year of LDC experience (matching sample sizes and results can be found in Tables I16 and I17). The LDC effect on student outcomes are in the negative direction, but are not statistically significant for either model. In other words, neither analysis provided sufficient evidence to conclude that students taught by LDC teachers performed at levels different than their matched peers in the comparison group.

The effects of the covariates on student performance were in the expected directions. Female students performed at higher levels than male students, English Language Learners performed at lower levels than non-ELL students, and students classified as special education performed at lower levels than did students not classified as special education.

Table 7.19

Effect Estimates of Cohort 2 Elementary School Teachers Participating in LDC in Two Consecutive Years on 2018–2019 Smarter Balanced ELA Performance, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD*)	Dosage-independent model coefficient (*SD*)
Level 2 LDC teacher treatment	0.094 (0.138)	0.058 (0.094)
Level 1 student characteristics		
Hispanic	-0.038 (0.131)	-0.039 (0.131)
Black	-0.165 (0.135)	-0.166 (0.135)
Other	0.574 (0.403)	0.568 (0.403)
Poverty	-0.043 (0.086)	-0.042 (0.085)
Female	0.130 (0.054)*	0.131 (0.054)*
English language learner	0.079 (0.082)	0.079 (0.082)
Special education	-0.334 (0.079)*	-0.335 (0.079)*
Teacher Experience	0.011 (0.007)	0.012 (0.007)
Baseline peer ELA Z score	0.121 (0.084)	0.121 (0.084)
Baseline year mathematics Z score	0.226 (0.044)*	0.227 (0.043)*
Baseline year ELA Z score	0.559 (0.048)*	0.559 (0.048)*

Note. All students were in Grade 3 at baseline year. Based on the dosage-dependent model, the average treated student received a 0.591 treatment dosage. Because of this, using the dosage-dependent model we could estimate an average treatment effect on the treated (ATET) at (0.591 * 0.094) = 0.056.
*CI two tailed probability ≥ .95

We next present results of both the dosage dependent and dosage independent models on Cohort 2 elementary school students' ELA performance in 2018–2019 after being taught by teachers with 2 years of LDC experience. Matching sample sizes and results can be found in Tables I19 and I20. As can be seen in Table 7.19, model results for the LDC effect on elementary

student outcomes are in the positive direction, but are not statistically significant for either model. In other words, neither model provided sufficient evidence to conclude that elementary students taught by LDC teachers performed better on the ELA assessment than did their matched peers in the comparison group.

The significant effects of the covariates on student performance were similar under the two models and were in the expected direction. Baseline ELA performance was the strongest predictor and baseline mathematics performance also helped explain the outcome. In addition to baseline achievement, two demographic variables helped predict performance: 1) females performed at significantly higher levels than males, and 2) special education students performed at lower levels than did students not in special education.

7.8 Supplementary Outcome Analysis Results: Cohort 2 Middle School Teachers

We conducted analyses for Cohort 2 middle school teachers who implemented LDC in 2017–2018, who implemented in both 2017–2018 and 2018–2019, and who newly joined and implemented LDC in 2018–2019. In Table 7.20 we present results for the students taught by Cohort 2 middle school teachers participating in LDC in 2017–2018 (matching sample sizes and results can be found in Tables I22 and I23). Both model results for the LDC effect on student outcomes are in the positive direction and did not yield a statistically significant LDC effect. Once again, covariates were in the expected direction, with in this case, gender, English Language Learner status, and special education status being significant predictors of ELA achievement.

Table 7.20

Effect Estimates for Cohort 2 LDC Middle School Teachers Participating in LDC for 1 year on 2017–2018 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD*)	Dosage-independent model coefficient (*SD*)
Variables	Dosage-dependent model coefficient (*SD*)	Dosage-independent model coefficient (*SD*)
Level 2 - LDC teacher treatment	0.202 (0.108)	0.078 (0.051)
Level 1 - student characteristics		
Hispanic	0.107 (0.067)	0.107 (0.067)
Black	0.021 (0.066)	0.021 (0.066)
Asian	0.113 (0.074)	0.112 (0.074)
Other	-0.086 (0.116)	-0.088 (0.116)
Poverty	-0.056 (0.032)	-0.055 (0.032)
Female	0.130 (0.024)*	0.130 (0.024)*
English language learner	-0.195 (0.044)*	-0.196 (0.044)*
Special education	-0.167 (0.032)*	-0.167 (0.032)*
Grade 5 at baseline	0.039 (0.043)	0.037 (0.043)
Grade 6 at baseline	0.080 (0.039)*	0.081 (0.040)*
Teacher Experience	0.003 (0.004)	0.003 (0.004)
Baseline Peer ELA Z score	0.092 (0.037)*	0.096 (0.037)*
Baseline year mathematics Z score	0.206 (0.020)*	0.206 (0.019)*

Note. For the dosage dependent model, since the average treatment student received a 0.400 treatment dosage we could estimate an average treatment on the treated (ATET) at 0.40 * 0.202 = 0.081.

*CI two tailed probability ≥ .95

In Table 7.21 we present results of models that are both dosage dependent and dosage independent for teachers who participated in LDC for 2 years: 2017–2018 and 2018–2019 (matching sample sizes and results can be found in Tables I25 and I26). Dosage dependent model results indicate an LDC effect in the negative direction and the dosage independent model results was in the positive direction; both effects were very close to zero and not statistically significant. Once again, covariates were in the expected direction, with in this case, Black, female, and special education status being significant predictors of ELA achievement.

Table 7.21

Effect Estimates of Cohort 2 Middle School Teachers Participating in LDC in Two Consecutive Years on 2018–2019 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD*)	Dosage-independent model coefficient (*SD*)
Level 2 LDC teacher treatment	-0.004 (0.135)	0.061 (0.053)
Level 1 student characteristics		
Hispanic	-0.049 (0.052)	-0.051 (0.052)
Black	-0.130 (0.054) *	-0.131 (0.054) *
Other	0.086 (0.129)	0.083 (0.129)
Poverty	-0.070 (0.039)	-0.070 (0.038)
Female	0.165 (0.030)*	0.165 (0.030)*
English language learner	-0.030 (0.051)	-0.030 (0.051)
Special education	-0.112 (0.040)*	-0.112 (0.040)*
Grade 5 at baseline	-0.035 (0.047)	-0.034 (0.046)
Grade 6 at baseline	0.064 (0.048)	0.065 (0.048)
Teacher Experience	0.000 (0.004)	0.000 (0.004)
Baseline peer ELA Z score	0.321 (0.039)*	0.322 (0.039)*
Baseline year mathematics Z score	0.179 (0.024)*	0.179 (0.024)*
Baseline year ELA Z score	0.537 (0.026)*	0.536 (0.026)*

Note. For the analysis here, Asian & White were combined as reference category to provide adequate sample, and the variable of total content weeks was not included as it did not reach our tolerance criteria. Based on the dosage-dependent model, the average treated student received a 0.336 treatment dosage. Because of this, using the dosage-dependent model we could estimate an average treatment effect on the treated (ATET) at (0.336 * 0.004) = -0.001.
*CI two tailed probability ≥ .95

In Table 7.22 we present results of models that are both dosage dependent and dosage independent for the Cohort 2 middle school teachers who newly joined and participated in LDC in 2018–2019 (matching sample sizes and results can be found in Tables I28 and I29). Dosage dependent model results indicate an LDC effect in a positive direction that approached but did not obtain statistical significance on the student outcome. The dosage independent model was in the negative direction and did not yield a statistically significant LDC effect. Once again, covariates were in the expected direction, with in this case, Black, female, and special education status being significant predictors of ELA achievement.

Table 7.22

Effect Estimates for Cohort 2 LDC Middle School Teachers Joining LDC in 2018–2019 on 2018–2019 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD*)	Dosage-independent model coefficient (*SD*)
Level 2 - LDC teacher treatment	0.029 (0.173)	-0.023 (0.067)
Level 1 - student characteristics		
Hispanic	-0.151 (0.087)	-0.151 (0.087)
Black	-0.224 (0.084)*	-0.224 (0.084)*
Other	-0.283 (0.192)	-0.284 (0.192)
Poverty	-0.088 (0.053)	-0.087 (0.053)
Female	0.186 (0.040)*	0.186 (0.040)*
English language learner	0.048 (0.068)	0.050 (0.068)
Special education	-0.125 (0.052)*	-0.126 (0.052)*
Grade 5 at baseline	0.155 (0.058)*	0.153 (0.058)*
Grade 6 at baseline	0.189 (0.065)*	0.187 (0.065)*
Teacher Experience	0.013 (0.006)*	0.013 (0.006)*
Baseline Peer ELA Z score	0.233 (0.053)*	0.232 (0.053)*
Baseline year mathematics Z score	0.183 (0.032)*	0.182 (0.032)*
Baseline year ELA Z score	0.556 (0.035)*	0.557 (0.035)*

Note. For the dosage dependent model, since the average treatment student received a 0.323 treatment dosage we could estimate an average treatment on the treated (ATET) at 0323 * 0.029 = 0.009.

*CI two tailed probability ≥ .95

7.9 Supplementary Outcome Analysis Results: Prior Year and Outcome Year Exposure Subgroups

In this section, we present results exploring sub-groups of teachers and students from the Cohorts 1 and 2 middle school sample. These analyses explore whether the positive results found for the overall Cohorts 1 and 2 middle school sample are being driven by subgroups of teachers and/or students.

First, we explore whether students with sustained exposure to LDC over time performed at relatively higher levels than did students exposed to LDC for the first time in the primary outcome year. To answer this question, we constructed two mutually exclusive subgroups of students: students who were exposed to LDC in 2 consecutive years (2016–2017 and 2017–2018 for Cohort 1; 2017–2018 and 2018–2019 for Cohort 2), and students who were only

exposed to LDC in the second year (2017–2018 for Cohort 1; 2018–2019 for Cohort 2). Matched control groups were selected for each subgroup of students. The full results of the model can be found in Table I31 in Appendix I. The model includes indicator variables for the two treatment groups and the matched control group for the students exposed to LDC in 2 consecutive years. The control group for the students exposed to LDC in just the outcome year was used as the reference group in the model.

Our primary substantive interest, however, is not in the coefficients as displayed in Table I.31, but rather in two post-hoc tests of the statistical difference between coefficients, displayed in Table 7.23. Using the MLwiN software[4], we obtained the Chi Square value (1 degree of freedom) for a test of the difference between two coefficients. The first test examines the difference between the coefficient for the treatment group of students exposed to LDC in 2 consecutive years, and the coefficient for the control group selected specifically for these treatment students. Although the difference (0.046) is in the expected direction, with the treatment group coefficient higher than the control group coefficient, the difference (with a *p* value of 0.274) is not significant. The second test examines the difference between the two treatment groups: 1) those students with 2 years of LDC exposure and 2) those students with only exposure in the outcome year. The difference (0.102) is in the expected direction and statistically significant ($p = 0.008$). Students with 2 years of LDC experience scored significantly higher than the students with only 1 year of LDC experience.

Table 7.23

Subgroup results examining exposure of students to LDC over time

Difference test	Difference	X^2	*p* value
Difference between coefficient for students exposed to LDC for two consecutive year and coefficient for matched control student group	0.046	1.201	0.273
Difference between coefficient for students exposed to LDC for two consecutive year and coefficient for students with exposure to LDC only in the outcome year	0.102	6.986	0.008

Next, we explore whether the impact for students with greater exposure to LDC teachers is different from the impact for students with less exposure to LDC teachers. Again, we constructed two mutually exclusive treatment groups: 1) a high dosage group consisting of students who were exposed to LDC in half or more of their core content area class time, and 2) a low dosage group consisting of students who were exposed to LDC in less than half of their core content area class time. Like the model for which results are displayed in Tables 7.23 and Table I31, this analysis selected matched control groups for each of the two mutually exclusive

[4] See http://www.bristol.ac.uk/cmm/software/mlwin/

treatment groups, and indicators for three of the four groups that were included in the model. Full model results are displayed in Table I33, and the difference tests of interest are displayed in Table 7.24. As can be seen, the coefficient for the high dosage treatment group is smaller than the coefficients for both the high dosage matched control group and the low dosage treatment group, and these differences (-0.036 and -0.044 respectively) are not statistically significant.

Table 7.24

Subgroup results examining high and low LDC dosage in the outcome year

Difference test	Difference	X^2	P value
Difference between coefficient for students exposed to LDC in over half of their core content class time and coefficient for matched control student group	-0.036	0.295	0.587
Difference between coefficient for students exposed to LDC in over half of their core content class time and coefficient for students exposed to LDC in less than half of their core content class time	-0.044	0.634	0.426

7.10 Summary and Interpretation of Results

Here we summarize the student outcome analysis results. Table 7.25 includes the results of all of our analyses of the impact of LDC as practiced by teachers with 2 or more years of experience with program. In our previous report (Wang et al., 2019), we shared results of the impact of Cohort 1 middle school teachers with 2 years of LDC participation. That analysis did not identify a statistically significant effect, and a parallel analysis on Cohort 1 elementary school teachers was not possible due to insufficient sample size. The sample size for elementary sample is usually smaller than the sample size for the middle school sample as expected. In this report, we share for the first time the results of the impact of Cohort 2 teachers alone and the pooled group of Cohort 1 and Cohort 2 teachers. We also share the results of an analysis looking at the impact of Cohort 1 middle school teachers with 3 consecutive years of LDC experience, and an analysis of the impact of Cohort 1 middle school teachers who began implementing in 2017–2018 (the second year of school implementation).

Although effect estimates tended to be in the positive direction, none were statistically significant, and therefore these analyses do not provide evidence that students exposed to LDC instruction as taught by teachers with 2 or more years of experience performed at different levels on the New York State ELA Assessment than matched comparison students.

Table 7.25

Impact of LDC on New York State ELA Assessment Scores by Cohort and School Level

Cohort/teachers	LDC analytical sample information	Dosage-dependent model coefficient (*SD*)	Dosage-independent model coefficient (*SD*)
Cohort 1 elementary schools/ teachers with 2 years of LDC (starting 2016–2017)	2 schools / 2 teachers / 35 students[a]	Not conducted	Not conducted
Cohort 1 middle schools/teachers with 2 years of LDC (starting 2016–2017)	10 schools / 26 teachers / 1,408 students	0.001 (0.133)	-0.009 (0.056)
Cohort 1 middle schools/teachers with 2 years of LDC (starting 2017–2018)	2 schools / 8 teachers / 500 students	0.421 (0.297)	0.133 (0.139)
Cohort 2 elementary schools/ teachers with 2 years of LDC (starting 2017–2018)	9 schools / 17 teachers / 341 students	0.094 (0.138)	0.058 (0.094)
Cohort 2 middle schools/teachers with 2 years of LDC (starting 2017–2018)	9 schools / 22 teachers / 947 students	-0.004 (0.135)	0.061 (0.053)
Cohorts 1 & 2 elementary schools/ teachers with 2 years of LDC (starting in 2016–2017 for Cohort 1 and 2017–2018 for Cohort 2)	11 schools / 19 teachers / 363 students	0.041 (0.139	0.025 (0.091)
Cohorts 1 & 2 middle schools/ teachers with 2 years of LDC (starting in 2016–2017 for Cohort 1 and 2017–2018 for Cohort 2)	19 schools / 48 teachers / 2,355 students	0.005 (0.092)	0.020 (0.038)
Cohorts 1 & 2 elementary & middle schools/teachers with 2 years of LDC (starting in 2016–2017 for Cohort 1 and 2017–2018 for Cohort 2)	29 schools / 66 teachers / 2,718 students	0.019 (0.075)	0.020 (0.035)
Cohort 1 middle schools/teachers with 3 years of LDC (starting 2016–2017)	6 schools / 11 teachers / 406 students	0.125 (0.250)	0.010 (0.090)

Note. [a]These are the numbers before conducting matching analysis.
*CI two tailed probability ≥ .95

Next, we provide a lens through which the reader can contextualize the magnitude of the results. We present dosage-dependent effects for each of the three primary analyses based on teachers with 2 years of LDC implementation. Figure 7.1 depicts the estimated impacts of LDC

in the three samples of students exposed to LDC teachers in all three major content areas: ELA, social studies/history, and science. These effect sizes can be best understood as the estimated impact of LDC under ideal conditions. Figure 7.2 depicts the estimated impact of LDC in the three samples on the average observed student, who in the middle school context had considerably less exposure to LDC teachers in his or her core content classes.

As can be seen in the figures, the confidence intervals all cross the zero line, and therefore the estimates are not statistically significant at the 95 percent level. Higher than expected levels of school and teacher attrition, and several changes in LDC project leadership are likely to have contributed to this lack of statistical significance. The analyses provide no evidence of an effect on students taught by either elementary or middle school teachers who implemented LDC for 2 years.

Figure 7.1

Treatment Effect on New York State Assessment ELA Scores with 95% Confidence Interval for Students with Full LDC Dosage, by Cohort

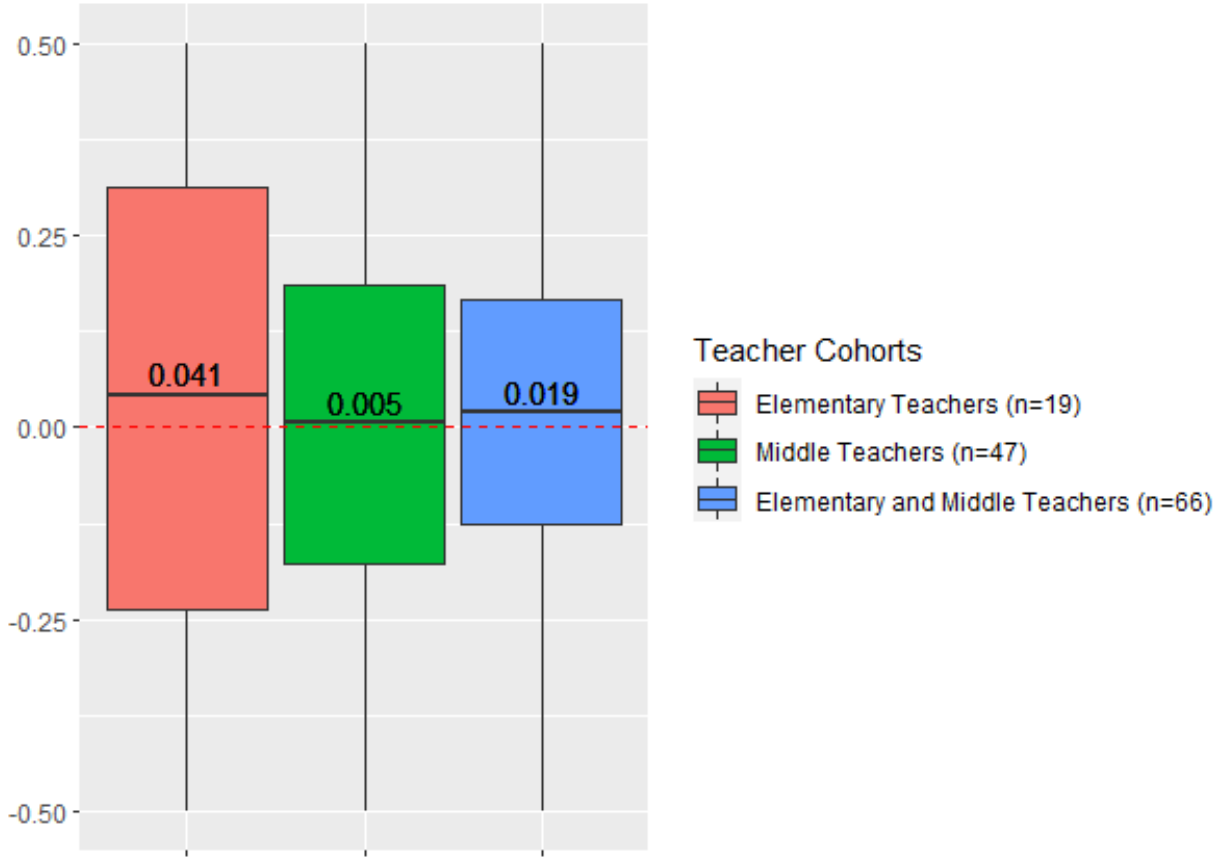
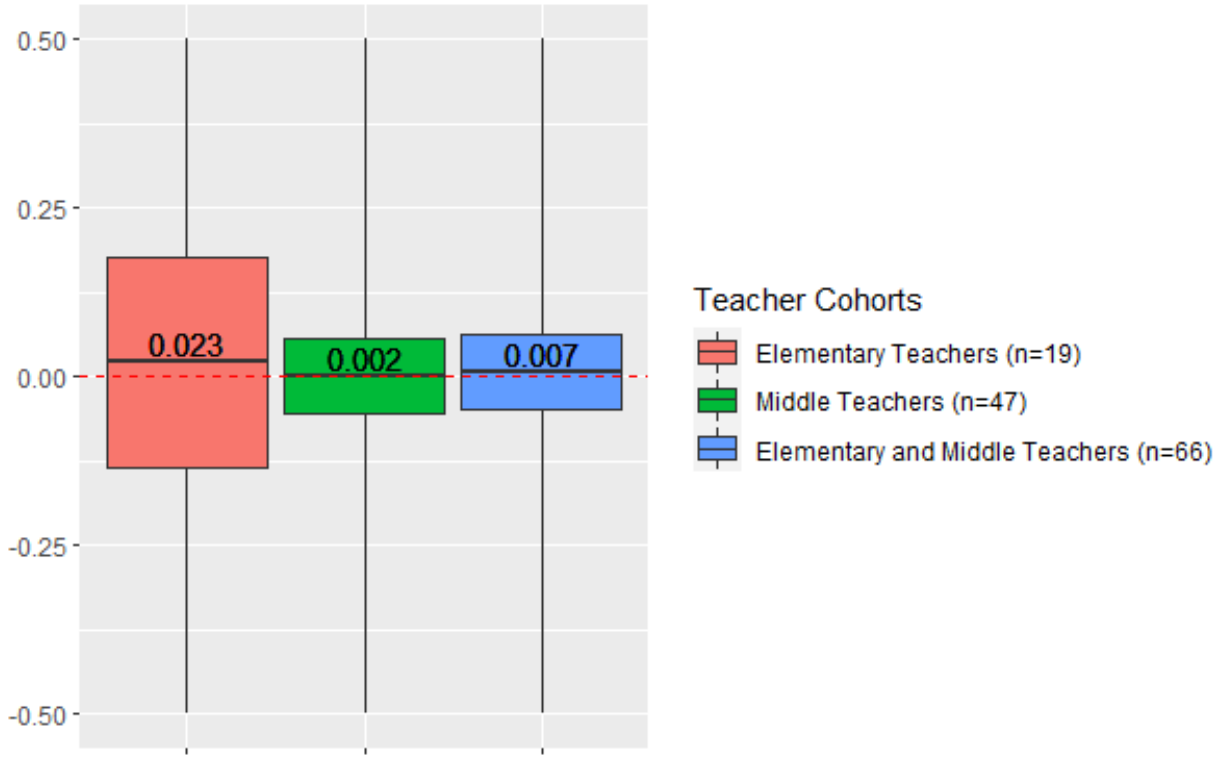


Figure 7.2

Treatment Effect on New York State Assessment ELA Scores with 95% Confidence Interval for Students with Average LDC Dosage, by Cohort



8.0 Summary of Findings

This final annual report examines LDC following 3 years of implementation in Cohort 1 schools and 2 years of implementation in Cohort 2 schools. We summarize these results organized by the three categories of evaluation questions listed in Chapter 1 of this report.

