The Enduring Impact of Design-Based Professional Development on Literacy Instruction in Secondary Subject Areas

Project READI Technical Report #3

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Project READI operated as a multi-institution collaboration among the Learning Sciences Research Institute, University of Illinois at Chicago; Northern Illinois University; Northwestern University; WestEd's Strategic Literacy Initiative; and Inquirium, LLC. Project READI developed and researched interventions in collaboration with classroom teachers that were designed to improve reading comprehension through argumentation from multiple sources in literature, history, and the sciences appropriate for adolescent learners. Curriculum materials in the READI modules were developed based on enacted instruction and are intended as case examples of the READI approach to deep and meaningful disciplinary literacy and learning.

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Abstract

Despite progress in identifying general features of effective PD, there is a critical need to expand our understanding of PD that can support teachers in integrating literacy and content learning. Drawing on observations of secondary English language arts, history, and science classrooms, this quasi-experimental study explores differences in opportunity to learn offered by teachers who had previously participated in a model of design-based PD to those who had not. Observations and data analysis focused on the complex disciplinary literacy practices envisioned by current literacy reforms. Our analysis revealed that PD teachers allocated less time to delivering content and more time to working with text, argumentation, close reading, and cross-textual analysis than comparison teachers. Challenging the perception that literacy instruction detracts from content learning, we found that literacy tasks in PD classrooms generally had a disciplinary knowledge focus. Differences between PD and comparison teachers suggest that PD can potentially increase literacy learning opportunities presented to students. Of particular interest, because teachers who had participated in the PD had done so in years prior to the observational study reported here, the study offers an opportunity to explore the enduring effects of design-based PD on teacher practice and, thereby, on students' opportunity to learn.

The Enduring Impact of Design-Based Professional Development on Literacy Instruction in Secondary Subject Areas

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This study was inspired by the problem of how to transform traditional content area instruction dominated by teacher lecture into the kind of instruction that supports the complex reading and reasoning skills and processes instantiated in current literacy reform initiatives. Current literacy reform efforts epitomized by the Common Core State Standards in Literacy for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects emphasize instruction that engages students in reading and reasoning with complex academic texts across the subject areas (National Governors Association Center for Best Practices & Council of Chief State School Officers (CCSSOO, 2010). The Standards' focus on "close, attentive reading…wide, deep, and thoughtful engagement with high-quality literary and informational texts…cogent reasoning and use of evidence" (CCSSO, 2010, p. 3) represents a considerable shift from previous state standards and assessments, curriculum materials, and teacher practices (Beach, 2011; Porter, McMaken, Hwang, & Yang, 2011). Research indicates that secondary teachers across the disciplines have long prioritized content mastery, allocating little time and attention to developing literacy and reasoning processes and skills (Goldman & Bisanz, 2002; Greenleaf, Schoenbach, Cziko, & Mueller, 2001; Heller & Greenleaf, 2007; Lee & Spratley, 2010; Snow, 2002; ACT, Inc., 2009, 2013a, 2013b; Carnegie Council for Advancing Adolescent Literacy, 2010). Given teachers' tendency to sideline the practices promoted by literacy reforms under perceived pressures for content coverage, research is urgently needed to determine how to assist teachers to create literacy learning opportunities that support adolescents to develop reading and reasoning skills in the

academic disciplines.

Professional development (PD) must be a partner to curricular reform in building teachers' capacity for integrating literacy with content (Anderson, Harrison, & Lewis, 2012; Desimone, Smith, & Phillips, 2013; Heller & Greenleaf, 2007; Rose, 2015). Despite progress in identifying general features of effective PD (Desimone, 2009), there is a critical need to expand our understanding of PD that can effectively support teachers in integrating literacy and content learning (Cobb & Jackson, 2011; Wilson, 2013). Cobb & Jackson (2011) call on educational researchers to prioritize "studies that both investigate and inform the improvement of designs for implementation" of the Common Core State Standards (CCSS) (p. 185). Although their comments specifically reference the CCSS in Math, a parallel call to prioritize the learning demands on teachers of integrating reading and reasoning skills and processes with disciplinary learning is warranted across academic disciplines and reform initiatives (Desimone, 2013; Desimone et al., 2013; Penuel, Gallagher, & Moorthy, 2011). In particular, the current emphasis on cognitively demanding literacy practices such as modeling and argumentation will require significant changes in the practices of most secondary subject area teachers.

The study reported here represents a contribution to this research agenda. The study draws on videotapes of middle and high school classrooms observed during the initial phase of a larger IES-funded Reading for Understanding study[1] focused on disciplinary argumentation from multiple text sources. Our goal in the initial stages of this design-based research was to get a sense of the kinds of

[1]This research was supported by Project READI: a multi-institution collaboration between The Learning Sciences Research Institute at the University of Illinois at Chicago, Northwestern University, Northern Illinois University, and WestEd's Strategic Literacy Initiative to improve reading comprehension through argumentation from multiple sources in literature, history and science. It is supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305F100007 to University of Illinois at Chicago. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.

practices teachers were engaging in that might be promising for developing instructional interventions to support disciplinary reading and reasoning. To this end, we observed 34 middle and high school English language arts, history, and science teachers in two urban areas, one located on the northern West Coast and one in the Midwest. Although all the teachers we observed had reputations for good instructional practice, somewhat different recruitment and selection processes at the two research sites resulted in two subgroups of teachers: a group of 16 teachers who had previously participated in Reading Apprenticeship professional development and a group of 18 teachers who had not. Through an initial qualitative analysis of field notes and lesson artifacts (Miles & Huberman, 1994), it emerged that teachers who had participated in Reading Apprenticeship PD appeared to offer more opportunities and support for students to engage in disciplinary reading and reasoning than teachers who had not. While Reading Apprenticeship was not a focus of the larger research project, these findings suggested that the design-based PD instantiated in the Reading Apprenticeship model was potentially in itself an intervention for supporting the cognitively demanding literacy skills and processes indexed in the CCSS. To more systematically investigate this emergent finding, utilizing a quasi-experimental post-test only design with non-equivalent groups (Cohen, Manion, & Morrison, 2005), we conducted a quantitative analysis of students' opportunity to learn literacy skills and processes (hereafter OTL) in PD and comparison classrooms based on video data from observed lessons. The quantitative analysis of video data is the focus of this article.

Theoretical Background and Relevance to the Field

Literacy Instruction in Secondary Classrooms

Instruction in the sort of disciplinary reading and reasoning envisioned by current literacy reforms remains quite rare in our nation's secondary schools (ACT, Inc, 2006; Banilower et al.,

2013; Blanton, Wood, & Taylor, 2007; Duschl, Schweingruber, & Shouse, 2007; Fisher, 2009; Ness, 2009; Reisman, 2012; Schwarz & Asterhan, 2