8.1 Program Characteristics and Implementation

The study schools serve largely Hispanic and Black populations, with a high proportion of students from economically disadvantage backgrounds, and many English language learners. Consistent with prior year results, participants reported very positive attitudes toward LDC and its implementation at their schools. Teachers generally appreciated the opportunity to collaborate with colleagues, and nearly uniformly praised their LDC coaches.

Evidence suggests that implementation was largely faithful to the intended structure of LDC, although the level of implementation was not uniformly high. The frequency of PLC meetings varied greatly across schools, with some struggling to meet frequently and ensure high attendance among teachers. On a positive note, PLC members were nearly uniform in reporting that their teacher leaders were supportive, knowledgeable, and helpful. Teacher leaders themselves also reported high satisfaction with support from coaches, professional development offerings, and how the teacher leader role allowed them to be instructional leaders in their schools.

Analysis of program data suggests that nearly all participants were engaging with the module building platform at least to some degree, but that engagement varied considerably. Nearly half of teachers failed to engage in module design at a basic level by editing the teaching task, while others engaged deeply by editing multiple module elements. When coaches provided feedback via commenting on modules and other methods, PLC members generally found it useful. Our fidelity analysis, however revealed that almost 20% of modules did not receive the program goal of two coach comments. Furthermore, the national peer review process was used by few participants. Module analysis suggests that the materials adapted and created by PLC members varied in levels of completion, and based on the presence of uploaded student work, a sizable number of modules might not have been implemented in the classroom.

8.2 Contextual Factors and Implementation

Coaches and teacher leaders were almost universally praised by teachers participating in LDC. While teacher respondents generally reported that their school administrators were supportive of the program, administrators' level of participation in PLC meetings and their observation of LDC instruction varied greatly across the sample. There was substantial attrition of schools and teachers from the program across the 3 years, with many school leaders deciding that they didn't have sufficient resources and/or teacher buy-in to sustain the program. Most schools that remained in the program at the end of the study, however,

indicated that they would continue to use LDC practices and tools, at least to some extent. While school personnel generally perceived district leaders as supportive of LDC, some educators did not feel that district leaders fully understood the program.

8.3 Program Impacts

Based on survey results, LDC was perceived to have positive impacts on a range of both teacher practices and student skills. Teachers, in general, felt that LDC had improved their instructional planning and pedagogical skill sets and was also helping to promote collaboration between teachers. Teachers and administrators also felt that LDC was improving student learning across multiple domains. Furthermore, those attitudes around teacher and student skills became even more positive over time on average for teachers completing the survey in both 2017−2018 and 2018−2019. Analysis of module quality showed improvement from 2016–2017 to 2017–2018, but average quality seemed to decrease slightly from 2017–2018 to 2018–2019.

Although effect estimates tended to be in the positive direction, none of the quasi-experimental analyses of the impact of LDC on student learning after 2 or more years of teacher participation in LDC PLCs yielded statistically significant results. The study did not provide evidence that students exposed to LDC instruction performed at different levels than did matched comparison students on the New York State ELA Assessment. Supplementary analyses revealed that students exposed to LDC across 2 consecutive years performed at higher levels than students exposed to LDC in just 1 year, suggesting that sustained exposure to LDC over time may yield greater benefits to students than exposure in 1 year alone.

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Appendix A:
Teacher Survey and Responses

2018–2019
LDC Teacher Survey

1 LDC Participation

T1. Please select your school from the drop down box.
Teachers are skipped to T3 if they teach in an elementary school.

T2a. In the current school year (2018-19), how many classes did you teach?

☐ classes n = 121, Mean = 3.90, Range: 0 - 14

T2b. In how many of these classes did you use LDC modules and/or mini-tasks?

☐ classes n = 121, Mean = 2.35, Range: 0 - 8

T2c. In what content areas did you use LDC modules and/or mini-tasks?

_____

T2d. In what grades did you use LDC modules and/or mini-tasks?

_____

T3. Prior to the current school year (2018-19), did you have any experience with LDC?

(n = 206)

☐ Yes — 124 teachers (60.2%)

☐ No ↓ Skip to T5a — 82 teachers (39.8%)

T4. How many of the following did you teach prior to the current school year (2018-19)?

☐	LDC modules	n = 124, Mean = 2.69, Range: 0 - 15
☐	LDC mini-tasks, outside of modules	n = 124, Mean =3.39, Range: 0 - 20

2 Professional Learning Community and Teacher Collaboration

T5a. Did you participate this year in a Professional Learning Community (PLC) at least partly focused on implementing LDC in your school?

(n = 182)

☐ Yes	Skip to T6	164 teachers (90.1%)
☐ No		18 teachers (9.9%)

T5b. Did you use any LDC tools in your instructional planning or classroom instruction this year?

(n = 18)

☐ Yes	Skip to 5d	18 teachers (100.0%)
☐ No		0 teachers (0.0%)

T5c. Why did you choose not to use any LDC tools in your instructional planning or classroom instruction this year?

[Survey ends here for respondents answering question T5c]

T5d. What LDC tools did you use during the current school year? Select all that apply.

	(n = 17)
☐ CoreTools online platform to access existing modules or mini-tasks	13 teachers (6.3%)
☐ CoreTools online platform to design modules or mini-tasks	10 teachers (4.9%)
☐ LDC online courses	6 teachers (2.9%)
☐ Modules or mini-tasks given to me by other teachers in my school	7 teachers (3.4%)
☐ Other (please specify) _____	1 teacher (0.5%)

[Survey ends here for respondents answering question T5d]

T6. About how often did your LDC PLC meet?

		(n = 188)
☐ Less than once a month		12 teachers (6.4%)
☐ Once a month		33 teachers (17.6%)
☐ Every other week		39 teachers (20.7%)
☐ Once a week	Skip to T8	94 teachers (50.0%)
☐ Twice a week or more often	Skip to T8	10 teachers (5.3%)

T7. What were the primary barriers preventing your LDC PLC from meeting weekly? Select all that apply.

	(n =84)
☐ PLC time was not protected.	18 teachers (21.4%)
☐ PLC members had limited interest in attending meetings.	7 teachers (8.3%)
☐ School administrator did not make it a priority.	12 teachers (14.3%)
☐ Teacher Leader did not provide sufficient organizational support.	1 teacher (1.2%)
☐ Not enough teachers participated.	6 teachers (7.1%)
☐ PLC members had other priorities that compete with LDC participation.	49 teachers (58.3%)
☐ Other (please specify) _____	24 teachers (28.6%)

T8. About how often did you have informal discussions (as opposed to scheduled meetings) about LDC with teachers in your LDC PLC?

	(n = 188)
☐ Less than once a month	29 teachers (15.4%)
☐ Once a month	27 teachers (14.4%)
☐ Every other week	28 teachers (14.9%)
☐ Once a week	69 teachers (36.7%)
☐ Twice a week or more	35 teachers (18.6%)

T9. On average, how long did your school's LDC PLC meetings typically last?

	(n = 188)
☐ Less than 45 minutes	32 teachers (17.0%)
☐ 45 to 59 minutes	125 teachers (66.5%)
☐ 60 to 74 minutes	20 teachers (10.6%)
☐ 75 minutes or more	11 teachers (5.9%)

3 Teacher Training and Support

T10. How effective was your LDC PLC in the following areas?

	Not effective	A little effective	Moderately effective	Very effective
Creating an environment in which teachers were comfortable working together (n = 187)	4 (2.1%)	10 (5.3%)	72 (38.5%)	101 (54.0%)
Fostering an environment where teachers shared their instructional plans with colleagues (n = 187)	3 (1.6%)	13 (7.0%)	65 (34.8%)	106 (56.7%)
Allowing space to share student work (n = 187)	3 (1.6%)	15 (8.0%)	66 (35.3%)	103 (55.1%)
Helping teachers to improve their LDC instructional plans (n = 187)	4 (2.1%)	23 (12.3%)	69 (36.9%)	91 (48.7%)

T11. How would you rate each of the following aspects of the online course material (in the LEARN tab in LDC CoreTools) that your coach used or directed you to use?

	Poor	Fair	Good	Excellent
Clarity of information presented (n = 187)	6 (3.2%)	28 (15.0%)	87 (46.5%)	66 (35.3%)
Relevance of information presented (n = 187)	4 (2.1%)	28 (15.0%)	94 (50.3%)	61 (32.6%)
Ease of use (n = 187)	9 (4.8%)	44 (23.5%)	89 (47.6%)	45 (24.1%)
Usefulness of resource documents (e.g., LDC Pitfall Checklist, CCSS Mental Markers, etc.) (n = 187)	8 (4.3%)	36 (19.3%)	81 (43.3%)	62 (33.2%)
Usefulness of videos (n = 187)	13 (7.0%)	57 (30.5%)	73 (39.0%)	44 (23.5%)
Degree to which course material helped teachers to create and/or adapt LDC modules (n = 187)	10 (5.3%)	34 (18.2%)	90 (48.1%)	53 (28.3%)
Opportunity to extend learning when needed or desired (n = 187)	7 (3.7%)	31 (16.6%)	90 (48.1%)	59 (31.6%)

T12a. Overall, were you able to get the feedback and support you needed from your LDC coach (through written feedback in LDC CoreTools, or coaching and modeling in your LDC PLCs) to plan, teach, reflect on, and revise LDC modules)?

(n = 187)

☐ Yes 174 teachers (93.0%)

☐ No 13 teachers (7.0%)

T12b. Did your LDC coach provide written feedback on your module(s) in LDC CoreTools in a timely manner?

(n = 187)

☐ Yes 179 teachers (95.7%)

☐ No 8 teachers (4.3%)

T13. Outside of the PLC meetings with your LDC coach, please indicate whether you used each of the following types of coach support, and how helpful you found these types of support.

	Did not use	Used			
		Not helpful	A little helpful	Moderately helpful	Very helpful
Written feedback in LDC CoreTools from your LDC coach (in the comments areas and/or via the teacher work rubric) (n = 187)	7 (3.7%)	8 (4.3%)	29 (15.5%)	64 (34.2%)	79 (42.2%)
One-on-one Zoom video conference and/or call with your LDC coach (n = 187)	37 (19.8%)	7 (3.7%)	20 (10.7%)	55 (29.4%)	68 (36.4%)
Email or phone communication with your LDC coach (n = 187)	36 (19.3%)	3 (1.6%)	25 (13.4%)	42 (22.5%)	81 (43.3%)
Other (n = 187) Please specify:_____	118 (63.1%)	4 (2.1%)	5 (2.7%)	20 (10.7%)	40 (21.4%)

4 Module Creation

T14. During the current school year (2018-19), how many LDC modules did you individually or collaboratively adapt from existing modules (e.g., modules you created in a prior year and/or modules found in the LDC Library in CoreTools)?

☐ Adapted modules n = 163, Mean = 2.18, Range: 0 - 16

T15. During the current school year (2018-19), how many LDC modules did you create, either individually or with colleague(s)? Only include modules built from scratch, not those adapted from existing modules in the LDC library.

☐ New modules n = 163, Mean = 1.43, Range: 0 - 8

T16. How did members of your PLC collaborate to create LDC modules? Check all that apply.

	(n = 187)
☐ Modules were created by individual teachers.	74 teachers (35.9%)
☐ Modules were created by teams of two or more teachers.	120 teachers (58.3%)
☐ Modules were created by the PLC as a whole.	44 teachers (21.4%)
☐ Other (please specify) _____	18 teachers (8.7%)

T17. Please indicate to what extent you were able to do each of the following when creating LDC modules.

	Not at all	A little bit	A moderate extent	A great extent
Select focus standards for a writing assignment (n = 185)	2 (1.1%)	14 (7.6%)	61 (33.0%)	108 (58.4%)
Create a standards-driven writing assignment (n = 185)	2 (1.1%)	12 (6.5%)	69 (37.3%)	102 (55.1%)
Select high quality, complex texts and other materials to engage students in deeper learning (n = 185)	0 (0.0%)	24 (13.0%)	78 (42.2%)	83 (44.9%)
Identify the skills students need to develop to complete a writing assignment (n = 185)	0 (0.0%)	15 (8.1%)	68 (36.8%)	102 (55.1%)
Create daily lessons to teach the skills a student needs to complete a writing assignment (n = 185)	3 (1.6%)	20 (10.8%)	85 (45.9%)	77 (41.6%)
Differentiate instruction by incorporating multiple ways of thinking, various levels of complexity, and multiple modalities (n = 185)	2 (1.1%)	34 (18.4%)	86 (46.5%)	63 (34.1%)
Plan for a variety of methods to assess student progress (e.g., rubrics and/or mini-task scoring guides) (n = 185)	2 (1.1%)	29 (15.7%)	83 (44.9%)	71 (38.4%)
Assess the quality of writing assignments and/or instructional plans using Peer Review/Curriculum Alignment Rubric (e.g. Task Pitfalls Checklist, rubric indicators) (n = 185)	4 (2.2%)	16 (8.6%)	85 (45.9%)	80 (43.2%)
Make a writing assignment relevant and engaging for students (n = 185)	1 (0.5%)	23 (12.4%)	69 (37.3%)	92 (49.7%)

5 Classroom Implementation

T18. How many total LDC modules did you teach during the current school year (2018-19)?

☐ Modules n = 183, Mean = 2.75, Range: 0 - 15

T19. Outside of modules, approximately how many individual LDC mini-tasks did you teach during the current school year (2018-19)?

☐ Mini-tasks n = 183, Mean = 4.20, Range: 0 - 48

T20. Please indicate to what extent you were able to do each of the following activities when teaching LDC modules.

	Not at all	A little bit	A moderate extent	A great extent
Engage students in understanding the assignment and its rubric (n = 183)	4 (2.2%)	16 (8.7%)	77 (42.1%)	86 (47.0%)
Engage students in accessing complex text for the purpose of the assignment (n = 183)	2 (1.1%)	15 (8.2%)	84 (45.9%)	82 (44.8%)
Systematically collect information about students' progress (n = 183)	3 (1.6%)	26 (14.2%)	82 (44.8%)	72 (39.3%)
Provide feedback to students using assignment rubrics (n = 183)	3 (1.6%)	17 (9.3%)	78 (42.6%)	85 (46.4%)
Locate evidence of standards in final student work on the writing assignment (n = 183)	3 (1.6%)	17 (9.3%)	78 (42.6%)	85 (46.4%)
Use evidence of student progress on standards to modify subsequent instruction (n = 183)	4 (2.2%)	21 (11.5%)	72 (39.3%)	86 (47.0%)

T21. Toward the beginning of the school year, did you "find and teach" a module from CoreTools?

(n = 183)

- ☐ Yes — 110 teachers (60.1%)
- ☐ No — Skip to T24 — 73 teachers (39.9%)

T22. What was the name of the Find and Teach module?

_____

T23. Did you make any adjustments to the Find and Teach module?

(n = 110)

- ☐ Yes — 81 teachers (73.6%)
- ☐ No — 29 teachers (26.4%)

T24. What module did you adapt, refine, and/or develop most during the current school year (2018-19)? This module is typically one you worked on *after* the Find and Teach module.

_____

T25. Which of these statements best describes how you created the module named in the previous question?

(n = 182)

- ☐ I created a module from a template in CoreTools. — 77 teachers (42.3%)
- ☐ I found and adjusted another teacher's module from the LDC Library in CoreTools. — 105 teachers (57.7%)

T26. Did you teach this module in your classroom?

(n = 182)

- ☐ Yes, I have already taught this module this year. — 159 teachers (87.4%)
- ☐ No, but I plan to teach this module before the end of the 2018-19 school year. — 11 teachers (6.0%)
- ☐ No, but I plan to teach this module during next school year. — 5 teachers (2.7%)
- ☐ No. I do not currently have plans to teach this module in my classroom. — 7 teachers (3.8%)

6 Module Peer Review

T27. Did you attend a Peer Review/Curriculum Alignment Workshop this school year? (Y/N)

(n = 182)

- ☐ Yes — 52 teachers (28.6%)
- ☐ No — 130 teachers (71.4%)

T28. How many modules did you submit online for LDC National Peer Review during the current school year (2018-19)?

☐ Modules If none, ↓ skip to T29 — n = 182, Mean = 0.81, Range: 0 - 4

T29. How helpful did you find the National Peer Review process in improving the quality of your module?

(n = 117)

- ☐ Not helpful — 4 teachers (4.5%)
- ☐ A little helpful — 29 teachers (32.6%)
- ☐ Moderately helpful — 30 teachers (33.7%)
- ☐ Very helpful — 26 teachers (29.2%)

7 Impact on Teacher Practice and Learning

T30. Between the beginning and end of this year's work with LDC, please indicate how much your skills have *improved* in the following areas:

	Not at all	A little	Moderately	A great deal
Selecting focus standards for a writing assignment (n = 183)	7 (3.8%)	20 (10.9%)	74 (40.4%)	82 (44.8%)
Creating standards-driven writing assignments (n = 183)	4 (2.2%)	24 (13.1%)	71 (38.8%)	84 (45.9%)
Identifying the skills students need to develop to complete a writing assignment (n = 183)	6 (3.3%)	22 (12.0%)	75 (41.0%)	80 (43.7%)
Creating daily lessons to teach the skills students need to complete a writing assignment (n = 183)	9 (4.9%)	26 (14.2%)	75 (41.0%)	73 (39.9%)
Systematically collecting information on students' progress (n = 183)	9 (4.9%)	29 (15.8%)	75 (41.0%)	70 (38.3%)
Identifying patterns of student understandings or misconceptions (n = 183)	9 (4.9%)	24 (13.1%)	76 (41.5%)	74 (40.4%)
Using evidence of student progress on standards to modify subsequent instruction (n = 183)	5 (2.7%)	28 (15.3%)	75 (41.0%)	75 (41.0%)

T31. Please indicate the degree to which you agree or disagree with the statements below.

	Strongly disagree	Disagree	Agree	Strongly agree
Participating in LDC raised my expectations for students' writing. (n = 183)	6 (3.3%)	16 (8.7%)	99 (54.1%)	62 (33.9%)
Using LDC modules became an important part of my instructional practice. (n = 183)	9 (4.9%)	29 (15.8%)	96 (52.5%)	49 (26.8%)
Implementing LDC helped me incorporate my state's College- and Career-Ready Standards into my instruction. (n = 183)	8 (4.4%)	23 (12.6%)	105 (57.4%)	47 (25.7%)
LDC helped me incorporate writing assignments into my existing curriculum. (n = 183)	5 (2.7%)	20 (10.9%)	105 (57.4%)	53 (29.0%)
I am more likely to collaborate with other teachers on designing instruction after participating in our LDC Professional Learning Community. (n = 183)	7 (3.8%)	24 (13.1%)	102 (55.7%)	50 (27.3%)
LDC helped me improve on my teacher evaluation ratings. (n = 183)	13 (7.1%)	34 (18.6%)	100 (54.6%)	36 (19.7%)
Participating in LDC helped me develop working relationships with teachers in different grades and/or subjects. (n = 183)	9 (4.9%)	26 (14.2%)	103 (56.3%)	45 (24.6%)
I shared my LDC work with colleagues outside of the LDC PLC. (n = 183)	17 (9.3%)	46 (25.1%)	84 (45.9%)	36 (19.7%)

8 Impact on Student Learning

T32. Please indicate to what extent LDC had a positive effect on students in the following areas.

	Not at all	A little	Moderately	A great deal
Reading skills (n = 183)	11 (6.0%)	34 (18.6%)	85 (46.4%)	53 (29.0%)
Content knowledge (n = 183)	8 (4.4%)	27 (14.8%)	78 (42.6%)	70 (38.3%)
Ability to complete writing assignments (n = 183)	4 (2.2%)	27 (14.8%)	73 (39.9%)	79 (43.2%)
Quality of students' writing (n = 183)	6 (3.3%)	27 (14.8%)	75 (41.0%)	75 (41.0%)
College and career ready skills (n = 183)	12 (6.6%)	35 (19.1%)	83 (45.4%)	53 (29.0%)
Capacity to analyze and understand the components of a writing assignment (n = 183)	4 (2.2%)	34 (18.6%)	72 (39.3%)	73 (39.9%)
Speaking and listening skills (n = 183)	8 (4.4%)	31 (16.9%)	86 (47.0%)	58 (31.7%)
Overall literacy performance (n = 183)	4 (2.2%)	31 (16.9%)	93 (50.8%)	55 (30.1%)
Performance on assessments throughout the school year (n = 183)	10 (5.5%)	30 (16.4%)	81 (44.3%)	62 (33.9%)

9 Teacher Leader Support

The following question refers to the LDC project liaison in your school. This is the teacher leading your Professional Learning Community work.

T33. Please indicate the degree to which you agree or disagree with the following statements.

	Strongly disagree	Disagree	Agree	Strongly agree
Our school's LDC teacher leader effectively supported our Professional Learning Community meetings. (n = 159)	0 (0.0%)	7 (4.4%)	71 (44.7%)	81 (50.9%)
When I had questions about LDC, I felt comfortable approaching our school's teacher leader. (n = 159)	0 (0.0%)	5 (3.1%)	66 (41.5%)	88 (55.3%)
Our teacher leader helped teachers align LDC to broader school instructional goals. (n = 159)	0 (0.0%)	14 (8.8%)	66 (41.5%)	79 (49.7%)
Our teacher leader offered useful feedback for the design and revision of LDC modules. (n = 159)	1 (0.6%)	12 (7.5%)	66 (41.5%)	80 (50.3%)
Our teacher leader was effective in inviting teachers to join the LDC initiative. (n = 159)	2 (1.3%)	8 (5.0%)	68 (42.8%)	81 (50.9%)

10 School Administrator Support

The following questions refer to the school administrator who oversees the LDC project at your school.

T34. What proportion of PLC meetings focused on LDC did your school administrator attend?

	(n = 183)
☐ Less than one quarter of LDC PLCs	65 teachers (35.5%)
☐ About one quarter of LDC PLCs	41 teachers (22.4%)
☐ About one half of LDC PLCs	30 teachers (16.4%)
☐ About three quarters of LDC PLCs	15 teachers (8.2%)
☐ More than three quarters of LDC PLCs	32 teachers (17.5%)

T35. How many times did your school administrator observe you teach an LDC mini-task during the current school year (2018-19)?

	(n = 183)
☐ 0 times	69 teachers (37.7%)
☐ 1 time	45 teachers (24.6%)
☐ 2 times	39 teachers (21.3%)
☐ 3 or more times	30 teachers (16.4%)

T36. Please indicate the degree to which you agree or disagree with the following statements.

My school administrator…	Strongly disagree	Disagree	Agree	Strongly agree
had a firm understanding of LDC. (n = 183)	11 (6.0%)	23 (12.6%)	100 (54.6%)	49 (26.8%)
Allocated resources such as teacher time, payment, administrator time, support staff, sub coverage, etc., to ensure the LDC team could meet. (n = 183)	14 (7.7%)	11 (6.0%)	98 (53.6%)	60 (32.8%)
encouraged teachers to participate in LDC. (n = 183)	7 (3.8%)	4 (2.2%)	99 (54.1%)	73 (39.9%)
expressed concerns that implementing LDC is taking time away from other instructional priorities (n = 183)	40 (21.9%)	49 (26.8%)	63 (34.4%)	31 (16.9%)
communicated how using LDC's tools supported specific school initiatives and/or goals. (n = 183)	11 (6.0%)	19 (10.4%)	97 (53.0%)	56 (30.6%)
provided me with feedback about my LDC planning and/or instruction. (n = 183)	20 (10.9%)	24 (13.1%)	101 (55.2%)	38 (20.8%)
made formative assessment a priority at my school. (n = 183)	9 (4.9%)	16 (8.7%)	104 (56.8%)	54 (29.5%)
used LDC to implement standards-driven assignments within existing curriculum. (n = 183)	14 (7.7%)	19 (10.4%)	95 (51.9%)	55 (30.1%)

11 Teacher Leadership Role

T37. Please indicate the degree to which you agree or disagree with the following statements about your role in your school's LDC implementation.

	Strongly disagree	Disagree	Agree	Strongly agree
I was involved in setting instructional goals for the LDC work at my school. (n = 158)	14 (8.9%)	34 (21.5%)	80 (50.6%)	30 (19.0%)
I was involved in discussions about how to expand LDC implementation at my school in future years. (n = 158)	15 (19.5%)	42 (26.6%)	74 (46.8%)	27 (17.1%)
I had the opportunity to work with our LDC teacher leader and our administrator to help shape LDC implementation. (n = 158)	14 (8.9%)	38 (24.1%)	75 (47.5%)	31 (19.6%)
I am interested in learning more about how to lead LDC implementation at my school by facilitating with the virtual coach, providing feedback to my peers, etc. (n = 158)	25 (15.8%)	26 (16.5%)	73 (46.2%)	34 (21.5%)

12 Facilitators and Barriers

T38. Please indicate the degree to which you agree or disagree with the following statements.

	Strongly disagree	Disagree	Agree	Strongly agree
My LDC PLC was given sufficient time to meet. (n = 182)	5 (2.7%)	36 (19.8%)	99 (54.4%)	42 (23.1%)
I felt adequately prepared to effectively implement LDC modules in my classroom. (n = 182)	6 (3.3%)	21 (11.5%)	110 (60.4%)	45 (24.7%)
It was challenging to find content-rich reading materials for the LDC modules I developed. (n = 182)	13 (7.1%)	50 (27.5%)	81 (44.5%)	38 (20.9%)
My school had adequate technology to support teachers' use of LDC. (n = 182)	9 (4.9%)	18 (9.9%)	99 (54.4%)	56 (30.8%)
It was easy to find and adapt LDC mini-tasks for use in my classroom. (n = 182)	4 (2.2%)	27 (14.8%)	103 (56.6%)	48 (26.4%)

13 Areas for Improvement

There have been a number of supports for implementation of LDC in your school, including:

- CoreTools online platform
- LDC online courses in the "LEARN" section of CoreTools
- Virtual coaching
  - Zoom meetings, written feedback on teacher work in LDC CoreTools, emails, etc.
- In-person coaching
  - Summer training, in-person support visits from LDC and District Lead, in-person professional development opportunities, etc.

T39. What supports did you find the most useful and why?

T40. What supports were not helpful and why?

T41. In what ways could LDC implementation be improved in your school in the future?

Appendix B:
Teacher Leader Survey and Responses

2018–2019
LDC Teacher Leader Survey

1 LDC Participation

TL1. Prior to the current school year (2018-19), did you have any experience with LDC?

(n = 30)

☐ Yes — 29 Teacher Leaders (96.7%)

☐ No — Skip to TL3 — 1 Teacher Leader (3.3%)

TL2. How many of the following did you teach prior to the current school year (2018-19)?

☐ LDC modules — n = 29, Mean = 2.68, Range: 0 - 6

☐ LDC mini-tasks, outside of modules — n = 29, Mean = 3.90, Range: 0 - 15

2 Professional Learning Community and Teacher Collaboration

The following questions involve the LDC Professional Learning Community (PLC) that you are leading.

TL3. About how often did your LDC PLC meet?

		(n = 30)
☐ Less than once a month		2 Teacher Leaders (6.7%)
☐ Once a month		5 Teacher Leaders (16.7%)
☐ Every other week		11 Teacher Leaders (36.7%)
☐ Once a week	Skip to TL5	11 Teacher Leaders (36.7%)
☐ Twice a week or more often	Skip to TL5	1 Teacher Leader (3.3%)

TL4. What were the primary barriers preventing your LDC PLC from meeting weekly? Select all that apply.

	(n = 18)
☐ PLC time was not protected.	6 Teacher Leaders (33.3%)
☐ PLC members had limited interest in attending meetings.	2 Teacher Leaders (11.1%)
☐ School administrator did not make it a priority.	3 Teacher Leaders (16.7%)
☐ I was unable to provide sufficient organizational support.	0 Teacher Leaders (0.0%)
☐ Not enough teachers participated.	2 Teacher Leaders (11.1%)
☐ PLC members had other priorities that competed with LDC participation.	11 Teacher Leaders (61.1%)
☐ Other (please specify) _____	0 Teacher Leaders (0.0%)

TL5. About how often did you have informal discussions (as opposed to scheduled meetings) about LDC with teachers in your LDC PLC?

	(n = 30)
☐ Less than once a month	6 Teacher Leaders (20.0%)
☐ Once a month	6 Teacher Leaders (20.0%)
☐ Every other week	4 Teacher Leaders (13.3%)
☐ Once a week	9 Teacher Leaders (30.0%)
☐ Twice a week or more	5 Teacher Leaders (16.7%)

TL6. On average how long did your school's LDC PLC meetings typically last?

	(n = 30)
☐ Less than 45 minutes	6 Teacher Leaders (20.0%)
☐ 45 to 59 minutes	21 Teacher Leaders (70.0%)
☐ 60 to 74 minutes	3 Teacher Leaders (10.0%)
☐ 75 minutes or more	0 Teacher Leaders (0.0%)

3 Teacher Training and Support

TL7. How effective was your LDC PLC in the following areas?

	Not effective	A little effective	Moderately effective	Very effective
Creating an environment in which teachers are comfortable working together (n = 30)	1 (3.3%)	1 (3.3%)	13 (43.3%)	15 (50.0%)
Fostering an environment where teachers share their instructional plans with colleagues (n = 30)	1 (3.3%)	2 (6.7%)	12 (40.0%)	15 (50.0%)
Allowing space to share student work (n = 30)	2 (6.7%)	2 (6.7%)	12 (40.0%)	14 (46.7%)
Helping teachers learn to improve their LDC instructional plans. (n = 30)	1 (3.3%)	2 (6.7%)	13 (43.3%)	14 (46.7%)

TL8. How would you rate each of the following aspects of the online course material (in the LEARN tab in LDC CoreTools) that your coach used or directed you to use?

	Poor	Fair	Good	Excellent
Clarity of information presented (n = 30)	0 (0.0%)	3 (10.0%)	15 (50.0%)	12 (40.0%)
Relevance of information presented (n = 30)	0 (0.0%)	2 (6.7%)	17 (56.7%)	11 (36.7%)
Ease of use (n = 30)	0 (0.0%)	6 (20.0%)	17 (56.7%)	7 (23.3%)
Usefulness of resource documents (e.g., LDC Pitfall Checklist, CCSS Mental Markers, etc.) (n = 30)	0 (0.0%)	2 (6.7%)	17 (56.7%)	11 (36.7%)
Usefulness of videos (n = 30)	0 (0.0%)	10 (33.3%)	13 (43.3%)	7 (23.3%)
Degree to which course material helped teachers to create and/or adapt LDC modules (n = 30)	0 (0.0%)	4 (13.3%)	17 (56.7%)	9 (30.0%)
Opportunity to extend learning when needed or desired (n = 30)	0 (0.0%)	4 (13.3%)	16 (53.3%)	10 (33.3%)

TL9a. Overall, were you able to get the feedback and support you needed from your LDC coach (through written feedback in LDC CoreTools, or coaching and modeling in your LDC PLCs) to plan, teach, reflect on, and revise LDC modules?

(n = 30)

- ☐ Yes — 29 Teacher Leaders (96.7%)
- ☐ No — 1 Teacher Leader (3.3%)

TL9b. Did your LDC coach provide written feedback on your module(s) in LDC CoreTools in a timely manner?

(n = 30)

- ☐ Yes — 29 Teacher Leaders (96.7%)
- ☐ No — 1 Teacher Leader (3.3%)

TL10. Outside of the PLC meetings with your LDC coach, please indicate whether you used each of the following types of coach support, and how helpful you found these types of support.

	Did not use	Used			
		Not helpful	A little helpful	Moderately helpful	Very helpful
Written feedback in LDC CoreTools from your LDC coach (in the comments areas and/or via the teacher work rubric) (n = 30)	2 (6.7%)	2 (6.7%)	3 (10.0%)	5 (16.7%)	18 (60.0%)
One-on-one Zoom video conference and/or call with your LDC coach (n = 30)	2 (6.7%)	1 (3.3%)	0 (0.0%)	8 (26.7%)	19 (63.3%)
Email or phone communication with your LDC coach (n = 30)	0 (0.0%)	1 (3.3%)	2 (6.7%)	7 (23.3%)	20 (66.7%)
Other (please specify) (n = 30)	20 (66.7%)	0 (0.0%)	0 (0.0%)	3 (10.0%)	7 (23.3%)

TL11. How many in-person and/or online LDC professional development offerings for school administrators and Teacher Leaders did you attend during the current school (e.g., Summer in-person launch days, Quarterly in-person Teacher Leader meetings, LDC monthly virtual coach meetings)?

☐ Professional development offerings n = 30, Mean = 3.83, Range: 0 - 17

4 Support to Teacher Leader from LDC Coach

TL12. Please indicate the degree to which you agree or disagree with the following statements.

	Strongly disagree	Disagree	Agree	Strongly agree	N/A
I was able to reach my LDC coach if I had any questions about LDC. (n = 30)	0 (0.0%)	0 (0.0%)	6 (20.0%)	24 (80.0%)	0 (0.0%)
LDC provided adequate technical support for issues with the CoreTools online platform. (n = 30)	0 (0.0%)	0 (0.0%)	14 (46.7%)	14 (46.7%)	2 (6.7%)
LDC offered sufficient professional development opportunities for me to lead the initiative in my school. (n = 30)	0 (0.0%)	1 (3.3%)	12 (40.0%)	16 (53.3%)	1 (3.3%)
LDC coaches were able to connect me with additional resources when needed. (n = 30)	0 (0.0%)	0 (0.0%)	11 (36.7%)	19 (63.3%)	0 (0.0%)
It was challenging to coordinate with our LDC coach on how to structure Professional Learning Community time. (n = 30)	8 (26.7%)	8 (26.7%)	4 (13.3%)	9 (30.0%)	1 (3.3%)
When I reached out to our LDC coach, he or she responded quickly. (n = 30)	1 (3.3%)	0 (0.0%)	7 (23.3%)	22 (73.3%)	0 (0.0%)
Our LDC coach was easy to work with. (n = 30)	1 (3.3%)	0 (0.0%)	6 (20.0%)	23 (76.7%)	0 (0.0%)
Our LDC coach was knowledgeable and provided high quality guidance. (n = 30)	1 (3.3%)	0 (0.0%)	9 (30.0%)	20 (66.7%)	0 (0.0%)

5 Module Creation

TL13. During the current school year (2018-19), how many LDC modules did your PLC individually or collaboratively adapt from existing modules (e.g., modules created in a prior year and/or modules from the LDC Library in CoreTools)?

☐ Adapted modules n = 30, Mean = 4.10, Range: 0 - 15

TL14. During the current school year (2018-19), how many LDC modules did your PLC create (either individually or in a group)? Only include modules built from scratch, not those adapted from existing modules in the LDC library.

☐ New modules n = 30, Mean = 2.50, Range: 0 - 10

TL15. How did members of your PLC collaborate to create LDC modules? Check all that apply.

	(n = 30)
☐ Modules were created by individual teachers.	14 Teacher Leaders (46.7%)
☐ Modules were created by teams of two or more teachers.	20 Teacher Leaders (66.7%)
☐ Modules were created by the PLC as a whole.	8 Teacher Leaders (26.7%)
☐ Other (please specify) _____	2 Teacher Leaders (6.7%)

TL16. Please indicate to what extent you were able to do each of the following when creating LDC modules.

	Not at all	A little bit	To a moderate extent	To a great extent
Select focus standards for a writing assignment (n = 30)	0 (0.0%)	0 (0.0%)	12 (40.0%)	18 (60.0%)
Create a standards-driven writing assignment (n = 30)	0 (0.0%)	0 (0.0%)	13 (43.3%)	17 (56.7%)
Select high quality, complex texts and other materials to engage students in deeper learning (n = 30)	0 (0.0%)	1 (3.3%)	14 (46.7%)	15 (50.0%)
Identify the skills students need to develop to complete a writing assignment (n = 30)	0 (0.0%)	0 (0.0%)	16 (53.3%)	14 (46.7%)
Create daily lessons to teach the skills a student needs to complete a writing assignment (n = 30)	0 (0.0%)	4 (13.3%)	12 (40.0%)	14 (46.7%)
Differentiate instruction by incorporating multiple ways of thinking, various levels of complexity, and multiple modalities. (n = 30)	0 (0.0%)	5 (16.7%)	15 (50.0%)	10 (33.3%)
Plan for a variety of methods to assess student progress (e.g., rubrics and/or mini-task scoring guides) (n = 30)	0 (0.0%)	1 (3.3%)	16 (53.3%)	13 (43.3%)
Assess the quality of writing assignments and/or instructional plans using Peer Review/Curriculum Alignment Rubric (e.g. Task Pitfalls Checklist, rubric indicators) (n = 30)	0 (0.0%)	1 (3.3%)	16 (53.3%)	13 (43.3%)
Make a writing assignment relevant and engaging for students (n = 30)	0 (0.0%)	1 (3.3%)	15 (50.0%)	14 (46.7%)

6 Impact on Student Learning

TL17. Please indicate to what extent LDC had a positive effect on students in the following areas.

	Not at all	A little	Moderately	A great deal
Reading skills (n = 30)	0 (0.0%)	1 (3.3%)	18 (60.0%)	11 (36.7%)
Content knowledge (n = 30)	0 (0.0%)	0 (0.0%)	18 (60.0%)	12 (40.0%)
Ability to complete writing assignments (n = 30)	0 (0.0%)	0 (0.0%)	14 (46.7%)	16 (53.3%)
Quality of students' writing (n = 30)	0 (0.0%)	0 (0.0%)	16 (53.3%)	14 (46.7%)
College and career ready skills (n = 30)	0 (0.0%)	1 (3.3%)	17 (56.7%)	12 (40.0%)
Capacity to analyze and understand the components of a writing assignment (n = 30)	0 (0.0%)	0 (0.0%)	16 (53.3%)	14 (46.7%)
Speaking and listening skills (n = 30)	1 (3.3%)	1 (3.3%)	15 (50.0%)	13 (43.3%)
Overall literacy performance (n = 30)	0 (0.0%)	0 (0.0%)	19 (63.3%)	11 (36.7%)
Performance on assessments throughout the school year (n = 30)	0 (0.0%)	0 (0.0%)	18 (60.0%)	12 (40.0%)

7 School Administrator Support

The following questions refer to the school administrator who oversees the LDC project at your school.

TL18. What proportion of PLC meetings focused on LDC did your school administrator attend?

(n = 29)

☐ Less than one quarter of LDC PLCs	10 Teacher Leaders (34.5%)
☐ About one quarter of LDC PLCs	9 Teacher Leaders (31.0%)
☐ About one half of LDC PLCs	4 Teacher Leaders (13.8%)
☐ About three quarters of LDC PLCs	3 Teacher Leaders (10.3%)
☐ More than three quarters of LDC PLCs	3 Teacher Leaders (10.3%)

TL19. Please indicate the degree to which you agree or disagree with the following statements.

My school administrator…	Strongly disagree	Disagree	Agree	Strongly agree
had a firm understanding of LDC. (n = 29)	4 (13.8%)	2 (6.9%)	16 (55.2%)	7 (24.1%)
allocated resources such as teacher time, payment, administrator time, support staff, sub coverage, etc., to ensure the LDC team could meet. (n = 29)	3 (10.3%)	1 (3.4%)	14 (48.3%)	11 (37.9%)
encouraged teachers to participate in LDC. (n = 29)	2 (6.9%)	1 (3.4%)	13 (44.8%)	13 (44.8%)
expressed concerns that implementing LDC is taking time away from other instructional priorities. (n = 29)	7 (24.1%)	7 (24.1%)	9 (31.0%)	6 (20.7%)
communicated how using LDC's tools supported specific school initiatives and/or goals. (n = 29)	2 (6.9%)	2 (6.9%)	17 (58.6%)	8 (27.6%)
provided me with feedback about my LDC planning and/or instruction. (n = 29)	5 (17.2%)	2 (6.9%)	19 (65.5%)	3 (10.3%)
made formative assessment a priority at my school. (n = 29)	3 (10.3%)	1 (3.4%)	17 (58.6%)	8 (27.6%)
used LDC to implement standards-driven assignments within existing curriculum. (n = 29)	2 (6.9%)	2 (6.9%)	16 (55.2%)	9 (31.0%)

8 Teacher Leader Leadership Role

TL20. Please indicate the degree to which you agree or disagree with the following statements about your role in leading your school's LDC implementation.

	Strongly disagree	Disagree	Agree	Strongly agree
I met regularly with my school administrator to make planning decisions around LDC. (n = 29)	3 (10.3%)	3 (10.3%)	17 (58.6%)	6 (20.7%)
I was involved in discussions about differentiating LDC implementation to meet teacher learning needs. (n = 29)	1 (3.4%)	1 (3.4%)	18 (62.1%)	9 (31.0%)
I was involved in discussions about how to expand LDC implementation at my school in future years. (n = 29)	1 (3.4%)	4 (13.8%)	16 (55.2%)	8 (27.6%)
My role as an LDC Teacher Leader allowed me to effectively advocate for additional resources on my campus. (n = 29)	1 (3.4%)	4 (13.8%)	17 (58.6%)	7 (24.1%)
I was involved in adjusting the problems of practice that my school targeted with the LDC work. (n = 29)	1 (3.4%)	3 (10.3%)	17 (58.6%)	8 (27.6%)
I met regularly with my LDC coach to manage the LDC work plan. (n = 29)	0 (0.0%)	1 (3.4%)	17 (58.6%)	11 (37.9%)
I feel that my position as an LDC Teacher Leader allowed me to build my capacity as an instructional leader among my colleagues. (n = 29)	1 (3.4%)	2 (6.9%)	15 (51.7%)	11 (37.9%)
I am confident that I can lead our LDC PLC in the future without the assistance of an LDC coach. (n = 29)	1 (3.4%)	5 (17.2%)	14 (48.3%)	9 (31.0%)

9 Alignment

TL21. Please indicate the degree to which you agree or disagree with the following statements.

	Strongly disagree	Disagree	Agree	Strongly agree
Our school connected LDC implementation to our specific schoolwide goals. (n = 29)	2 (6.9%)	2 (6.9%)	17 (58.6%)	8 (27.6%)
LDC helped teachers create writing assignments to use within their current curricula. (n = 29)	1 (3.4%)	4 (13.8%)	15 (51.7%)	9 (31.0%)
LDC complemented other initiatives taking place in my school. (n = 29)	2 (6.9%)	1 (3.4%)	19 (65.5%)	7 (24.1%)
I view LDC as a strategy for implementing my state's College- and Career-Ready Standards. (n = 29)	1 (3.4%)	1 (3.4%)	17 (58.6%)	10 (34.5%)
The time spent implementing LDC interfered with other important initiatives at my school. (n = 29)	3 (10.3%)	14 (48.3%)	8 (27.6%)	4 (13.8%)
LDC helped prepare students in my school for current state assessments. (n = 29)	1 (3.4%)	1 (3.4%)	20 (69.0%)	7 (24.1%)
It was difficult for teachers to focus on LDC because of other competing priorities at the school. (n = 29)	1 (3.4%)	10 (34.5%)	10 (34.5%)	8 (27.6%)
Our instructional leaders are using LDC to implement standards-driven assignments within the existing curriculum. (n = 29)	2 (6.9%)	4 (13.8%)	16 (55.2%)	7 (24.1%)

10 Scale-up and Sustainability

TL22. Please indicate the degree to which you agree or disagree with the following statements.

	Strongly disagree	Disagree	Agree	Strongly agree
I expect that most teachers participating in LDC this year will continue to do so next year. (n = 29)	2 (6.9%)	6 (20.7%)	14 (48.3%)	7 (24.1%)
Teachers at my school who were not part of the LDC PLC meetings used the LDC planning process and/or LDC CoreTools. (n = 29)	5 (17.2%)	11 (37.9%)	7 (24.1%)	6 (20.7%)
As a result of LDC, new collaborations across grades and/or subjects were created or are being launched at my school. (n = 29)	3 (10.3%)	6 (20.7%)	13 (44.8%)	7 (24.1%)
Teachers and administrators at my school are committed to sustaining the LDC initiative. (n = 29)	3 (10.3%)	5 (17.2%)	15 (51.7%)	6 (20.7%)
I expect our LDC PLC to increase in size next year. (n = 29)	3 (10.3%)	8 (27.6%)	12 (41.4%)	6 (20.7%)

11 District Support

TL23. Please indicate the degree to which you agree or disagree with the following statements.

	Strongly disagree	Disagree	Agree	Strongly agree	Don't know
District leaders supported the implementation of LDC. (n = 29)	1 (3.4%)	1 (3.4%)	8 (27.6%)	2 (6.9%)	17 (58.6%)
District leaders had a firm understanding of LDC. (n = 29)	1 (3.4%)	1 (3.4%)	7 (24.1%)	1 (3.4%)	19 (65.5%)
District leaders are interested in spreading the use of LDC to additional schools. (n = 29)	1 (3.4%)	0 (0.0%)	7 (24.1%)	2 (6.9%)	19 (65.5%)
District professional development efforts were aligned with the LDC initiative. (n = 29)	1 (3.4%)	2 (6.9%)	7 (24.1%)	2 (6.9%)	17 (58.6%)
District leaders visited my school to discuss the implementation of LDC. (n = 29)	2 (6.9%)	3 (10.3%)	6 (20.7%)	2 (6.9%)	16 (55.2%)

12 Areas for Improvement

There have been a number of supports for implementation of LDC in your school, including:

- CoreTools online platform
- LDC online courses in the "LEARN" section of CoreTools
- Virtual coaching
  - Zoom meetings, written feedback on teacher work in LDC CoreTools, emails, etc.
- In-person coaching
  - Summer training, in-person support visits from LDC and District Lead, in-person professional development opportunities, etc.

TL24. What supports did you find the most useful and why?

TL25. What supports were not helpful and why?

TL26. In what ways could LDC implementation be improved in your school in the future?

Appendix C:
Administrator Survey and Responses

2018–2019
LDC School Administrator Survey

1 LDC Participation

A1. What is your role at the school?

	(n = 16)
☐ Principal	8 admins (50.0%)
☐ Assistant Principal	8 admins (50.0%)
☐ Other (please specify) _____	0 admin (0.0%)

2 Professional Learning Community

A2. What proportion of LDC Professional Learning Community (PLC) meetings did you attend during the current school year?

	(n = 15)
☐ Less than one quarter of LDC PLCs	4 admins (26.7%)
☐ About one quarter of LDC PLCs	3 admins (20.0%)
☐ About one half of LDC PLCs	3 admins (20.0%)
☐ About three quarters of LDC PLCs	3 admins (20.0%)
☐ More than three quarters of LDC PLCs	2 admin (13.3%)

3 Training and Support

A3. How many in-person and/or online LDC professional development offerings for school administrators and teacher leaders did you attend during the current school year (e.g.,

Summer launch meetings, quarterly in-person administrator meetings, monthly virtual LDC leadership meetings)?

☐ LDC Professional development offerings n = 15, Mean = 6.00, Range: 0 - 20

A4. Please indicate the degree to which you agree or disagree with the following statements.

	Strongly disagree	Disagree	Agree	Strongly agree	N/A
I was able to reach LDC staff when I had questions about LDC. (n = 15)	0 (0.0%)	0 (0.0%)	6 (40.0%)	9 (60.0%)	0 (0.0%)
My school has adequate technology to access LDC online resources. (n = 15)	0 (0.0%)	1 (6.7%)	5 (33.3%)	9 (60.0%)	0 (0.0%)
LDC offered sufficient professional development opportunities for LDC teacher leaders. (n = 15)	0 (0.0%)	0 (0.0%)	6 (40.0%)	9 (60.0%)	0 (0.0%)
LDC offered sufficient professional development opportunities for school administrators. (n = 15)	0 (0.0%)	0 (0.0%)	8 (53.3%)	7 (46.7%)	0 (0.0%)
LDC staff members were able to connect me with additional resources when needed. (n = 15)	0 (0.0%)	0 (0.0%)	7 (46.7%)	7 (46.7%)	1 (6.7%)

4 Classroom Observation

A5. On average, how many times during the school year did you observe each member of the LDC PLC teaching an LDC module?

		(n = 15)
☐ 0 times	Skip to A7	0 admin (0.0%)
☐ 1 time		2 admins (13.3%)
☐ 2 times		4 admins (26.7%)
☐ 3 or more times		9 admins (60.0%)

A6. On average, how effective were LDC modules in developing students' literacy skills?

(n = 15)

☐ Not effective	0 admin (0.0%)
☐ A little effective	0 admin (0.0%)
☐ Moderately effective	9 admins (60.0%)
☐ Very effective	6 admins (40.0%)

5 Impact on Teacher Practice

A7. Based on your oversight of the LDC program, please indicate on average how much the teaching practice of LDC PLC members improved in each of the following areas:

	Not at all	A little	Moderately	A great deal
Selecting a set of focus standards for a writing assignment (n = 15)	0 (0.0%)	0 (0.0%)	7 (46.7%)	8 (53.3%)
Creating standards-driven writing assignments (n = 15)	0 (0.0%)	0 (0.0%)	7 (46.7%)	8 (53.3%)
Identifying the skills students need to develop to complete a writing assignment (n = 15)	0 (0.0%)	1 (6.7%)	6 (40.0%)	8 (53.3%)
Creating daily lessons to teach each skill a student needs to complete a writing assignment (n = 15)	0 (0.0%)	1 (6.7%)	7 (46.7%)	7 (46.7%)
Systematically collecting information on students' progress. (n = 15)	0 (0.0%)	0 (0.0%)	9 (60.0%)	6 (40.0%)
Identifying patterns of student understandings or misconceptions (n = 15)	0 (0.0%)	3 (20.0%)	6 (40.0%)	6 (40.0%)
Using evidence of student progress on standards to modify subsequent instruction (n = 15)	0 (0.0%)	2 (13.3%)	8 (53.3%)	5 (33.3%)

6 Impact on Student Learning

A8. Please indicate to what extent LDC had a positive effect on students in the following areas:

	Not at all	A little	Moderately	A great deal
Reading skills (n = 15)	0 (0.0%)	2 (13.3%)	8 (53.3%)	5 (33.3%)
Content knowledge (n = 15)	0 (0.0%)	3 (20.0%)	7 (46.7%)	5 (33.3%)
Ability to complete writing assignments (n = 15)	0 (0.0%)	2 (13.3%)	6 (40.0%)	7 (46.7%)
Quality of students' writing (n = 15)	0 (0.0%)	3 (20.0%)	6 (40.0%)	6 (40.0%)
College and career ready skills (n = 15)	0 (0.0%)	3 (20.0%)	6 (40.0%)	6 (40.0%)
Capacity to analyze and understand the components of a writing assignment (n = 15)	0 (0.0%)	4 (26.7%)	4 (26.7%)	7 (46.7%)
Speaking and listening skills (n = 15)	0 (0.0%)	2 (13.3%)	7 (46.7%)	6 (40.0%)
Overall literacy performance (n = 15)	0 (0.0%)	2 (13.3%)	7 (46.7%)	6 (40.0%)
Performance on assessments throughout the school year (n = 15)	0 (0.0%)	3 (20.0%)	6 (40.0%)	6 (40.0%)

7 Administrator Leadership Role

A9. Please indicate the degree to which you agree or disagree with the following statements about your role in leading LDC implementation in your school:

	Strongly disagree	Disagree	Agree	Strongly agree
I was able to shape LDC implementation at my school. (n = 15)	0 (0.0%)	3 (20.0%)	7 (46.7%)	5 (33.3%)
I met regularly with the LDC teacher leader in my school to stay abreast of implementation progress. (n = 15)	0 (0.0%)	2 (13.3%)	5 (33.3%)	8 (53.3%)
I was involved in discussions about differentiating LDC implementation to meet teacher learning needs. (n = 15)	0 (0.0%)	1 (6.7%)	7 (46.7%)	7 (46.7%)
I led discussions about how to expand my school's LDC implementation in future years. (n = 15)	0 (0.0%)	2 (13.3%)	8 (53.3%)	5 (33.3%)
I made changes to school schedules to accommodate LDC professional learning time. (n = 15)	0 (0.0%)	2 (13.3%)	5 (33.3%)	8 (53.3%)
I allocated resources such as teacher time, payment, administrator time, support staff, sub coverage, etc., to ensure the LDC team could meet. (n = 15)	0 (0.0%)	2 (13.3%)	6 (40.0%)	7 (46.7%)

8 Alignment

A10. Please indicate the degree to which you agree or disagree with the following statements:

	Strongly disagree	Disagree	Agree	Strongly agree
Our school connected LDC implementation to our specific schoolwide goals. (n = 15)	0 (0.0%)	2 (13.3%)	8 (53.3%)	5 (33.3%)
LDC helped teachers create writing assignments to use within their current curricula. (n = 15)	0 (0.0%)	0 (0.0%)	9 (60.0%)	6 (40.0%)
LDC complemented other initiatives taking place in my school. (n = 15)	0 (0.0%)	1 (6.7%)	7 (46.7%)	7 (46.7%)
I view LDC as a strategy for implementing my state's College- and Career-Ready Standards. (n = 15)	0 (0.0%)	1 (6.7%)	9 (60.0%)	5 (33.3%)
The time spent implementing LDC interfered with other important initiatives at my school. (n = 15)	4 (26.7%)	6 (40.0%)	2 (13.3%)	3 (20.0%)
LDC helped prepare students in my school for current state assessments. (n = 15)	0 (0.0%)	1 (6.7%)	8 (53.3%)	6 (40.0%)
It was difficult for teachers to focus on LDC because of other competing priorities at the school. (n = 15)	4 (26.7%)	6 (40.0%)	2 (13.3%)	3 (20.0%)
I am using LDC to implement standards-driven assignments within the existing curriculum. (n = 15)	0 (0.0%)	1 (6.7%)	8 (53.3%)	6 (40.0%)
LDC helped improve teacher evaluation ratings. (n = 15)	0 (0.0%)	3 (20.0%)	7 (46.7%)	5 (33.3%)

9 Scale-up and Sustainability

A11. Please indicate the degree to which you agree or disagree with the following statements:

	Strongly disagree	Disagree	Agree	Strongly agree	Don't know
I expect that most teachers participating in LDC this year will continue to do so next year. (n = 14)	0 (0.0%)	1 (7.1%)	5 (35.7%)	5 (35.7%)	3 (21.4%)
Teachers at my school who were not part of the LDC PLC meetings used the LDC planning process and/or LDC CoreTools. (n = 14)	1 (7.1%)	6 (42.9%)	3 (21.4%)	2 (14.3%)	2 (14.3%)
As a result of LDC, new collaborations across grades and/or subjects were created or are being launched at my school. (n = 14)	0 (0.0%)	2 (14.3%)	8 (57.1%)	3 (21.4%)	1 (7.1%)
Teachers and administrators at my school are committed to sustaining the LDC initiative. (n = 14)	0 (0.0%)	1 (7.1%)	7 (50.0%)	4 (28.6%)	2 (14.3%)
I expect our LDC PLC to increase in size next year. (n = 14)	0 (0.0%)	2 (14.3%)	6 (42.9%)	3 (21.4%)	3 (21.4%)

10 District Support

A12. Please indicate the degree to which you agree or disagree with the following statements:

	Strongly disagree	Disagree	Agree	Strongly agree	Don't know
District leaders supported the implementation of LDC. (n = 14)	1 (7.1%)	1 (7.1%)	5 (35.7%)	2 (14.3%)	5 (35.7%)
District leaders had a firm understanding of LDC. (n = 14)	1 (7.1%)	1 (7.1%)	6 (42.9%)	0 (0.0%)	6 (42.9%)
District leaders are interested in spreading the use of LDC to additional schools. (n = 14)	1 (7.1%)	0 (0.0%)	4 (28.6%)	0 (0.0%)	9 (64.3%)
District professional development efforts were aligned with the LDC initiative. (n = 14)	1 (7.1%)	1 (7.1%)	4 (28.6%)	3 (21.4%)	5 (35.7%)
District leaders visited my school to discuss the implementation of LDC. (n = 14)	2 (14.3%)	4 (28.6%)	5 (35.7%)	0 (0.0%)	3 (21.4%)

11 Areas for Improvement

There have been a number of supports for implementation of LDC in your school, including:

- *CoreTools online platform*
- *LDC online courses in the "LEARN" section of CoreTools*
- *Virtual coaching*
  - *Zoom meetings, written feedback on teacher work in LDC CoreTools, emails, etc.*
- *In-person coaching*
  - *Summer training, in-person support visits from LDC and District Lead, in-person professional development opportunities, etc.*

A13. What supports did you find the most useful and why?

A14. What supports were not helpful and why?

A15. In what ways could LDC implementation be improved in your school in the future?

Appendix D:
LDC Module Rating Dimensions

Each module was rated on six dimensions. All of these were rated using a 5-point scale. With the first five, anchor points ranged from not present or realized to fully present or realized. In contrast, the overall dimension ranged from inadequate to advanced.

Dimension **1**

Effective Writing Task

Definition

Degree to which teaching task makes effective use of the template task's writing mode (i.e., argumentation or explanation); requires sustained writing and effective use of ideas and evidence to substantiate claims; and is feasible for most students to complete (i.e., appropriate for the grade-level and subject matter).

Main Sources of Information

Module Creator Handout (Task)

- Read and evaluate the teaching task, student background/prior knowledge, and summary information.
- Evaluate the difficulty or ease students may encounter trying to answer the question.
- Compare module teaching task to teaching task template options.

Anchor Points	Description
5 Fully Present or Realized	The teaching task and performance expectations for the module are explicit and clear, require students to engage in higher-order thinking and writing, and are appropriate for the grade-level and subject matter.
4 Sufficiently Present or Realized	
3 Moderately Present or Realized	Clear module teaching task and performance expectations are available, but do not require students to engage in higher-order thinking and writing and/or are not appropriate for the grade-level and subject matter.
2 Barely Present or Realized	
1 Not Present or Realized	There is minimal evidence of an effort to identify an explicit and clear teaching task and performance expectations that provide opportunities for students to think critically and are appropriate for the grade-level and subject matter.

Dimension 2

Alignment to CCSS, Local, State Literacy and Content Standards

Definition

Extent to which module addresses content essential to the discipline, as well as reading comprehension and writing standards informed by local and state standards.

Main Sources of Information

Module Creator Handout (Task)

- Read and evaluate the standards included in the module.
- Module should include ELA as well as subject matter CCSS/state standards.
- Compare and contrast the standards the module includes with those that could have been included.
- Particular attention to content standards (CCSS History/Social Studies, Science, and Technical Subjects); State Standards; Specific Reading, Writing, Speaking/Listening, Language Skills

Anchor Points	Description
5 Fully Present or Realized	Module specifically addresses content essential to CCSS and local or state standards in science or social studies, as well as reading comprehension and writing. All standards are well aligned to the topic and teaching task.
4 Sufficiently Present or Realized	
3 Moderately Present or Realized	Module broadly addresses content essential to CCSS and local or state standards in science or social studies and reading comprehension and writing. Standards are sufficiently aligned to the topic and teaching task.
2 Barely Present or Realized	
1 Not Present or Realized	Minimal evidence that module addresses content essential to the discipline and literacy standards. Standards are poorly aligned to the topic and teaching task.

Dimension
3

Fidelity to LDC Module Instruction

Definition

Degree to which module instruction, activities, and teaching task address each of the four stages of instructional practice (preparation for the task, reading process, transition to writing, writing process).

Main Sources of Information

Module Creator Handout (Instruction) and Information Sheet

- Evaluate for distribution of activities and time spent on each of the four stages of instructional practice.

Anchor Points	Description
5 Fully Present or Realized	The module instruction, activities, and teaching task reflect deliberate attention and fidelity to the four discrete stages of LDC module instruction. Classroom materials reflect demonstrable effort to develop instructional scaffolding within and across each stage of instruction.
4 Sufficiently Present or Realized	
3 Moderately Present or Realized	The module instruction, activities, and teaching task reflect moderate attention and fidelity to the four discrete stages of LDC module instruction. Classroom materials reflect sufficient effort to develop instructional scaffolding within and across each stage of instruction.
2 Barely Present or Realized	
1 Not Present or Realized	The module instruction, activities, and teaching task reflect poor attention and lack of fidelity to the four discrete stages of LDC module instruction. Classroom materials reflect inadequate effort to develop instructional scaffolding within and across each stage of instruction.

Dimension
4

Quality Instructional Strategies

Definition

Degree to which the module provides clear instructional strategies aimed at helping students develop literacy skills and successfully complete the teaching task. In addition, the degree to which module instruction and activities scaffold critical thinking and performance in a way that is meaningful within the context of a given field or subject matter.

Main Sources of Information

Module Creator Handout (Instruction), Classroom Handouts, and Student Work

- Evaluate extent to which the module activities scaffold critical thinking and student performance within the context of the subject matter at the core of the teaching task.
- Evaluate extent to which instructional strategies guide student learning in literacy and ability to complete the teaching task.

Anchor Points	Description
5 Fully Present or Realized	Module provides clear and targeted instructional strategies and activities that scaffold student learning and promote critical thinking in social studies or science. There is explicit attention to helping students develop an accurate understanding of the topic and teaching task, and literacy skills necessary to complete the writing task successfully.
4 Sufficiently Present or Realized	
3 Moderately Present or Realized	Instructional strategies and activities are available to support adequate student learning and critical thinking in social studies or science. There is moderate attention to helping students develop an understanding of the topic and teaching task, and literacy skills necessary to complete the writing task.
2 Barely Present or Realized	
1 Not Present or Realized	Limited instructional strategies and activities are available to support student learning and critical thinking in social studies or science. Insufficient attention to helping students develop an understanding of the topic and teaching task, or literacy skills necessary to complete the writing task.

Dimension 5

Coherence and Clarity of Module

Definition

The degree of logical alignment found between the teaching task and the goals of the module with the readings, mini-tasks, and instructional strategies.

Main Sources of Information

Module Creator Handout (Instruction), Classroom Handouts, and Student Work

Anchor Points	Description
5 Fully Present or Realized	Strong alignment between the teaching task and goals of the module—including the CCSS and local and state literacy and content standards—with the readings, mini-tasks, student work, and instructional strategies.
4 Sufficiently Present or Realized	
3 Moderately Present or Realized	Moderate alignment between the teaching task and goals of the module—including the CCSS and local and state literacy and content standards—with the readings, mini-tasks, student work, and instructional strategies.
2 Barely Present or Realized	
1 Not Present or Realized	Poor alignment between the teaching task and goals of the module—including the CCSS and local and state literacy and content standards—with the readings, mini-tasks, student work, and instructional strategies.

Dimension 6

Overall Impression

Definition

A holistic assessment of the LDC Module.

Main Sources of Information

Module Creator Handout, Classroom Handouts, and Student Work

- To what extent does this module contribute to student college readiness and development of advanced literacy skills?

Anchor Points	
5	Advanced LDC Module Implementation
4	Proficient LDC Module Implementation
3	Adequate LDC Module Implementation
2	Marginal LDC Module Implementation
1	Inadequate LDC Module Implementation

Appendix E:
Principal Interviews

To better understand teacher retention rates of LDC schools after the 2016–2017 school year, we conducted an interview study of school administrators. Twenty principals and assistant principals volunteered to be interviewed. This section presents the methods and results of the principal interviews.

Method

Instrument

We developed a six-question interview protocol for principals and assistant principals. Some of the interview questions had sub-questions. Five of the questions were asked of all principals, regardless of their schools' retention typology, and one question (question 5) differed slightly based on the school's retention typology. See Figure E1 for the interview protocol.

Figure E1

Principal and assistant principal interview protocol.

Question No.	Question	Given to
1	Why did you initially participate in LDC? • What were your goals when you signed on and how well have those goals been met thus far?	All
2	What was your role in LDC implementation? • Who else at the school supported LDC? • How much did you see of PLC meetings? • Was part of your role to give feedback on LDC instruction? (If needed: Who gave feedback on LDC instruction?)	All
3	Could you tell me about outside support – from both LDC and the district – and what worked or didn't work?	All
4	What were the incentives for teachers' participation in LDC? • How would you describe teacher buy-in and commitment to LDC? • Did teachers receive any additional pay? If so, for what?	All
5	What would you say are the main factors that led to not continuing with LDC?	Drop out
	a) Looking across the district, we noticed that some schools chose to continue with LDC for another year and others chose to stop. What would you say are the main factors that led to continuing with LDC? b) We noticed that none of the year-1 teachers participated in year 2, so the year-2 PLC began with an entirely new set of teachers. Why do you think that was? c) Were there changes in implementation to keep this from happening again the following year?	Zero retention

	a) Looking across the district, we noticed that some schools chose to continue with LDC for another year and others chose to stop. What would you say are the main factors that led to continuing with LDC? b) We noticed that many teachers who participated in Year 1 did not participate in Year 2. Why do you think that was?	Very Low and Low Retention
	a) Looking across the district, we noticed that some schools chose to continue with LDC for another year and others chose to stop. What would you say are the main factors that led to continuing with LDC? b) We noticed that many teachers who participated in Year 1 continued into Year 2. Why do you think that was?	Moderate-High Retention
6	Do you have any advice for strengthening LDC or is there anything else we should know about your experience with LDC?	All

Participants

During the 2016–2017 school year, 48 total schools participated in the i3 LDC program including 28 in the New York City Department of Education (NYCDOE) and 20 in the West Coast district which is the subject of this report. We categorized the schools into retention typologies based on a school's total teacher participants in 2016–2017 and returning teachers in 2017–2018. Using the proportions of the same teacher participating for the 2 years, we created five school retention typologies:

- drop out (the school has no teachers participating in LDC in 2017–2018);
- zero retention (no 2016–2017 teachers returning to LDC, but new teachers in the school are participating in 2017–2018);
- very low retention (less than 1/3 of teachers returning);
- low retention (between 1/3 and 2/3 returning teachers); and
- moderate to high retention (over 2/3 teachers returning).

The following table show the number of schools per retention typology in NYCDOE and the West Coast district.

Table E1

Number of Schools and Proportion of Retention Typologies for NYCDOE and West Coast district in 2016–2017

Retention type	Number of NYCDOE schools	Proportion of total NYCDOE schools	Number of West Coast district schools	Proportion of total West Coast district schools
Dropped out after 2016–2017	10	36%	6	30%
Zero retention	1	4%	2	10%
Very low teacher retention	7	25%	3	15%
Low teacher retention	5	18%	2	10%
Moderate to high teacher retention	5	18%	7	35%
Total	28		20	

All LDC schools from the 2016–2017 cohort were contacted for a phone interview by email, and a total of 20 principals and assistant principals (10, or 36%, of NYCDOE schools and 10, or 50%, of West Coast district schools) participated in the interview. Table E2 shows the school retention typologies that are represented in this sample. Of the principals and assistant principals who participated in an interview, most were from very low teacher retention schools (8 participants), followed by moderate to high teacher retentions schools (6 participants). We also had three principals or assistant principals from drop out schools participate, two principals from low teacher retention schools, and one principal in a zero-retention school.

Table E2

School Retention Typologies Represented in the Study

Retention Type	Number of participating NYCDOE schools	Proportion of NYCDOE schools in the typology	Number of participating West Coast district schools	Proportion of West Coast district schools in the typology
Dropped out after 2016–2017	2	20%	1	17%
Zero retention	0	0%	1	50%
Very low teacher retention	5	71%	3	100%
Low teacher retention	1	20%	1	50%
Moderate to high teacher retention	2	40%	4	57%
Total	10		10	

Procedures

We originally contacted principals of all schools except for schools designated as low retention. This was done as sampling strategy for a case study methodology to understand reasons behind high and low retention schools. Initial emails were sent to 41 schools in both districts (23 in NYCDOE and 18 in the West Coast district) on the week of June 16, 2018. A minimum of three follow-up emails for non-responding administrators were sent between June 25 and August 6, 2018. During this window, nine NYCDOE principals or assistant principals participated (39% of schools in the first round) and seven principals from the West Coast district participated (39% of schools in the first round). One West Coast district principal contacted us to say that she did not have enough knowledge about the LDC program in the school because she was the new principal.

Because of the low response rate, we decided to contact the principals in the low teacher retention schools (five in NYCDOE and two in the West Coast district) to increase the numbers of participants. The initial email for these NYCDOE principals were sent on September 20, 2018 and, for West Coast district principals, between October 1 and October 8, 2018. Follow-up emails were sent to NYCDOE and West Coast district principals between the weeks of October 1 and October 19, 2018. We also reached out to the LDC grant directors in NYCDOE and the West Coast district for recruitment support. Between the new round of emails and support from the LDC grant directors, four additional school leaders participated in interviews, bringing our total participants to 20 principals and assistant principals (10, or 36%, of NYCDOE schools and 10, or 50%, of West Coast district schools).

Interviews were scheduled at times most convenient to the principal or assistant principal. Interviews were conducted by two researchers following the protocol, and the

interviews ranged from about eight minutes to 30 minutes in length. Participant consent was obtained prior to the interviews, and interviews were recorded.

Analysis

Recordings of interviews were transcribed. (For one interview, due to researcher and equipment error, the interview was not recorded. However, notes taken by the researcher during the interview were used for general counts in the analysis.) Transcriptions were read iteratively and coded for broad themes using grounded theory (Glaser & Strauss, 1967). Multiple close readings of each group transcript were conducted in order to summarize the data and identify themes related to reasons for a school's retention (or lack thereof) of teachers from year 1 to year 2 of LDC implementation. A coding scheme was developed based on targeted areas of interest in relation to reasons for retention.

Results

Qualitative results from the data are presented in five main categories: reasons for teachers continuing in LDC, meeting goals, administrator's role, teacher buy-in, and outside support.

Reasons for Teachers Continuing or Leaving LDC in Year 2

To understand why teachers remained or left LDC after year 1, interview data were coded into three main categories: teacher or grade level decision, administrative decision, and mandatory participation. In teacher or grade level decisions, individual teachers, a grade level, or a content-area team (e.g., English teachers) were free to decide to return the following year. Administrative decisions typically involved the principal deciding on changing the grade level or content-area teachers who would participate in the second year of implementation (e.g., moving from second grade to third grade teachers; dropping mathematics teachers but keeping science teachers in the program). A couple principals also decided that LDC participation would be better suited for a particular level of teacher. For example, a principal decided to focus year 2 teacher participation on "teachers that were new to the profession and teachers that were struggling instructionally;" therefore, only a few teachers continued from year 1 to year 2 at that site. Mandatory participation, which is based on an administrator's decision, reflected schools where teachers were told that participation in the second year of LDC was not voluntary. Table E3 shows the reasons for retention by school retention typology.

Table E3

Teachers' Participation in LDC in Year 2 by Retention Typology

Retention typology	Teacher/grade level decision	Administrative decision	Mandatory participation
Dropped out after 2016–2017	1	2	0
Zero retention	0	1	0
Very low teacher retention	4	4	0
Low teacher retention	1	0	1
Moderate to high teacher retention	4	0	2
Total	10	7	3

For the three drop out schools in our sample, two of the schools had a change in leadership. One had a new principal who came in before the second year of LDC implementation and decided not to participate in LDC, and the other school had a new superintendent who did not continue partnering with LDC. For the last of the three drop out schools, the small group of teachers who were in the first year of implementation decided not to continue because of "teacher and administrator burn out." This school had too many initiatives that were handled by a small number of administrative staff and the same teachers who were also part of the LDC implementation.

For the one zero retention school in our sample, the principal decided to change the teachers for year 2. The grade level that was selected to participate in LDC the first year found the program successful, and so for year 2, "other teachers haven't been exposed, and we wanted more teachers to have access…to spread the wealth within the school," so another grade level was selected to participate. In one of the low retention schools, the principal said that participation in LDC was mandatory, but many of teachers who were part of year 1 implementation left the school the following year.

For the 10 schools that were coded as a teacher/grade level decision, half of those decisions were based on the grade-level or content-area team (e.g., science teachers) deciding to leave LDC because they started a new program or initiative the second year and did not have the time to participate in LDC. For the moderate to high teacher retention schools who were coded as teacher/grade level decision, the majority of teachers in those schools decided to stay in LDC the second year.

Meeting Goals

We asked participants their reasons for participating in LDC during the first year. The most popular reasons for participating in LDC were its alignment to standards and rigorous tasks. Principals and assistant principals also stated that they felt both teachers and students in their

schools needed assignments where literacy instruction, the writing tasks, and the writing process were a focus. Other responses included wanting better lesson planning, collaboration, and content-area instruction. Interestingly, three principals said that LDC appealed to them as they were new to the school or position.

After stating their reasons for participation, we asked if these goals were met after the first year of implementation. Table E4 shows participant responses to whether goals were met by school typology. The majority of principals and assistant principals responded positively: 12 (60%) said yes, five expressed mixed feelings about accomplishing their original goals for LDC (25%), and three said that their goals were not met (15%). From these responses, meeting goals for LDC did not appear to influence retention of teachers. For example, two of the three dropout schools reported meeting their LDC goals for participation, yet they didn't remain in the program. Teacher retention seemed to be tied more to teacher and principal decisions (see section above).

Table E4

Principal Reponses for LDC Goals by School Typology

School typology	LDC goals met		
	Yes	No	Mixed
Dropped out after 2016–2017	2	1	0
Zero retention	1	0	0
Very low teacher retention	4	1	3
Low teacher retention	1	1	0
Moderate to high teacher retention	4	0	2
Total	12	3	5

Administrator's Role

The majority of principals and assistant principals in our sample reported having an active role in supporting LDC implementation. Sixteen (80%) attended LDC PLCs, and those who could not make the PLCs were able to get a summary of the meetings from their assistant principals or lead teachers. For those who were able to attend some PLCs, the amount of time they were able to sit in on the PLCs varied. Some principals were only able to drop in for a portion of the PLCs. For example, one principal (moderate to high retention school) said, "I would probably just go in the last 15 minutes. I don't think I was in a full session all the time. But I would touch bases and then each teacher would give me a wrap up summary of what they had done, what they were working on." Others were able to go to almost all PLCs. As the zero-retention school principal said, "I was a participant, also, in the learning." Sixteen participants (80%) also

reported that they gave feedback on LDC instruction. However, the degree to which principals or assistant principals gave feedback varied. Table E5 shows the numbers of participants who attended PLCs and provided feedback on LDC instruction.

Table E5

Participation of Principals and Assistant Principals in LDC Implementation by Retention Type

Retention typology	Attended PLCs	Provided feedback
Dropped out after 2016–2017	3	3
Zero retention	1	1
Very low teacher retention	6	6
Low teacher retention	1	2
Moderate to high teacher retention	5	4
Total	16	16

Teacher Buy-In

Most of the principals and assistant principals mentioned increasing skills and knowledge, collaboration, and student achievement and accessing LDC materials as incentives for teachers. Besides these incentives that were actually part of the LDC implementation, few schools were able to provide additional school-based supports. Eight schools (40%) in our sample reported providing teachers with more tangible incentives for their participation in LCD, such as additional pay and time, and four of the eight gave multiple incentives. Table E6 shows the number of these types of teacher incentives by school typology. No pattern emerges that connects teacher incentives to retention typology. However, it is notable that the majority of schools in the sample did not provide tangible incentives (i.e., pay, extra time, teacher evaluation) to teachers for their participation for LDC.

Table E6

Teacher Incentives by School Typology

Retention typology	Additional pay	Extra time	Teacher evaluation
Dropped out after 2016–2017	0	0	0
Zero retention	1	1	0
Very low teacher retention	2	0	1
Low teacher retention	1	2	0
Moderate to high teacher retention	1	1	1
Total	5	4	2

Five schools (25%) were able to pay teachers for their participation in LCD. Aside from pay, some principals were able to support participating teachers with extra time, such as adjusting the schedule to give teachers more time to meet during the week or giving teachers a release day. For example, the principal from the zero-retention school said, “Initially, it was kind of an imposition of time, but when we created extra time and space for the teachers to meet, they were appreciative. So, they had more buy-in.” Another principal (low retention school) said, “I make it very easy for teachers, because I've built in time in their schedule for them to meet for LDC. There are no discrepancies in terms of when we should meet or how can we meet, or what needs to be done, which is usually the issue sometimes when it comes to work with outside consultants or providers, right?”

Two schools incentivized participation through teacher evaluations. One principal (very low retention school) postponed teacher evaluations for the year. The other principal (moderate to high retention school) said, “I very much tied it to teacher performance and my expectation of what high quality planning looks like.” For this principal, he knew LDC would be “transformative. I knew that if they got through it and actually did it, the carrot would reveal itself in the students’ performance. And I knew my teachers were committed; I knew they wanted our kids to do well. They just needed to be pushed through the process to see how to get the kids to do well.”

Outside Support

Overwhelmingly positive responses were reported from our sample regarding LDC support the schools received. All principals and assistant principals mentioned either training or coaching that LDC provided. Two principals, both from a very low retention schools, also mentioned that the administrator meetings as helpful. As one principal described, “It gave an opportunity to speak to other people who were in the project, and it also gave an opportunity to actually go through all of the CoreTools that were there to support the teachers.” Two principals (both from New York) also found site visits to another school as helpful: “There are sites where the work is going on really nicely, and we were able to go over to those sites and

see presentations from the principal and her teachers on how they have embedded this entire system into their daily program." Five participants mentioned district support being available.

Discussion

Participants in this study all reported playing an active role in LDC implementation at their school site, and most said that their goals for participation were met. They also overwhelmingly responded favorably to LDC support, and district support, if provided or perceived, was also helpful. The principal interviews showed the diversity of reasons for why schools were able to retain teachers, and they also show why teachers left. The main reason for teacher retention was teacher and grade-level team decisions to leave or stay, followed by the principals' decision to switch participation of teachers from year 1 to year 2. Teacher buy-in also seemed to affect teachers' decisions for remaining or continuing. We did not find any consistent trends for retention typology; that is, we cannot characterize reasons for each retention typology and say, for example, all drop out schools had these characteristics or most moderate to high retention schools had other characteristics. Teacher retention in LDC from year 1 to year 2 was due to a myriad of factors that worked in combination at each school.

Appendix F:
Module Artifact Ratings

The following presents further details of the module analyses. First, we present the methodology and results of the generalizability theory studies. This is followed by the additional tables for the descriptive analyses.

Generalizability Study

Generalizability theory is a statistical framework for examining multiple sources of potential error during the scoring process. For each grade band, we first modeled score variability across all six dimensions using a two-faceted design, whereby we estimated variance components for module by rater by dimension (t*r*d). The goal here was to separate true variation in the modules from other potential sources of measurement error. The main effects reflect true variation across modules (σ2t) and error variance across raters (σ2r) and dimensions (σ2d), while the error term (σ2trd,e) reflects unexplained residual error in the model. To disentangle the sources of potential error further, we also used a single-faceted design to examine potential error within the scoring of each dimension. As with the first set of models, the main effect reflects true variation across teachers (σ2t) and error variance across raters (σ2r).

Elementary Module Results

Generalizability theory models were conducted to examine potential error in the scoring process for the elementary modules. Results from the two-faceted and one-faceted models that examine error across and within dimensions are presented in Tables F1 and F2. As would be the goal of any rating session, most of the variation found for the elementary modules was due directly to differences in the modules (62%) or to differences in the modules by dimension (29%). Despite this, 6% of the variation was due either directly or through interaction with the raters. Finally, approximately 1% of the variation was unexplained by the two-faceted model used.

As previously mentioned, we also used a one-faceted design to disentangle variation in the ratings that was due either directly or through interaction with the dimensions (see Table F2). As would be desired, almost all of the variation found for each dimension was due directly to differences in the modules (84% to 100.0%). For most of the dimensions, the greatest amount of other variation was found due to an interaction between raters and modules. For example, for Dimension 1, which measures the effective writing task, 5% of the variation was due directly to the raters and 11% was due to an interaction between the raters and modules. The exception involved Dimension 3, which measures fidelity to LDC instruction, with 9% of the variation due directly to the raters and only 6% being due to the interaction between raters and modules. Finally, there was no unexplained error variance detected by the models.

Table F1

Generalizability Study of the Elementary Module Ratings across Dimensions (n = 90)

Source	Var.	%
Module (σ2t)	0.78	62.23
Rater (σ2r)	0.00	0.00
Dimension (σ2d)	0.02	1.67
Module*Dimension (σ2td)	0.36	28.89
Rater*Dimension (σ2rd)	0.06	4.57
Module*Rater (σ2tr)	0.02	1.21
Error (σ2trd,e)	0.02	1.42

Table F2

Generalizability Study of the Elementary Module Ratings for Each Dimension (n = 139)

	Module (σ2t)		Rater (σ2r)		Module*Rater (σ2tr)		Error (σ2trd,e)	
Dimension	Var.	%	Var.	%	Var.	%	Var.	%
1. Effective writing task	1.15	84.02	0.07	4.99	0.15	10.98	0.00	0.00
2. Standards alignment	0.98	90.56	0.01	0.92	0.09	8.52	0.00	0.00
3. Fidelity to LDC instruction	1.16	85.53	0.12	8.90	0.08	5.57	0.00	0.00
4. Quality instructional strategies	1.23	96.31	0.02	1.49	0.03	2.20	0.00	0.00
5. Coherence/clarity of module	1.27	100.00	0.00	0.00	0.00	0.00	0.00	0.00
6. Overall impression	0.83	97.16	0.00	0.00	0.02	2.84	0.00	0.00

Note. Negative estimates of variance were changed to zero in order to calculate percentages (see Shavelson & Webb, 1991)

Secondary Module Results

Generalizability theory models were conducted to examine potential error in the scoring process for the secondary modules. Tables F3 and F4 present results from the two-faceted and one-faceted models that examine error across and within dimensions. As would be the goal of any rating session, most of the variation found in the ratings was due directly to differences in the modules (36%) or to differences in the modules by dimension (60%). Furthermore, only 3% of the variation for the secondary modules was due either directly or indirectly to the raters, and only 1% of the variation in ratings for the model was unexplained.

Table F3

Generalizability Study of the Secondary Module Ratings across Dimensions (n = 66)

Source	Var.	%
Module (σ2t)	0.41	36.05
Rater (σ2r)	0.00	0.00
Dimension (σ2d)	0.00	0.00
Module*Dimension (σ2td)	0.68	59.91
Rater*Dimension (σ2rd)	0.03	2.72
Module*Rater (σ2tr)	0.00	0.32
Error (σ2trd,e)	0.01	1.00

Table F4

Generalizability Study of the Secondary Module Ratings for Each Dimension (n = 66)

	Module (σ2t)		Rater (σ2r)		Module*Rater (σ2tr)		Error (σ2trd,e)	
Dimension	Var.	%	Var.	%	Var.	%	Var.	%
1. Effective writing task	1.34	89.72	0.09	5.90	0.01	0.49	0.06	3.89
2. Standards alignment	0.84	92.90	0.00	0.00	0.03	2.93	0.04	4.17
3. Fidelity to LDC instruction	1.57	98.96	0.00	0.00	0.00	0.00	0.02	1.04
4. Quality instructional strategies	1.25	91.77	0.08	5.95	0.03	2.28	0.00	0.00
5. Coherence/clarity of module	0.95	87.46	0.02	1.37	0.12	11.17	0.00	0.00
6. Overall impression	0.54	88.20	0.06	9.90	0.00	0.00	0.01	1.89

Note. Negative estimates of variance were changed to zero in order to calculate percentages (see Shavelson & Webb, 1991)

We also used a one-faceted design to disentangle the variance that was due either directly or through interaction with the dimensions (see Table F4). As would be desired, 87% to 99% of the variance found for each dimension was attributable to differences in the modules. Only Dimension 6, which measures the raters' overall impression of module quality, had moderate amounts of variation due directly to the raters (10%). Furthermore, Dimension 5, which measures coherence and clarity of the module, had 11% of variation due to an interaction between modules and raters. Finally, some error variance (1% to 4%) was found for four of the dimensions. The greatest amount of this unexplained error was found for the first

two dimensions, which measure foundational features of the modules including the effectiveness of the writing task and standards alignment (4%, respectively).

Summary

Generalizability models were fit for the overall samples for the two grade bands. As would be hoped for, when examining the one-faceted models, the vast majority of variation for the elementary and secondary ratings were due directly to differences in the modules (62%, 36%) or to differing quality in the modules across dimensions (29%, 60%). Likewise, results from the two-faceted models showed that the vast majority of variation within dimension was due to differences in both the elementary modules (84% to 100%) and secondary modules (87% to 99%). Despite this, for the elementary modules 11% of the variation for Dimension 1, which measures the effectiveness of the writing task, and 9% of the variation for Dimension 2, which measures standards alignment, was due to an interaction between the raters and modules. In addition, 9% of the variation for Dimension 3, which measures fidelity to LDC instruction, was due directly to differences in the elementary raters. The only dimensions for the secondary modules that showed moderate amounts of other variation were Dimension 5, with 11% due to an interaction between raters and modules, and Dimension 6, with 10% due to differences in raters alone. Finally, some unexplained error variance was found for the two-faceted model used for the elementary modules and secondary modules (1%, respectively), and some of the one-faceted models used for the secondary modules (0% to 4%).

Descriptive Results

The following section presents percentages for the elementary and secondary modules. This includes the overall results, and then results broken down by content area and then cohort group.

Table F5

Distribution (Percentage) of Ratings for the Modules

Dimension	1	2	3	4	5
ELEMENTARY (*n* = 48)					
1. Effective writing task	8.3	16.7	33.3	27.1	12.5
2. Standards alignment	12.5	18.8	43.8	18.8	6.3
3. Fidelity to LDC instruction	8.3	18.8	22.9	35.4	14.6
4. Quality instructional strategies	8.3	22.9	29.2	29.2	10.4
5. Coherence/clarity of module	8.3	20.8	31.3	29.2	10.4
6. Overall impression	4.2	22.9	33.3	37.5	2.1
SECONDARY (*n* = 61)					
1. Effective writing task	3.3	14.8	36.1	29.5	9.8
2. Standards alignment	4.9	14.8	41.0	31.1	8.2
3. Fidelity to LDC instruction	8.2	16.4	34.4	31.1	6.6
4. Quality instructional strategies	3.3	13.1	21.3	47.5	11.5
5. Coherence/clarity of module	6.6	14.8	39.3	29.5	9.8
6. Overall impression	0.0	14.8	45.9	36.1	3.3
OVERALL (*n* = 109)					
1. Effective writing task	5.5	15.6	34.9	28.4	11.0
2. Standards alignment	8.3	16.5	42.2	25.7	7.3
3. Fidelity to LDC instruction	8.3	17.4	29.4	33.0	10.1
4. Quality instructional strategies	5.5	17.4	24.8	39.4	11.0
5. Coherence/clarity of module	7.3	17.4	35.8	29.4	10.1
6. Overall impression	1.8	18.3	40.4	36.7	2.8

Table F6

Distribution (Percentage) of Ratings for the Elementary Modules by Content Area

Dimension	1	2	3	4	5
ELA (*n* = 24)					
1. Effective writing task	12.5	25.0	33.3	12.5	12.5
2. Standards alignment	4.2	20.8	50.0	20.8	4.2
3. Fidelity to LDC instruction	8.3	29.2	25.0	29.2	8.3
4. Quality instructional strategies	12.5	20.8	25.0	29.2	12.5
5. Coherence/clarity of module	12.5	20.8	29.2	29.2	8.3
6. Overall impression	4.2	25.0	33.3	33.3	4.2
SCIENCE (*n* = 11)					
1. Effective writing task	0.0	0.0	36.4	54.5	9.1
2. Standards alignment	27.3	9.1	45.5	18.2	0.0
3. Fidelity to LDC instruction	0.0	0.0	36.4	27.3	36.4
4. Quality instructional strategies	0.0	27.3	36.4	27.3	9.1
5. Coherence/clarity of module	0.0	18.2	45.5	18.2	18.2
6. Overall impression	0.0	18.2	36.4	45.5	0.0
SOCIAL STUDIES (*n* = 13)					
1. Effective writing task	7.7	15.4	30.8	30.8	15.4
2. Standards alignment	15.4	23.1	30.8	15.4	15.4
3. Fidelity to LDC instruction	15.4	15.4	7.7	53.8	7.7
4. Quality instructional strategies	7.7	23.1	30.8	30.8	7.7
5. Coherence/clarity of module	7.7	23.1	23.1	38.5	7.7
6. Overall impression	7.7	23.1	30.8	38.5	0.0

Table F7

Distribution (Percentage) of Ratings for the Elementary Modules by Cohort

Dimension	1	2	3	4	5
COHORT 2, 2017–2018 (*n* = 23)					
1. Effective writing task	13.0	13.0	43.5	26.1	4.3
2. Standards alignment	21.7	17.4	39.1	21.7	0.0
3. Fidelity to LDC instruction	17.4	21.7	17.4	26.1	17.4
4. Quality instructional strategies	13.0	34.8	17.4	26.1	8.7
5. Coherence/clarity of module	13.0	34.8	17.4	21.7	13.0
6. Overall impression	8.7	39.1	17.4	34.8	0.0
COHORT 2, 2018–2019 (*n* = 19)					
1. Effective writing task	5.3	10.5	15.8	36.8	26.3
2. Standards alignment	0.0	21.1	47.4	15.8	15.8
3. Fidelity to LDC instruction	0.0	5.3	31.6	47.4	15.8
4. Quality instructional strategies	5.3	5.3	42.1	36.8	10.5
5. Coherence/clarity of module	5.3	0.0	47.4	42.1	5.3
6. Overall impression	0.0	5.3	47.4	42.1	5.3

Note. Cohort groups with less than five are not presented.

Table F8

Distribution (Percentage) of Ratings for the Secondary Modules by Content Area

Dimension	1	2	3	4	5
ELA (*n* = 31)					
1. Effective writing task	0.0	9.7	38.7	38.7	9.7
2. Standards alignment	0.0	12.9	41.9	35.5	9.7
3. Fidelity to LDC instruction	12.9	9.7	25.8	38.7	6.5
4. Quality instructional strategies	0.0	0.0	16.1	61.3	16.1
5. Coherence/clarity of module	3.2	0.0	54.8	29.0	12.9
6. Overall impression	0.0	6.5	38.7	51.6	3.2
SCIENCE (*n* = 10)					
1. Effective writing task	0.0	30.0	20.0	20.0	30.0
2. Standards alignment	20.0	10.0	10.0	40.0	20.0
3. Fidelity to LDC instruction	0.0	30.0	30.0	20.0	20.0
4. Quality instructional strategies	10.0	50.0	0.0	30.0	10.0
5. Coherence/clarity of module	10.0	50.0	0.0	30.0	10.0
6. Overall impression	0.0	50.0	10.0	30.0	10.0
SOCIAL STUDIES (*n* = 20)					
1. Effective writing task	10.0	15.0	40.0	20.0	0.0
2. Standards alignment	5.0	20.0	55.0	20.0	0.0
3. Fidelity to LDC instruction	5.0	20.0	50.0	25.0	0.0
4. Quality instructional strategies	5.0	15.0	40.0	35.0	5.0
5. Coherence/clarity of module	10.0	20.0	35.0	30.0	5.0
6. Overall impression	0.0	10.0	75.0	15.0	0.0

Table F9a

Distribution (Percentage) of Ratings for the Secondary Modules by Cohort

Dimension	1	2	3	4	5
COHORT 1, 2016–2017 (*n* = 14)					
1. Effective writing task	0.0	21.4	35.7	35.7	0.0
2. Standards alignment	0.0	21.4	35.7	35.7	7.1
3. Fidelity to LDC instruction	14.3	14.3	35.7	28.6	7.1
4. Quality instructional strategies	0.0	7.1	21.4	42.9	21.4
5. Coherence/clarity of module	7.1	7.1	35.7	28.6	21.4
6. Overall impression	0.0	7.1	50.0	35.7	7.1
COHORT 1, 2017–2018 (*n* = 11)					
1. Effective writing task	9.1	9.1	36.4	18.2	9.1
2. Standards alignment	9.1	18.2	63.6	9.1	0.0
3. Fidelity to LDC instruction	0.0	27.3	36.4	36.4	0.0
4. Quality instructional strategies	0.0	18.2	36.4	36.4	9.1
5. Coherence/clarity of module	9.1	27.3	45.5	9.1	9.1
6. Overall impression	0.0	18.2	63.6	18.2	0.0
COHORT 1, 2018–2019 (*n* = 9)					
1. Effective writing task	0.0	11.1	44.4	22.2	11.1
2. Standards alignment	0.0	22.2	22.2	44.4	11.1
3. Fidelity to LDC instruction	11.1	11.1	44.4	22.2	11.1
4. Quality instructional strategies	11.1	11.1	11.1	55.6	11.1
5. Coherence/clarity of module	11.1	11.1	44.4	33.3	0.0
6. Overall impression	0.0	22.2	44.4	33.3	0.0

Table F9b

Distribution (Percentage) of Ratings for the Secondary Modules by Cohort

Dimension	1	2	3	4	5
COHORT 2, 2017–2018 (*n* = 17)					
1. Effective writing task	0.0	11.8	29.4	41.2	17.6
2. Standards alignment	5.9	11.8	29.4	41.2	11.8
3. Fidelity to LDC instruction	0.0	5.9	29.4	41.2	11.8
4. Quality instructional strategies	5.9	5.9	5.9	70.6	5.9
5. Coherence/clarity of module	0.0	11.8	41.2	35.3	11.8
6. Overall impression	0.0	11.8	23.5	58.8	5.9
COHORT 2, 2018–2019 (*n* = 10)					
1. Effective writing task	10.0	20.0	40.0	20.0	10.0
2. Standards alignment	10.0	0.0	60.0	20.0	10.0
3. Fidelity to LDC instruction	20.0	30.0	30.0	20.0	0.0
4. Quality instructional strategies	0.0	30.0	40.0	20.0	10.0
5. Coherence/clarity of module	10.0	20.0	30.0	40.0	0.0
6. Overall impression	0.0	20.0	60.0	20.0	0.0

Table F10

Means and Standard Deviations for the Exploratory Analysis of Elementary Modules by Cohort

Dimension	2017—2018	2018—2019	Change
COHORT 1 (*n* = 4)			
1. Effective writing task	--	--	--
2. Standards alignment	--	--	--
3. Fidelity to LDC instruction	--	--	--
4. Quality instructional strategies	--	--	--
5. Coherence/clarity of module	--	--	--
6. Overall impression	--	--	--
Average (Dimensions 1 to 5)	--	--	--
COHORT 2 (*n* = 9)			
1. Effective writing task	4.00 (1.00)	3.44 (0.88)	-0.56 (0.73)
2. Standards alignment	3.78 (1.09)	2.89 (0.93)	-0.89 (0.93)
3. Fidelity to LDC instruction	3.00 (1.41)	3.78 (1.30)	0.78 (1.92)
4. Quality instructional strategies	3.33 (0.87)	3.44 (1.24)	0.11 (1.36)
5. Coherence/clarity of module	3.44 (0.88)	3.56 (1.33)	0.11 (1.27)
6. Overall impression	3.67 (0.71)	3.22 (0.97)	-0.44 (1.01)
Average (Dimensions 1 to 5)	3.51 (0.63)	3.42 (1.01)	-0.09 (0.87)

Note. Means not presented for samples of less than five.

Table F11

Means and Standard Deviations for the Exploratory Analysis of Secondary Modules by Cohort

Dimension	2017—2018	2018—2019	Change
COHORT 1 (*n* = 20)			
1. Effective writing task	3.25 (1.29)	2.75 (1.41)	-0.50 (1.54)
2. Standards alignment	3.00 (1.21)	2.90 (0.91)	-0.10 (1.65)
3. Fidelity to LDC instruction	3.40 (1.27)	3.10 (1.07)	-0.30 (1.26)
4. Quality instructional strategies	4.05 (0.76)	3.65 (1.18)	-0.40 (1.35)
5. Coherence/clarity of module	3.60 (0.82)	3.25 (1.21)	-0.35 (1.35)
6. Overall impression	3.60 (0.75)	3.30 (0.73)	-0.30 (1.17)
Average (Dimensions 1 to 5)	3.46 (0.83)	3.13 (0.83)	-0.33 (1.17)
COHORT 2 (*n* = 10)			
1. Effective writing task	3.30 (1.16)	3.90 (0.57)	0.60 (1.35)
2. Standards alignment	3.20 (0.79)	3.50 (0.85)	0.30 (1.06)
3. Fidelity to LDC instruction	3.70 (1.25)	3.30 (1.42)	-0.40 (1.35)
4. Quality instructional strategies	3.00 (1.15)	3.50 (1.27)	0.50 (1.96)
5. Coherence/clarity of module	3.30 (0.82)	3.60 (0.70)	0.30 (0.95)
6. Overall impression	3.00 (0.94)	3.70 (0.67)	0.70 (1.25)
Average (Dimensions 1 to 5)	3.30 (0.61)	3.56 (0.59)	0.26 (1.00)

Table F12

Distribution (Percentage) of Ratings for the Exploratory Analysis of Elementary Modules by Cohort

Dimension	Negative		No Change		Positive	
	#	%	#	%	#	%
COHORT 1 (*n* = 4)						
1. Effective writing task	NA	NA	NA	NA	NA	NA
2. Standards alignment	NA	NA	NA	NA	NA	NA
3. Fidelity to LDC instruction	NA	NA	NA	NA	NA	NA
4. Quality instructional strategies	NA	NA	NA	NA	NA	NA
5. Coherence/clarity of module	NA	NA	NA	NA	NA	NA
6. Overall impression	NA	NA	NA	NA	NA	NA
Average (Dimensions 1 to 5)	NA	NA	NA	NA	NA	NA
COHORT 2 (*n* = 9)						
1. Effective writing task	4	44.4	5	55.6	0	0.0
2. Standards alignment	7	77.8	1	11.1	1	11.1
3. Fidelity to LDC instruction	3	33.3	1	11.1	5	55.6
4. Quality instructional strategies	2	22.2	3	33.3	1	11.1
5. Coherence/clarity of module	3	33.3	2	22.2	4	44.4
6. Overall impression	5	55.6	2	22.2	2	22.2
Average (Dimensions 1 to 5)	4	44.4	1	11.1	4	44.4

Table F13

Distribution (Percentage) of Ratings for the Exploratory Analysis of Secondary Modules by Cohort

Dimension	Negative		No Change		Positive	
	#	%	#	%	#	%
COHORT 1 (*n* = 20)						
1. Effective writing task	10	50.0	4	20.0	6	30.0
2. Standards alignment	8	40.0	5	25.0	7	35.0
3. Fidelity to LDC instruction	9	45.0	8	40.0	3	15.0
4. Quality instructional strategies	7	35.0	8	40.0	5	25.0
5. Coherence/clarity of module	10	50.0	4	20.0	6	30.0
6. Overall impression	7	35.0	9	45.0	4	20.0
Average (Dimensions 1 to 5)	13	65.0	1	5.0	6	30.0
COHORT 2 (*n* = 10)						
1. Effective writing task	3	30.0	1	10.0	6	60.0
2. Standards alignment	2	20.0	5	50.0	3	30.0
3. Fidelity to LDC instruction	5	50.0	3	30.0	2	20.0
4. Quality instructional strategies	1	10.0	4	40.0	5	50.0
5. Coherence/clarity of module	2	20.0	4	40.0	4	40.0
6. Overall impression	2	20.0	2	20.0	6	60.0
Average (Dimensions 1 to 5)	2	20.0	2	20.0	6	60.0

Appendix G:
Fidelity Matrix

Appendix H:
Outcome Analysis Methodology

Analysis Model Specification

The specification outlined below is for middle school analyses. The elementary model is identical with two exceptions. A variable representing the average number of weeks in which a student was exposed to core class content was included in the middle school models to capture variation in that variable due to students taking extra core science content. Additionally, the middle school models include two dummy variables (one for grade 7 and one for grade 8), while the elementary school model only required one dummy variable (grade 5).

For our outcome analyses, we used a threshold of $p < .05$ to determine whether there was a statistically significant impact of LDC on ELA achievement. In addition to the LDC treatment indicator, a teacher effect for years of experience was included, as well as an aggregate indicator measuring the mean prior performance of each student's classroom peers. The fixed effects also included student characteristics to identify the matched comparison sample of students, such as baseline achievement, socioeconomic status, demographics, language proficiency, grade level, and participation in special education.

The three-level MMMC model was used to estimate the impacts of the LDC intervention on student learning. This same analytic model will be used to estimate impacts in future years. The general specification for the middle school level MMMC model is shown in the following equation using similar notation proposed by Browne et al. (2001, equation 6) and applied in Tranmer, Steel, and Browne (2014, equation 3).

$$y_i = x_i'\beta + u^{(3)}_{School(i)} \sum_{j \in Teacher(i)} w_{i,j} u^{(2)}_j + e_i$$

$$\mathrm{i} = 1, \ldots, \mathrm{n}\ \ \mathrm{Teacher(i)} \subset (1, \ldots, \mathrm{J})$$

$$u^{(3)}_{School(i)} \sim \mathrm{N}\left(0, \sigma^2_{u(2)}\right), u^{(2)}_j \sim \mathrm{N}\left(0, \sigma^2_{u(2)}\right), e_i \sim \mathrm{N}(0, \sigma^2_e)$$

In this model y_i is the student achievement score response, X_i is a vector of the fixed covariates and β is the vector of the corresponding fixed effects. $School(i)$ is the school which student i attends, thus the term $u^{(3)}_{School(i)}$ represents the random effects for that level of classification. Within the term $\sum_{j \in Teacher(i)} w_{i,j} u^{(2)}_j$, $u^{(2)}_j$ is the set of j random effects for the teachers included in the selected dataset, and $w_{i,j}$ is the weight which sums to 1 for each student applied in proportion to the instruction time assigned with each teacher. The following presents an example of the full model middle school specification.

$$achievement_i = \beta_0 + LDC_i * \beta_1 + priorELA_i * \beta_2 + priorMath_i * \beta_3 + Female_i * \beta_4 + LEP_i * \beta_5 + SES_i * \beta_6 + Black_i * \beta_7 + Hispanic_i * \beta_8 + Asian_i * \beta_{10} + OtherEth_i * \beta_{11} + SPED_i * \beta_{12} + Grade7_i * \beta_{13} + Grade8_i * \beta_{14} + priorClassELA_i * \beta_{15} + TeachExp_i * \beta_{16} + ContentExpWeeks_i * \beta_{17} + u^{(3)}_{School(i)} \sum_{j \in Teacher(i)} w_{i,j} u^{(2)}_j + e_i$$

$$u^{(3)}_{School(i)} \sim N(0, \sigma^2_{u(3)}), u^{(2)}_j \sim N(0, \sigma^2_{u(2)}), e_i \sim N(0, \sigma^2_e)$$

In this model, $achievement_i$ is the standardized ELA outcome score for student i; In the dosage-dependent model LDC_i is the proportion of core class instruction time taken with an LDC teacher (ranges 0–1); In the dosage-independent model LDC_i is coded as zero for comparison students and as 1 for students receiving any level of LDC teacher exposure.

$Female_i, LEP_i, Black_i, Hispanic_{i,}, Asian_{i,}, OtherEth_{i,}\ SPED_i, SES_i, Grade7_i, Grade8_i$ ar e student demographic indicators coded 1 if the status is present and 0 if absent; white students serve as the reference group for the race/ethnicity variables, and grade level 6 is the reference group for grade level;

$priorELA_i$, and $priorMath_i$ are standardized student achievement scores from the prior year;

$priorClassELA_i$ is the aggregated mean of the prior ELA scores for all the core class peers of student i;

$TeachExp_i$ is the aggregated percentage of the years of teaching experience less than 3 for those teachers to which student i was exposed to in her core classes;

$ContentExpWeeks_i$ is the average number of weeks in which student i was exposed to in her core classes;

β_1 is the impact of LDC, the treatment;

β_{12} is the average difference between Cohort 1 and Cohort 2;

β_2 & β_3 are the effects of the prior score covariates;

β_4 … β_{14} are the effects of the demographic covariates;

β_{15}& β_{16} are the effects of the aggregated class level covariates.

$u^{(3)}_{School(i)}$, $u^{(2)}_j$, e_i are the error components at the school, teacher, and student level respectively assumed to all have mean 0 and variance, $\sigma^2_{u(2)}, \sigma^2_{u(3)}, \sigma^2_e$ respectively.

Student/Teacher Course Exposure Weighting

Tables H1 and H2 demonstrate how the process of calculating general MMMC teacher weights and LDC treatment weights (for the dosage modeling approach) was conducted

respectively for elementary and middle school. In elementary school, in the event that a student was exposed to more than one teacher, each content area was given equal weight in distributing teacher/student exposure. For example, if a student was enrolled for both ELA and social studies/history under one teacher, then that teacher was coded as .67 for having contributed to two thirds of the students' core curriculum exposure. If the same student enrolled in science with a different teacher than the one who was linked to their course marks in ELA and social studies/history, then that science teacher would have been coded as .33 and all other teachers in the sample would have been coded as zero. This would then result in the student's exposure adding to a unity (1).

Table H1

Example of Elementary School Student/Teacher Weighting Based on Course Links

Core content area	Example student/teacher weighting for use in MMMC (Weight=Subject Days/Total Days)	Example LDC treatment dosage weight
ELA	Student enrolled with an intervention Teacher: Weight=0.333	Weight=.333
Social studies	Student enrolled with an intervention Teacher: Weight=0.333	Weight=.333
Science	Student enrolled with a non-intervention teacher: Weight=0.333	Weight=.0
Total	Unity: for every student the student/teacher weights sum to 1	Treatment Weight=.667

Table H2

Example of Middle School Student/Teacher Weighting Based on Course Mark Links

Core content area	Course name	Example student/teacher weighting for use in MMMC (Weight=Subject Days/Total Days)	Example LDC treatment dosage weight
ELA	English 7A & 7B	Student enrolled two hundred days of core ELA (grade 7) with an intervention teacher: Weight=200/700=0.286	Weight=.286
Social studies	Social Studies WHG: ANC CIV & B	Student enrolled two hundred days of core social studies (grade 7) with a non-intervention teacher: Weight=200/700=0.286	Weight=.0
Science	Science 7	Student enrolled three hundred days of core science (grade 7) with a non-intervention teacher: Weight=300/700=0.428	Weight=.0
Total		Unity: for every student the student/teacher weights sum to 1	Treatment Weight=.286

Note. "Days" refers to core content enrolled days preceding the NYS assessment date.

In middle school, students' exposure to teachers at the course level in the three core content areas was coded in the same manner as in the elementary grades based on enrolled time preceding the assessment period. A difference in our middle school coding process was that we did not force each core content area into equal weighting. Instead each core content area exposure contributed to a core content area total sum which formed the basis from which the weights were proportioned.

Most commonly a student had equivalent days of core instruction exposure in each of the three content areas (often 215 days in each content area). In that scenario, if a student had exposure to three different teachers, then each teacher would contribute one third (.33) of the overall core curriculum exposure and all other teachers in the sample would be coded as zero. However, in addition to the typical core science course, extra core science courses were also included in the LDC analysis (for example a Grade 8 student taking biology), which made it possible then for a student to accumulate more units in science than in the other two content areas.

The weighting in middle school was always distributed as a proportion of the total exposure days in the three content areas. Therefore, if a student accumulated 300 science days (across two courses), 200 social studies days, and 200 ELA days, the base number of instruction days would be 700 days. If, using that same scenario, the same teacher taught both the typical core and biology courses then that teacher would contribute three-sevenths (.43) of the overall

core curriculum exposure with the social studies and science teachers contributing two-sevenths (.285) each, again resulting in the student's exposure adding to a unity (1).

Calculation of Effect Size

We calculated student-level effect sizes according to the WWC 3.0 criteria. Specifically, for the impact analysis with treatment status as a dichotomous variable, we calculated Hedges' *g*, the difference in adjusted mean outcomes for the groups divided by the unadjusted pooled within-group standard deviation of the outcome measure in the sample, for all outcomes. The difference in adjusted mean outcomes is estimated by β_1 in the models defined above, as outlined in the WWC standards handbook for computing effect sizes in multi-level frameworks. Specifically,

$$g = \frac{\omega\gamma}{\sqrt{\frac{(n_i - 1)s_i^2 + (n_c - 1)s_c^2}{n_i + n_c - 2}}}$$

where γ is β_1 which is the coefficient from the MMMC for the intervention effect.

Note that in our analyses the outcome measure is standardized within the analytical sample (mean=0, standard deviation=1). As a result, we expected that g would likely be quite similar to the β_1 coefficient from the MMMC Model in the large samples we plan to collect later in the study.

Though it is not standard to use g with a continuous treatment effect, as in the case of our dosage-dependent treatment measure, we have defined and matched populations n_i and n_c where treated students (n_i) could have any positive treatment value<=1, and control students (n_c) had a treatment value of zero. We could therefore calculate *g* in the case of our dosage-dependent treatment measure, and again expect that it would not differ substantially from the β_1 coefficient. It is crucial, however, to note that *g* and β_1 in the dosage-dependent models reflect the effect size projected for a student who would receive exposure to intervention teachers in all of their core classes. Along with this effect we report average dosage received by treated students so that the average treatment effect on treated students could be calculated.

Appendix I:
Supplemental Outcome Analysis Tables

In this appendix, we provide tables displaying the sample sizes and matching results for all the supplementary analyses. We also provide full model results for the supplementary analyses which divide the primary treatment sample into groups based on prior student exposure to LDC, and the amount of exposure in the outcome year. Here is the full list of supplementary analyses contained in this appendix:

I.1 2016–2017 Cohort 1 Elementary School Sample (1 year)

I.2 2016–2017 Cohort 1 Middle School Sample (1 year)

I.3 2017–2018 Cohort 1 Middle School Sample (Participated in 2016–2017 and 2017–2018)

I.4 2017–2018 Cohort 1 Middle School Sample (Newly Joined LDC in 2017–2018)

I.5 2018–2019 Cohort 1 Middle School Sample (Began Participating in 2017–2018 and Continued Through 2018–2019)

I.6 2017–2018 Cohort 2 Elementary School Sample (1 year)

I.7 2018–2019 Cohort 2 Elementary School Sample (2 years)

I.8 2017–2018 Cohort 2 Middle School Sample (1 year)

I.9 2018–2019 Cohort 2 Middle School Sample (2 years)

I.10 2018–2019 Cohort 2 Middle School Sample (Newly Joined LDC in 2018–2019)

I.11 Student Exposure Analysis

I.1 2016–2017 Cohort 1 Elementary School Sample (1 year)

The 2016–2017 elementary sample prior to the CEM process included 5 schools, the 15 elementary teachers who consented to participate in the evaluation study, and their 273 students. After the student-level matching, our final elementary LDC sample included 234 elementary students and retained nearly the same number of teachers and schools (see Table I1). Prior to matching, the potential elementary comparison sample consisted of 781 schools, 10,106 teachers, and 123,307 students. This comparison sample was substantially reduced during the first stage of matching, which identified the five schools that most closely resembled each of the 5 LDC elementary schools. After student-level CEM, a workable analytic comparison sample consisted of 19 schools, 100 teachers and 234 students.

Table I1

Before and After Matching Sample Sizes: 2016–2017 Cohort 1 Elementary School Analysis

	LDC sample			Comparison sample		
	School	Teacher	Student	School	Teacher	Student
Stage 1						
Before matching	5	15	273	781	10,106	123,307
After matching	5	15	273	25	474	4,979
Stage 2						
After matching	5	14	234	19	100	234

Table I2 presents the student characteristics for the LDC student and comparison students, based on the final analytical samples for the elementary analyses. Treatment and comparison samples matched very closely on all variables. Exact matching was achieved on some variables, and all demographic variables were within 4 percentage points. The final LDC elementary student sample after matching was comprised largely of Black, Asian, and Hispanic students, with more than one third of being of Black ethnicity, almost one third Asian, about slightly over one quarter Hispanic. The sample was comprised of fourth and fifth grade students and mostly of students who were economically disadvantaged (88.5%). English language learners and special education students each represented between 10 and 15 percent of the sample. Mean performance on the prior year academic assessment was very close to the district-wide performance levels in mathematics and ELA.

Table I2

2015–2016 Baseline Characteristics of Treated Students Taught by Cohort 1 Elementary School Teachers in 2016–2017 and Comparison Students After Matching

Student characteristic	LDC sample: (n = 234)	Comparison sample: (n = 234)
Race/Ethnicity		
Hispanic (%)	25.6	27.8
Black (%)	38.0	34.6
Asian (%)	30.8	30.8
White (%)	3.0	4.3
Other (%)	2.6	2.5
Female (%)	47.9	48.7
Special programs status		
Poverty (%)	88.5	90.4
English Language Learner (%)	12.4	8.5
Special education (%)	14.1	12.8
Student baseline achievement		
Mean mathematics Z score	-0.01	-0.03
Mean ELA Z score	0.01	0.02
Class & teacher characteristics		
Mean ELA Z score of current peers	0.02	-0.02
Teacher years of experience	11.5	11.9
Grade level		
Grade 3 at baseline (%)	62.4	62.4
Grade 4 at baseline (%)	37.6	37.6

Table I3 reports the model results for the effect of LDC teachers in 2016–2017 on student outcomes. The outcome variable for both models was students' 2017 New York State assessment scores in ELA. For technical reasons of evaluating effect sizes, New York State assessment scale scores were standardized to the study sample. Most treated students were only exposed to one teacher (the LDC intervention teacher); thus, the average treated student in this sample received a 0.72 treatment dosage. As reported, the dosage dependent effect is in the positive direction and the dosage independent effect is in the negative direction, but neither effect was statistically significant. In other words, neither model provided sufficient

evidence to conclude that students taught by LDC teachers performed at levels different than their matched peers in the comparison group.

The effects of the covariates on student performance were similar under both models and were in the expected directions (although most were not statistically significant). Prior ELA performance was the strongest predictor and prior mathematics performance also helped explain the outcome. In addition to prior achievement, one demographic variable (gender) helped predict performance. Females performed at significantly higher levels than males.

Table I3

Effect Estimates of Cohort 1 Elementary School Teachers Participating in LDC for One Year on 2016–2017 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage Dependent model coefficient (*SD*)	Dosage independent model coefficient (*SD*)
Level 1 - LDC teacher treatment	0.084 (0.147)	-0.059 (0.118)
Level 2 - Student characteristics		
Hispanic	-0.110(0.163)	-0.113(0.163)
Black	-0.195 (0.152)	-0.191 (0.152)
Asian	-0.143 (0.148)	-0.144 (0.148)
Other	-0.306 (0.208)	-0.302 (0.208)
Poverty	-0.058 (0.065)	-0.055 (0.065)
Female	0.171 (0.053)*	0.169 (0.053)*
ELL	-0.034 (0.107)	-0.030 (0.107)
Special Education	-0.169 (0.089)	-0.168 (0.089)
Grade 4 at baseline	-0.121 (0.105)	-0.126 (0.104)
Teacher experience	0.001 (0.010)	0.001 (0.010)
Baseline peer ELA Z score	0.152 (0.092)	0.144 (0.092)
Baseline year mathematics Z score	0.166 (0.044)*	0.167 (0.044)*
Baseline year ELA Z score	0.528 (0.051)*	0.528 (0.051)*

Note. Since the average treatment student received a 0.724 treatment dosage we could estimate an average treatment effect on the treated (ATET) at 0.724 * 0.084 = 0.061. This effect was not statistically significant. Inclusion rules led to removal of ELL students and students with disabilities variables from the model.
*CI two tailed probability ≥ .95

I.2 2016–2017 Cohort 1 Middle School Sample (1 year)

The 2016–2017 LDC middle school sample included twenty schools, 104 teachers, and 3,562 students prior to the CEM process. After the CEM student-level matching, our final secondary LDC sample was reduced to 3,214 students, with all schools and teachers being retained (see Table I4). Prior to matching, the potential comparison sample consisted of 519 schools, 10,131 teachers and 161,047 students. This comparison sample was substantially reduced during the first stage of matching, which identified the five schools that most closely resembled each of the 20 LDC schools. After student-level CEM, an analytic comparison sample of 85 schools, 1,423 teachers, and 3,214 students was constructed.

Table I4

Before and After Matching Sample Sizes: 2016–2017 Cohort 1 Middle School Analysis

	LDC sample			Comparison sample		
	Schools	Teachers	Students	Schools	Teachers	Students
Stage 1						
Before matching	20	104	3,562	519	10,131	161,047
After matching	20	104	3,562	100	2,304	29,375
Stage 2						
After matching	20	104	3,214	85	1,423	3,214

As shown in Table I5, the final LDC middle school student sample included a large proportion of Black and Hispanic students (87.2%), and a similarly large proportion of students who were economically disadvantaged (86.1%). The sample was comprised of sixth (16.1%), seventh (41.1%), and eighth grade students (42.8%). Special education students represented slightly less than one-quarter of this sample, while there was about one half that many English language learners (12.8%). In addition, mean performance on the prior year academic assessment was somewhat lower for LDC students as compared to district-wide performance levels in mathematics and ELA. Treatment and comparison samples matched very closely on all variables. Exact matching was achieved on some variables, and all demographic variables were within 3 percentage points.

Table I5

2015–2016 Baseline Characteristics of Treated Students Taught by Cohort 1 Middle School Teachers in 2016–2017 and Comparison Students After Matching

Student characteristic	LDC sample: (n = 3,214)	Comparison sample: (n = 3,214)
Race/Ethnicity		
Hispanic (%)	56.1	57.1
Black (%)	31.1	29.8
Asian (%)	5.2	6.4
White (%)	6.7	5.7
Other (%)	0.9	0.9
Female (%)	51.8	48.9
Special programs status		
Poverty (%)	86.1	86.4
English Language Learner (%)	12.8	13.5
Special education (%)	23.6	25.8
Student baseline achievement		
Mean math Z score	-0.40	-0.44
Mean ELA Z score	-0.38	-0.37
Class & teacher characteristics		
Mean ELA Z score of current peers	-0.41	-0.37
Teacher years of experience	8.7	8.4
Grade level		
Grade 5 at baseline (%)	16.1	16.1
Grade 6 at baseline (%)	41.1	41.1
Grade 7 at baseline (%)	42.8	42.8

In Table I6 we present results of both the dosage dependent and dosage independent models on middle school students' ELA performance in 2016−2017 after being taught by teachers in their first year of LDC implementation. Model results show no statistically discernible LDC effect on student outcomes for either model. In other words, both analyses showed that students taught by LDC teachers scored similarly on the ELA test to their matched peers in the comparison group. The effects of the covariates on student performance were similar in direction to those in the elementary school models for the same cohort and outcome year, although due to the larger sample size more demographic variables were significant in the

middle school analyses. Prior ELA and mathematics performance, as well as ELL status, special education status, Black ethnicity, Other Ethnicity, and gender were significant predictors of ELA performance. In secondary schools, the average prior achievement of a student's peers was also a significant predictor of ELA performance in the expected direction.

Table I6

Effect Estimates of Cohort 1 LDC Middle School Teachers Participating in LDC for One Year on 2016–2017 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD)*	Dosage-independent model coefficient (*SD*)
Level 2 - LDC teacher treatment	-0.016 (0.066)	-0.019 (0.042)
Level 1 - student characteristics		
Hispanic	-0.069 (0.036)	-0.069 (0.036)
Black	-0.126 (0.038)*	-0.126 (0.038)*
Asian	0.047 (0.046)	0.047 (0.046)
Other	-0.165 (0.083)*	-0.165 (0.083)*
Poverty	-0.039 (0.022)	-0.039 (0.022)
Female	0.094 (0.015)*	0.094 (0.015)*
English language learner	-0.101 (0.027)*	-0.101 (0.027)*
Special education	-0.147 (0.020)*	-0.147 (0.020)*
Grade 6 at baseline	0.054 (0.032)	0.054 (0.032)
Grade 7 at baseline	0.108 (0.035)*	0.108 (0.035)*
Content Exposure Weeks	-0.003 (0.002)	-0.003 (0.002)
Teacher Experience	-0.005 (0.003)	-0.005 (0.003)
Baseline Peer ELA Z score	0.155 (0.030)*	0.155 (0.030)*
Baseline year mathematics Z score	0.179 (0.012)*	0.179 (0.012)*
Baseline year ELA Z score	0.658 (0.013)*	0.658 (0.013)*

Note. Since the average treatment student received a 0.506 treatment dosage we could estimate an average treatment effect on the treated (ATET) at 0.506 * -0.016 = -0.008. This effect was not statistically significant.
*CI two tailed probability ≥ .95

I.3 2017–2018 Cohort 1 Middle School Sample (Participated in 2016–2017 and 2017–2018)

The 2017–2018 Cohort 1 middle school sample (teachers who participated in LDC in 2016–2017 and 2017–2018) prior to the CEM process included ten schools, 26 Cohort 1 returning middle school teachers who consented to participate in the evaluation study, and their 1,626 students. After the student-level matching, the final LDC sample included 1,511 students and the same number of teachers and schools prior to matching (see Table I7). Prior to matching, the potential middle school comparison sample consisted of 514 schools, 9,871 teachers, and 151,030 students. This comparison sample was substantially reduced during the first stage of matching, which identified up to five schools that closely resembled each of the ten LDC middle schools. After student-level CEM, a workable analytic comparison sample consisted of 43 schools, 753 teachers and 1,511 students.

Table I7

Before and After Matching Sample Sizes: Cohort 1 Middle School Teachers Participating in LDC in 2016–2017 and 2017–2018

	LDC sample			Comparison sample		
Stage	Schools	Teachers	Students	Schools	Teachers	Students
Stage 1						
Before matching	10	26	1,475	514	9,871	151,030
After matching	10	26	1,475	45	896	12,177
Stage 2						
After matching	10	26	1,408	44	702	1,408

The final LDC Cohort 1 middle school student sample after matching was comprised largely of students who were economically disadvantaged (see Table I8). Slightly more than half of students were Hispanic and about a third were black, and the sample was well distributed across the three grade levels in the baseline year. Special education students represented about one-quarter of this sample, while English language learners represented slightly more than 10%. Mean performance on the prior year assessments was more than one-third of a standard deviation lower than the district-wide performance levels in both mathematics and ELA.

Table I8

2015–2016 Baseline Characteristics of Treated Students Taught by Cohort 1 Middle School Teachers Participating in LDC in 2016–2017 and 2017–2018 and Comparison Students After Matching

Student characteristic	Treatment group (*n* = 1,408)	Comparison group (*n* = 1,408)
Race/ethnicity		
Hispanic (%)	52.4	52.4
Black (%)	31.9	31.9
Asian (%)	3.9	3.9
White (%)	10.9	10.6
Other (%)	0.9	1.2
Female (%)	54.3	54.3
Special programs status		
Poverty (%)	85.6	84.9
English language learner (%)	12.6	12.9
Special education (%)	26.0	23.7
Student prior achievement		
Mean baseline year mathematics Z score	-0.412	-0.391
Mean baseline year ELA Z score	-0.341	-0.345
Class & teacher characteristics		
Mean baseline ELA Z score of current peers	-0.373	-0.329
Mean Teacher years of experience	7.5	7.1
Grade level at baseline year		
Grade 4 at baseline (%)	27.7	27.7
Grade 5 at baseline (%)	39.7	39.7
Grade 6 at baseline (%)	32.6	32.6

In Table I9, we present results model results for the effect of LDC as practiced by Cohort 1 middle school teachers for two consecutive years on 2017–2018 ELA Assessment scores. Student outcomes are in the positive direction, but are not statistically significant for either model. In other words, neither analysis provided sufficient evidence to conclude that students taught by LDC teachers performed better on the ELA test than did their matched peers in the comparison group.

Table I9

Effect Estimates of Cohort 1 Middle School Teachers Participating in LDC in Two Consecutive Years on 2017–2018 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD)*	Dosage-independent model coefficient (*SD*)
Level 2 - LDC teacher treatment	0.001 (0.133)	-0.009 (0.056)
Level 1 - student characteristics		
Hispanic	-0.084 (0.049)	-0.084 (0.049)
Black	-0.180 (0.053)*	-0.180 (0.054)*
Asian	0.110 (0.073)	0.109 (0.073)
Other	0.147 (0.123)	0.147 (0.123)
Poverty	-0.114 (0.035)*	-0.114 (0.035)*
Female	0.195 (0.025)*	0.195 (0.025)*
English language learner	-0.008 (0.040)	-0.008 (0.040)
Special education	-0.104 (0.032)*	-0.104 (0.032)*
Grade 5 at baseline	0.107 (0.042)*	0.108 (0.042)*
Grade 6 at baseline	0.112 (0.045)*	0.112 (0.045)*
Teacher Experience	0.002 (0.004)	0.002 (0.004)
Baseline Peer ELA Z score	0.284 (0.035)*	0.283 (0.035)*
Baseline year mathematics Z score	0.179 (0.019)*	0.179 (0.019)*
Baseline year ELA Z score	0.579 (0.021)*	0.579 (0.021)*

Note. Based on the dosage-dependent model, the average treated student received a 0.344 treatment dosage. Because of this, using the dosage dependent model we estimate average treatment effect on the treated (ATET) at (0.345 * 0.001) = 0.0003.
*CI two tailed probability ≥ .95

The significant effects of the covariates on student performance were similar under the two models and were in the expected directions. Prior ELA performance was the strongest predictor and prior mathematics performance also helped explain the outcome. In addition to prior achievement, a number of demographic variables helped predict performance: Black students performed at lower levels than White students, students in special education performed at lower levels than students not in special education, females performed at significantly higher levels than males, and students with low socio-economic status performed at lower levels than did their peers with higher socio-economic status.

I.4 2017–2018 Cohort 1 Middle School Sample (Newly Joined LDC in 2017–2018)

The 2017−2018 Cohort 1 middle school sample (newly joined teachers with 1 year of LDC participation) prior to the CEM process included seven schools, 17 Cohort 1 middle school teachers who consented to participate in the evaluation study, and their 1,023 students. After the student-level matching, our LDC sample included 941 students and the same number of teachers and schools prior to matching (see Table I10). Prior to matching, the potential middle school comparison sample consisted of 514 schools, 9,871 teachers, and 151,030 students. This comparison sample was substantially reduced during the first stage of matching, which identified up to five schools that closely resembled each of the seven LDC middle schools. After student-level CEM, a workable analytic comparison sample consisted of 29 schools, 487 teachers and 941 students.

Table I10

Before and After Matching Sample Sizes: 2017–2018 Cohort 1 Middle School Analysis (Newly Joined LDC in 2017–2018)

	LDC sample			Comparison sample		
Stage	Schools	Teachers	Students	Schools	Teachers	Students
Stage 1						
Before matching	7	17	1,023	514	9,871	151,030
After matching	7	17	1,023	31	722	7,931
Stage 2						
After matching	7	17	941	29	487	941

The final LDC sample after matching was comprised largely of students who were economically disadvantaged (see Table I11). Over two thirds of students were Hispanic and a little over a quarter were black, and the sample was well distributed across the three grade levels in the baseline year. Special education students represented about one-quarter of this sample, while English language learners represented about one eighth. Mean performance on the prior year assessments was about one-half of a standard deviation lower than the district-wide performance levels in both mathematics and ELA.

Table I11

2015–2016 Baseline Characteristics of Students Taught by Cohort 1 Middle School Teachers Who Newly Joined LDC in 2017–2018 and Comparison Students After Matching

Student characteristic	Treatment group (*n* = 941)	Comparison group (*n* = 941)
Race/ethnicity		
Hispanic (%)	70.5	70.5
Black (%)	27.1	27.1
Asian (%)	1.0	1.0
White (%)	1.2	1.3
Other (%)	0.3	0.2
Female (%)	49.3	49.3
Special programs status		
Poverty (%)	91.8	91.8
English language learner (%)	12.8	12.8
Special education (%)	26.7	26.2
Student baseline achievement		
Mean baseline year mathematics Z score	-0.527	-0.499
Mean baseline year ELA Z score	-0.419	-0.409
Class & teacher characteristics		
Mean baseline ELA Z score of current peers	-0.446	-0.442
Teacher years of experience	8.6	8.3
Grade level at baseline year		
Grade 4 at baseline (%)	39.7	39.7
Grade 5 at baseline (%)	29.5	29.5
Grade 6 at baseline (%)	30.7	30.7

In Table I12 we present the analysis results for students taught by Cohort 1 teachers who newly joined existing LDC PLCs in 2017–2018 (these teachers had 1 year of LDC experience but their schools were in their second year of LDC implementation). As can be seen, the LDC effect on student ELA outcomes are in the negative direction, but are not statistically significant for either model. In other words, neither model provided sufficient evidence to conclude that students taught by LDC teachers performed differently on the ELA test than did their matched peers in the comparison group.

Table I12

Effect Estimates of Cohort 1 Middle School Teachers Joining LDC in 2017–2018 on 2017–2018 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD)*	Dosage-independent model coefficient (*SD*)
Level 2 - LDC teacher treatment	-0.120 (0.204)	-0.061 (0.077)
Level 1 - student characteristics		
Hispanic	-0.060 (0.138)	-0.060 (0.139)
Black	-0.167 (0.142)	-0.168 (0.142)
Asian	0.240 (0.208)	0.239 (0.207)
Other	-0.610 (0.325)	-0.604 (0.323)
Poverty	-0.006 (0.056)	-0.005 (0.056)
Female	0.231 (0.031)*	0.231 (0.031)*
English language learner	-0.043 (0.053)	-0.043 (0.053)
Special education	-0.105 (0.042)*	-0.104 (0.041)*
Grade 5 at baseline	0.052 (0.059)	0.053 (0.059)
Grade 6 at baseline	0.138 (0.062)*	0.142 (0.062)*
Content Exposure Weeks	-0.009 (0.008)	-0.009 (0.008)
Teacher Experience	-0.007 (0.006)	-0.007 (0.006)
Baseline Peer ELA Z score	0.240 (0.046)*	0.240 (0.046)*
Baseline year mathematics Z score	0.175 (0.026)*	0.174 (0.026)*
Baseline year ELA Z score	0.540 (0.027)*	0.540 (0.027)*

Note. Based on the dosage-dependent model, the average treated student received a 0.281 treatment dosage. Because of this, using the dosage dependent model we estimate an average treatment effect on the treated (ATET) at (0.281 *- 0.120) = -0.034.
*CI two tailed probability ≥ .95

The significant effects of the covariates on student performance were similar under the two models and were in the expected directions. Prior ELA performance was the strongest predictor and prior mathematics performance also helped explain the outcome. In addition to prior achievement, gender and special education status also helped predict the outcome.

I.5 2018–2019 Cohort 1 Middle School Sample (Began Participating in 2017–2018 and Continued Through 2018–2019)

The 2018−2019 Cohort 1 middle school sample (began participating in 2017–2018 and continued through 2018–2019) prior to the CEM process included two schools, 8 Cohort 1 middle school teachers who consented to participate in the evaluation study, and their 552 students. After the student-level matching, our LDC sample included 500 students and the same number of teachers and schools prior to matching (see Table I13). Prior to matching, the potential middle school comparison sample consisted of 480 schools, 9,965 teachers, and 153,981 students. This comparison sample was substantially reduced during the first stage of matching, which identified up to five schools that closely resembled each of the two LDC middle schools. After student-level CEM, a workable analytic comparison sample consisted of 9 schools, 155 teachers and 500 students.

Table I.13

Before and After Matching Sample Sizes: 2018–2019 Cohort 1 Middle School Analysis (Joined in 2017–2018 and Continued in 2018–2019)

	LDC sample			Comparison sample		
Stage	School	Teacher	Student	School	Teacher	Student
Stage 1						
Before matching	2	8	552	480	9,965	153,981
After matching	2	8	552	9	170	2,189
Stage 2						
After matching	2	8	500	9	155	500

The final LDC sample after matching was comprised largely of students who were economically disadvantaged (see Table I14). About two thirds of students were Hispanic and about one third were black. Special education students represented about one-quarter of this sample, while English language learners represented a little over 10%. Mean performance on the prior year assessments was over one-third of a standard deviation lower than the district-wide performance levels in both mathematics and ELA.

Table I14

2015–2016 Baseline Characteristics of Students Taught by Cohort 1 Middle School Teachers Who Joined LDC in 2017–2018 and Continued Through 2018–2019 and Comparison Students After Matching

Student characteristic	Treatment group (*n* = 500)	Comparison group (*n* = 500)
Race/ethnicity		
Hispanic (%)	65.8	65.8
Black (%)	30.6	30.6
Asian (%)	0.6	2.2
White (%)	2.8	1.2
Other (%)	0.2	0.2
Female (%)	48.4	44.6
Special programs status		
Poverty (%)	88.2	85.6
English language learner (%)	10.2	12.2
Special education (%)	23.8	23.8
Student prior achievement		
Mean baseline year mathematics Z score	-0.457	-0.475
Mean baseline year ELA Z score	-0.378	-0.381
Class & teacher characteristics		
Mean baseline ELA Z score of current peers	-0.412	-0.397
Teacher years of experience	11.2	10.1
Grade level at baseline year		
Grade 3 at baseline (%)	20.6	20.6
Grade 4 at baseline (%)	35.6	35.6
Grade 5 at baseline (%)	43.8	43.8

In Table I15, we present the analysis results for those students taught by Cohort 1 middle school teachers who began participating in 2017–2018 and continued through 2018–2019. Model results for the LDC effect on student outcomes are in the positive direction, but are not statistically significant for either model. In other words, neither analysis provided sufficient evidence to conclude that students taught by LDC teachers performed better on the ELA test than did their matched peers in the comparison group.

Table I15

Effect Estimates of Cohort 1 Middle School Teachers Who Began Participating in LDC in 2017–2018 on 2018–2019 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD)*	Dosage-independent model coefficient (*SD*)
Level 2 - LDC teacher treatment	0.421 (0.297)	0.133 (0.139)
Level 1 - student characteristics		
Hispanic	-0.019 (0.118)	-0.022 (0.118)
Black	-0.092 (0.126)	-0.093 (0.126)
Poverty	0.125 (0.064)	0.125 (0.064)
Female	0.231 (0.044)*	0.232 (0.044)*
English language learner	0.174 (0.076)*	0.170 (0.076)*
Special education	-0.102 (0.065)	-0.101 (0.065)
Grade 4 at baseline	0.078 (0.107)	0.090 (0.108)
Grade 5 at baseline	0.069 (0.107)	0.067 (0.108)
Teacher Experience	-0.002 (0.010)	-0.002 (0.010)
Baseline Peer ELA Z score	0.394 (0.075)*	0.392 (0.075)*
Baseline year mathematics Z score	0.148 (0.038)*	0.149 (0.038)*
Baseline year ELA Z score	0.513 (0.039)*	0.513 (0.039)*

Note. Based on the dosage-dependent model, the average treated student received a 0.355 treatment dosage. Because of this, using the dosage dependent model we estimate an average treatment effect on the treated (ATET) at (0.355 * 0.421) = 0.149.
*CI two tailed probability ≥ .95

The significant effects of the covariates on student performance were similar under the two models and were in the expected directions. Prior ELA performance was the strongest predictor and prior mathematics performance also helped explain the outcome. In addition to prior achievement, females performed at significantly higher levels than males. One interesting result was that English language learners in this analysis were found to have statistically significant higher ELA scores than the non-ELL students.

I.6 2017–2018 Cohort 2 Elementary School Sample (1 year)

As reported in Table I16, the resulting Cohort 2 elementary LDC one-year sample included 14 schools, 57 teachers, and 1,351 students prior to the CEM process. After the CEM student-level matching, our final Cohort 2 elementary LDC sample was reduced to 54 teachers and 1,258 students. Prior to matching, the potential comparison sample consisted of 781 schools,

10,722 teachers and 120,696 students. This comparison sample was substantially reduced during the first stage of matching, which identified up to five schools that most closely resembled each of the 14 LDC schools. After student-level CEM, a workable analytic comparison sample of 65 schools, 538 teachers, and 1,258 students was constructed.

Table I16

Before and After Matching Sample Sizes: 2017–2018 Cohort 2 Elementary School Analysis (1 year)

	LDC sample			Comparison sample		
Stage	School	Teacher	Student	School	Teacher	Student
Stage 1						
Before matching	14	57	1,351	781	10,722	120,696
After matching	14	57	1,351	70	1,962	9,722
Stage 2						
After matching	14	54	1,258	65	538	1,258

The final Cohort 2 LDC elementary student sample (see Table I17) was also more than one half Hispanic and about a third black. Most students were identified as economically disadvantaged. The sample was quite evenly distributed between students in third (51.8%) and fourth grade (48.2%) in the prior year. English language learners represented slightly more than 15% of this sample, while special education students represented slightly less than one quarter of the sample. In addition, mean performance on the prior year ELA assessments was about one-quarter of a standard deviation lower than the district-wide performance level, while mean performance on the prior year mathematics assessment was about one-third of a standard deviation lower than the district-wide performance level.

Table I17

2016–2017 Baseline Characteristics of Treated Students Taught by Cohort 2 Elementary School Teachers in 2017–2018 and Comparison Students After Matching

Student characteristic	Treatment group (*n* = 1,258)	Comparison group (*n* = 1,258)
Race/ethnicity		
Hispanic (%)	56.0	56.0
Black (%)	35.6	35.6
Asian (%)	3.0	3.5
White (%)	3.8	3.7
Other (%)	1.5	1.2
Female (%)	50.9	52.6
Special programs status		
Poverty (%)	85.0	86.3
English language learner (%)	15.3	12.2
Special education (%)	22.9	20.4
Student baseline achievement		
Mean baseline year mathematics Z score	-0.320	-0.331
Mean baseline year ELA Z score	-0.247	-0.237
Class and teacher characteristics		
Mean baseline ELA Z score of current peers	-0.244	-0.245
Teacher years of experience	12.7	12.2
Grade level at baseline year		
Grade 3 at baseline (%)	51.8	51.8
Grade 4 at baseline (%)	48.2	48.2

Table I18 presents results of both the dosage dependent and dosage independent models on Cohort 2 elementary school students' ELA performance in 2017–2018 after being taught by teachers with 1 year of LDC experience. The LDC effect on student outcomes are in the negative direction, but are not statistically significant for either model. In other words, neither analysis provided sufficient evidence to conclude that students taught by LDC teachers performed at levels different than their matched peers in the comparison group. The effects of the covariates on student performance were in the expected directions.

Table I18

Effect Estimates of Cohort 2 LDC Elementary School Teacher Participating in LDC for One Year on 2017–2018 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage Dependent model coefficient (*SD*)	Dosage independent model coefficient (*SD*)
Level 1 - LDC teacher treatment	-0.045 (0.067)	-0.003 (0.050)
Level 2 - Student characteristics		
Hispanic	-0.077 (0.073)	-0.077 (0.073)
Black	-0.111 (0.074)	-0.111 (0.074)
Asian	0.014 (0.094)	0.014 (0.094)
Other	-0.030 (0.121)	-0.031 (0.121)
Poverty	-0.057 (0.039)	-0.057 (0.039)
Female	0.079 (0.025) *	0.079 (0.025) *
English Language Learner	-0.160 (0.040) *	-0.161 (0.040) *
Special education	-0.154 (0.035) *	-0.154 (0.035) *
Grade 4 at baseline	0.008 (0.040)	0.012 (0040)
Teacher years of experience	0.001 (0.004)	0.001 (0.004)
Baseline peer ELA Z score	0.100 (0.039) *	0.100 (0.039) *
Baseline year mathematics Z score	0.234 (0.022) *	0.234 (0.022) *
Baseline year ELA Z score	0.593 (0.022) *	0.593 (0.022) *

Note. Based on the dosage-dependent model, the average treated student received a 0.642 treatment dosage. Because of this, using the dosage-dependent model we could estimate an average treatment effect on the treated (ATET) at (0.642 * -0.045) = -0.029.
*CI two tailed probability ≥ .95

I.7 2018–2019 Cohort 2 Elementary School Sample (2 years)

Prior to the CEM process, the Cohort 2 elementary two-year LDC sample included 9 schools, 17 teachers, and 356 students. After the student-level matching, our final pooled elementary LDC sample included 341 students and the same number of teachers and schools prior to matching (see Table I19). Prior to matching, the potential elementary school comparison sample consisted of 776 schools, 6,124 teachers, and 56,083 students. This comparison sample was substantially reduced during the first stage of matching, which identified up to five schools that closely resembled each of the nine LDC schools. After student-level CEM, a workable analytic comparison sample consisted of 40 schools, 221 teachers, and 341 students.

Table I19

Before and After Matching Sample Sizes: Cohort 2 Elementary School Analysis for Teachers with 2 years of LDC Implementation

	LDC sample			Comparison sample		
Stage	Schools	Teachers	Students	Schools	Teachers	Students
Stage 1						
Before school matching	9	17	356	776	6,124	56,083
After school matching	9	17	356	44	335	2753
Stage 2						
After student matching	9	17	341	40	221	341

The pooled LDC elementary school student sample after matching was composed mainly of Hispanic and Black students identified as economically disadvantaged (see Table I20). English language learners represented one eighth of the sample, while special education students represented 15%. Mean performance on the baseline year assessments was about one quarter of a standard deviation below the districtwide performance levels in both mathematics and ELA.

Table I20

2016–2017 Baseline Characteristics of Treated Students Taught by Cohort 2 Elementary School Teachers Participating in LDC in Two Consecutive Years and Comparison Students After Matching

Student characteristic	Treatment group (*n* = 341)	Comparison group (*n* = 341)
Race/ethnicity		
Hispanic (%)	59.5	59.5
Black (%)	35.8	35.8
Asian (%)	3.8	3.8
White (%)	0.3	0.6
Other (%)	0.6	0.3
Female (%)	48.1	48.1
Special programs status		
Poverty (%)	89.7	89.7
English language learner (%)	12.9	15.0
Special education (%)	15.5	15.5
Student baseline achievement		
Mean baseline year mathematics Z score	-0.288	-0.310
Mean baseline year ELA Z score	-0.249	-0.268
Class and teacher characteristics		
Mean baseline ELA Z score of current peers	-0.284	-0.291
Teacher years of experience	13.8	13.6
Grade level at baseline year		
Grade 3 at baseline (%)	100	100

In Table I21, we present results of both the dosage dependent and dosage independent models on Cohort 2 elementary school students' ELA performance in 2018–2019 after being taught by teachers with 2 years of LDC experience. Model results for the LDC effect on elementary student outcomes are in the positive direction, but are not statistically significant for either model. In other words, neither model provided sufficient evidence to conclude that elementary students taught by LDC teachers performed better on the ELA test than did their matched peers in the comparison group.

Table I21

Effect Estimates of Cohort 2 Elementary School Teachers Participating in LDC in Two Consecutive Years on 2018–2019 Smarter Balanced ELA Performance, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD*)	Dosage-independent model coefficient (*SD*)
Level 2 LDC teacher treatment	0.094 (0.138)	0.058 (0.094)
Level 1 student characteristics		
Hispanic	-0.038 (0.131)	-0.039 (0.131)
Black	-0.165 (0.135)	-0.166 (0.135)
Other	0.574 (0.403)	0.568 (0.403)
Poverty	-0.043 (0.086)	-0.042 (0.085)
Female	0.130 (0.054)*	0.131 (0.054)*
English language learner	0.079 (0.082)	0.079 (0.082)
Special education	-0.334 (0.079)*	-0.335 (0.079)*
Teacher Experience	0.011 (0.007)	0.012 (0.007)
Baseline peer ELA Z score	0.121 (0.084)	0.121 (0.084)
Baseline year mathematics Z score	0.226 (0.044)*	0.227 (0.043)*
Baseline year ELA Z score	0.559 (0.048)*	0.559 (0.048)*

Note. All students were in grade 3 at baseline year. Based on the dosage-dependent model, the average treated student received a 0.591 treatment dosage. Because of this, using the dosage-dependent model we could estimate an average treatment effect on the treated (ATET)at (0.591 × 0.094) = 0.056.
*CI two tailed probability ≥ .95

The significant effects of the covariates on student performance were similar under the two models and were in the expected direction. Baseline ELA performance was the strongest predictor and baseline mathematics performance also helped explain the outcome. In addition to baseline achievement, two demographic variables helped predict performance: females performed at significantly higher levels than males, and special education students performed at lower levels than did students not in special education.

I.8 2017–2018 Cohort 2 Middle School Sample (1 year)

As shown in Table I22, the resulting Cohort 2 LDC one-year middle school sample included 10 schools, 31 teachers, and 1,396 students prior to the CEM process. After the CEM student-level matching, our final secondary LDC sample was reduced to 1,285 students. Prior to matching, the potential comparison sample consisted of 516 schools, 9,867 teachers and 156,773 students. This comparison sample was substantially reduced during the first stage of

matching, which identified up to five schools that closely resembled each of the 10 LDC schools. After student-level CEM, a workable analytic comparison sample of 41 schools, 651 teachers, and 1,285 students was constructed.

Table I22

Before and After Matching Sample Sizes: 2017–2018 Cohort 2 Middle School Analysis

	LDC sample			Comparison sample		
	Schools	Teachers	Students	Schools	Teachers	Students
Stage 1						
Before matching	10	31	1,396	516	9,897	156,773
After matching	10	31	1,396	50	968	14,651
Stage 2						
After matching	10	31	1,285	41	651	1,285

As shown in Table I23 the final Cohort 2 LDC middle school student sample included a large combined proportion of Black (51.2%) and Hispanic students (34.0%), and a large majority of students who were economically disadvantaged (80.8%). Slightly over one half of the sample included students that were in fifth grade (26.4%), and sixth grade (25.1%) in the prior year, with the remainder (48.5%) in seventh grade in the prior year. English language learners represented about one eighth of this sample, while less than one quarter of the sample included special education students (23.8%). In addition, mean performance on the prior year assessment for LDC students was substantially lower than district-wide performance levels in mathematics and ELA.

Table I23

2016–2017 Baseline Characteristics of Treated Students Taught by Cohort 2 Middle School Teachers in 2017–2018 and Comparison Students After Matching

Student characteristic	Treatment group (*n* = 1,285)	Comparison group (*n* = 1,285)
Race/ethnicity		
Hispanic (%)	34.0	34.0
Black (%)	51.2	51.2
Asian (%)	11.5	7.5
White (%)	2.4	5.1
Other (%)	0.9	2.2
Female (%)	48.2	48.2
Special programs status		
Poverty (%)	80.8	81.6
English language learner (%)	13.6	11.6
Special education (%)	23.8	27.8
Student baseline achievement		
Mean baseline year mathematics Z score	-0.540	-0.542
Mean baseline year ELA Z score	-0.409	-0.419
Class & teacher characteristics		
Mean baseline ELA Z score of current peers	-0.434	-0.388
Teacher years of experience	10.9	10.0
Grade level at baseline year		
Grade 5 at baseline (%)	26.4	26.4
Grade 6 at baseline (%)	25.1	25.1
Grade 7 at baseline (%)	48.5	48.5

In Table I24 we present results for the students taught by Cohort 2 middle school teachers participating in LDC in 2017–2018. Both model results for the LDC effect on student outcomes are in the positive direction and did not yield a statistically significant LDC effect. Once again, covariates were in the expected direction, with in this case, gender, English Language Learner status, and special education status being significant predictors of ELA achievement.

Table I24

Effect Estimates for Cohort 2 LDC Middle School Teachers Participating in LDC for 1 year on 2017–2018 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD*)	Dosage-independent model coefficient (*SD*)
Level 2 - LDC teacher treatment	0.202 (0.108)	0.078 (0.051)
Level 1 - student characteristics		
Hispanic	0.107 (0.067)	0.107 (0.067)
Black	0.021 (0.066)	0.021 (0.066)
Asian	0.113 (0.074)	0.112 (0.074)
Other	-0.086 (0.116)	-0.088 (0.116)
Poverty	-0.056 (0.032)	-0.055 (0.032)
Female	0.130 (0.024)*	0.130 (0.024)*
English language learner	-0.195 (0.044)*	-0.196 (0.044)*
Special education	-0.167 (0.032)*	-0.167 (0.032)*
Grade 6 at baseline	0.039 (0.043)	0.037 (0.043)
Grade 7 at baseline	0.080 (0.039)*	0.081 (0.040)*
Teacher Experience	0.003 (0.004)	0.003 (0.004)
Baseline Peer ELA Z score	0.092 (0.037)*	0.096 (0.037)*
Baseline year mathematics Z score	0.206 (0.020)*	0.206 (0.019)*
Baseline year ELA Z score	0.653 (0.021)*	0.653 (0.021)*

Note. For the dosage dependent model, since the average treatment student received a 0.400 treatment dosage we could estimate an average treatment on the treated (ATET) at 0.40 * 0.202 = 0.081.

*CI two tailed probability ≥ .95

I.9 2018–2019 Cohort 2 Middle School Sample (2 years)

As shown in Table I25, the resulting Cohort 2 LDC middle school sample included nine schools, 22 teachers, and 1,033 students prior to the CEM process. After the CEM student-level matching, our final secondary LDC sample was reduced to 947 students. Prior to matching, the potential comparison sample consisted of 478 schools, 9,919 teachers and 152,128 students. This comparison sample was substantially reduced during the first stage of matching, which identified up to five schools that closely resembled each of the nine LDC schools. After student-level CEM, a workable analytic comparison sample of 37 schools, 547 teachers, and 947 students was constructed.

Table I25

Before and After Matching Sample Sizes: Cohort 2 Middle School (2 years)

	LDC sample			Comparison sample		
Stage	Schools	Teachers	Students	Schools	Teachers	Students
Stage 1						
Before school matching	9	22	1,033	478	9,919	152,128
After school matching	9	22	1,033	41	1022	12,791
Stage 2						
After student matching	9	22	947	37	547	947

As shown in Table I26 the final Cohort 2 LDC middle school student sample included a large combined proportion of Black (51.4%) and Hispanic students (35.5%), and a large majority of students who were economically disadvantaged (80.6%). English language learners represented about one eighth of the sample, and about one quarter of the sample were special education students. In addition, mean performance on the prior year assessment for LDC students was substantially lower when compared to district-wide performance levels in mathematics and ELA.

Table I26

2016–2017 Baseline Characteristics of Treated Students Taught by Cohort 2 Middle School Teachers Participating in LDC in Two Consecutive Years and Comparison Students After Matching

Student characteristic	Treatment group (*n* = 947)	Comparison group (*n* = 947)
Race/ethnicity		
Hispanic (%)	35.5	35.5
Black (%)	51.4	51.4
Asian (%)	9.5	7.6
White (%)	1.9	4.3
Other (%)	1.7	1.2
Female (%)	45.9	47.2
Special programs status		
Poverty (%)	80.6	81.9
English language learner (%)	12.8	13.6
Special education (%)	24.2	24.2
Student baseline achievement		
Mean baseline year mathematics Z score	-0.526	-0.497
Mean baseline year ELA Z score	-0.423	-0.424
Class and teacher characteristics		
Mean baseline ELA Z score of current peers	-0.449	-0.416
Teacher years of experience	10.8	10.3
Grade level at baseline year		
Grade 4 at baseline (%)	21.9	21.9
Grade 5 at baseline (%)	42.2	42.2
Grade 6 at baseline (%)	35.9	35.9

In Table I27 we present analysis results for students taught by Cohort 1 middle school teachers who participated in LDC for two consecutive years (2017–2018 and 2018–2019). Dosage dependent model results indicate an LDC effect in the negative direction and the dosage independent model results was in the positive direction; both effects were very close to 0 and not statistically significant. Once again, covariates were in the expected direction, with in this case, Black, female, and special education status being significant predictors of ELA achievement.

Table I27

Effect Estimates of Cohort 2 Middle School Teachers Participating in LDC in Two Consecutive Years on 2018–2019 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD*)	Dosage-independent model coefficient (*SD*)
Level 2 LDC teacher treatment	-0.004 (0.135)	0.061 (0.053)
Level 1 student characteristics		
Hispanic	-0.049 (0.052)	-0.051 (0.052)
Black	-0.130 (0.054) *	-0.131 (0.054) *
Other	0.086 (0.129)	0.083 (0.129)
Poverty	-0.070 (0.039)	-0.070 (0.038)
Female	0.165 (0.030)*	0.165 (0.030)*
English language learner	-0.030 (0.051)	-0.030 (0.051)
Special education	-0.112 (0.040)*	-0.112 (0.040)*
Teacher Experience	0.000 (0.004)	0.000 (0.004)
Baseline peer ELA Z score	0.321 (0.039)*	0.322 (0.039)*
Baseline year mathematics Z score	0.179 (0.024)*	0.179 (0.024)*
Baseline year ELA Z score	0.537 (0.026)*	0.536 (0.026)*
Grade 5 int baseline	-0.035 (0.047)	-0.034 (0.046)
Grade 6 at baseline	0.064 (0.048)	0.065 (0.048)

Note. Asian & White students were combined as reference category to provide adequate sample, and total content weeks was not included in this model as it did not reach our tolerance criteria. Based on the dosage-dependent model, the average treated student received a 0.336 treatment dosage. Because of this, using the dosage-dependent model we could estimate an average treatment effect on the treated (ATET)at (0.336 × -0.004) = -0.001.

*CI two tailed probability ≥ .95

I.10 2018–2019 Cohort 2 Middle School Sample (Newly Joined LDC in 2018–2019)

As shown in Table I28, the resulting Cohort 2 LDC middle school sample included five schools, 12 teachers, and 586 students prior to the CEM process. After the CEM student-level matching, our final secondary LDC sample was reduced to 547 students. Prior to matching, the potential comparison sample consisted of 516 schools, 9,897 teachers and 156,773 students. This comparison sample was substantially reduced during the first stage of matching, which identified up to five schools that closely resembled each of the five LDC schools. After student-level CEM, a workable analytic comparison sample of 22 schools, 298 teachers, and 547 students was constructed.

Table I28

Before and After Matching Sample Sizes: Cohort 2 Middle School Analysis (Newly Joined LDC in 2018–2019)

	LDC sample			Comparison sample		
Stage	Schools	Teachers	Students	Schools	Teachers	Students
Stage 1						
Before school matching	5	12	586	516	9,897	156,773
After school matching	5	12	586	23	451	5,819
Stage 2						
After student matching	5	12	547	22	298	547

As shown in Table I29 the final Cohort 2 LDC middle school student was comprised of primarily Hispanic and Black students from low socio-economic backgrounds. English language learners represented about one eighth of the sample, and about one quarter of the sample were special education students. In addition, mean performance on the prior year assessment for LDC students was over a half of a standard deviation lower when compared to district-wide performance levels in mathematics and ELA.

Table I29

2016–2017 Baseline Characteristics of Students Taught by Cohort 2 Middle School Teachers Who Newly Joined LDC in 2018–2019 and Comparison Students After Matching

Student characteristic	Treatment group (*n* = 547)	Comparison group (*n* = 547)
Race/ethnicity		
Hispanic (%)	29.6	29.6
Black (%)	62.3	62.3
Asian (%)	5.3	3.7
White (%)	1.8	2.9
Other (%)	0.9	1.5
Female (%)	50.2	46.1
Special programs status		
Poverty (%)	86.7	81.4
English language learner (%)	12.6	12.6
Special education (%)	26.5	26.5
Student baseline achievement		
Mean baseline year mathematics Z score	-0.598	-0.574
Mean baseline year ELA Z score	-0.529	-0.541
Class & teacher characteristics		
Mean baseline ELA Z score of current peers	-0.553	-0.556
Teacher years of experience	9.1	10.2
Grade level at baseline year		
Grade 4 at baseline (%)	24.5	24.5
Grade 5 at baseline (%)	46.4	46.4
Grade 6 at baseline (%)	29.1	29.1

In Table I30 we present results of models that are both dosage dependent and dosage independent for the Cohort 2 middle school teachers who newly joined and participated in LDC in 2018–2019. Dosage dependent model results indicate an LDC effect in a positive direction that approached but did not obtain statistical significance on the student outcome. The dosage independent model was in the negative direction and did not yield a statistically significant LDC effect. Once again, covariates were in the expected direction, with in this case, Black, female, and special education status being significant predictors of ELA achievement.

Table I30

Effect Estimates for Cohort 2 LDC Middle School Teachers Joining LDC in 2018–2019 on 2018–2019 New York State ELA Assessment, Dosage-Dependent and Dosage-Independent Models

Variables	Dosage-dependent model coefficient (*SD*)	Dosage-independent model coefficient (*SD*)
Level 2 - LDC teacher treatment	0.029 (0.173)	-0.023 (0.067)
Level 1 - student characteristics		
Hispanic	-0.151 (0.087)	-0.151 (0.087)
Black	-0.224 (0.084)*	-0.224 (0.084)*
Other	-0.283 (0.192)	-0.284 (0.192)
Poverty	-0.088 (0.053)	-0.087 (0.053)
Female	0.186 (0.040)*	0.186 (0.040)*
English language learner	0.048 (0.068)	0.050 (0.068)
Special education	-0.125 (0.052)*	-0.126 (0.052)*
Grade 5 at baseline	0.155 (0.058)*	0.153 (0.058)*
Grade 6 at baseline	0.189 (0.065)*	0.187 (0.065)*
Teacher Experience	0.013 (0.006)*	0.013 (0.006)*
Baseline Peer ELA Z score	0.233 (0.053)*	0.232 (0.053)*
Baseline year mathematics Z score	0.183 (0.032)*	0.182 (0.032)*
Baseline year ELA Z score	0.556 (0.035)*	0.557 (0.035)*

Note. For the dosage dependent model, since the average treatment student received a 0.323 treatment dosage we could estimate an average treatment on the treated (ATET) at 0323 * 0.029 = 0.009.

*CI two tailed probability ≥ .95

I.11 Student Exposure Analysis

In Table I31, we present the full results of the analysis exploring whether students with sustained exposure to LDC over time performed at relatively higher levels than students exposed to LDC for the first time in the primary outcome year. The treatment group was split into mutually exclusive group, including 1,489 students taught by at least one LDC teacher in the prior year, and 1,229 students only exposed to LDC in the outcome year. Separate control groups were selected for each mutually exclusive treatment group, and the control group for the students with only current exposure served as the reference group for the model.

Table I31

Effect Estimates of Cohort 1 and 2 Elementary and Middle School Teachers Participating in LDC in Two Consecutive Years on New York State ELA Assessment, Dosage-Independent Prior Year Subgroups Model

Variables	Dosage-Independent Subgroup model coefficient (SD)
Prior and current treatment (*n* = 1,489)	0.092 (0.045)*
Control for prior and current (*n* = 1,489)	0.046 (0.034)
Current only treatment (*n* = 1,229)	-0.007 (0.043)
Control for current only (*n* = 1,229)	Reference Group in Model
Level 1 student characteristics	
Hispanic	-0.046 (0.042)
Black	-0.142 (0.044)*
Asian	0.087 (0.053)
Other	0.162 (0.090)
Poverty	-0.091 (0.025)*
Female	0.173 (0.018)*
English language learner	-0.017 (0.029)
Special education	-0.129 (0.024)
Teacher Experience	0.004 (0.003)
Baseline peer ELA Z score	0.274 (0.025)*
Baseline year mathematics Z score	0.181 (0.014)*
Baseline year ELA Z score	0.563 (0.015)*
Grade 4 at baseline	-0.037 (0.049)
Grade 5 at baseline	-0.038 (0.045)
Grade 6 at baseline	0.004 (0.036)
In Cohort 2 schools	0.038 (0.033)

Our primary substantive interest, however, is not in the coefficients as displayed in Table I31, but rather in two post-hoc tests of the statistical difference between coefficients, displayed in Table I32. Using the MLwiN software5, we obtained the Chi Square value (1 degree of freedom) for a test of the difference between two coefficients. The first test examines the difference between the coefficient for the treatment group of students exposed to LDC in two

[5] See http://www.bristol.ac.uk/cmm/software/mlwin/

consecutive years, and the coefficient for the control group selected specifically for these treatment students. Although the difference (0.046) is in the expected direction, with the treatment group coefficient higher than the control group coefficient, the difference (with a p value of 0.274) is not significant. The second test examines the difference between the two treatment groups: those students with 2 years of LDC exposure and those students with only exposure in the outcome year. The difference (0.102) is in the expected direction and statistically significant (p = 0.008). Students with 2 years of LDC experience scored significantly higher than the students with only 1 year of LDC experience.

Table I32

Subgroup results examining exposure of students to LDC over time

Difference test	Difference	X^2	P value
Difference between coefficient for students exposed to LDC for two consecutive year and coefficient for matched control student group	0.046	1.240	0.265
Difference between coefficient for students exposed to LDC for two consecutive year and coefficient for students with exposure to LDC only in the outcome year	0.099	6.541	0.011

In Table I33, we present the full results of the analysis exploring whether students with higher LDC dosage in the outcome year performed at relatively higher levels than students exposed to lower LDC dosage outcome year. The treatment group was split into mutually exclusive group, including 459 students exposed to LDC in half or more of their core content area class time, and 2,259 students exposed to LDC in less than half of their core content area class time. Separate control groups were selected for each mutually exclusive treatment group, and the control group for the student with only current exposure served as the reference group for the model.

Table I33

Effect Estimates of Cohort 1 and 2 Elementary and Middle School Teachers Participating in LDC in Two Consecutive Years on New York State ELA Assessment, Dosage-Independent Current Year Dosage Subgroups Model

Variables	Dosage-Independent Subgroup model coefficient (SD)
LDC teacher treatment high dosage (n=459)	-0.010 (0.058)
Control for high dosage (n=459)	0.026 (0.043)
LDC teacher treatment low dosage (n=2,259)	0.034 (0.038)
Control for low dosage (n=2,259)	Reference Group in Model
Level 1 student characteristics	
Hispanic	-0.046 (0.042)
Black	-0.145 (0.044)*
Asian	0.081 (0.053)
Other	0.160 (0.090)
Poverty	-0.091 (0.025)*
Female	0.173 (0.018)*
English language learner	-0.015 (0.029)
Special education	-0.128 (0.024)
Teacher Experience	0.004 (0.003)
Baseline peer ELA Z score	0.179 (0.037)*
Baseline year mathematics Z score	0.276 (0.025)*
Baseline year ELA Z score	0.563 (0.015)*
Grade 4 at baseline	-0.068 (0.049)
Grade 5 at baseline	-0.020 (0.046)
Grade 6 at baseline	0.027 (0.047)
In Cohort 2 schools	0.029 (0.034)

Difference tests of interest are displayed in Table I34 below. As can be seen, the coefficient for the high dosage treatment group is smaller than the coefficients for both the high dosage matched control group and the low dosage treatment group, and these differences (-0.036 and -0.044 respectively) are not statistically significant.

Table I34

Subgroup results examining level of exposure of students to returning LDC teachers

Difference test	Difference	X^2	P value
Difference between coefficient for students exposed to returning LDC teachers for >=1/2 their total exposure and coefficient for matched control student group	-0.036	0.295	0.587
Difference between coefficient for students exposed to returning LDC teachers for >=1/2 their total exposure and coefficient for students with <1/2 their total exposure	-0.044	0.634	0.426

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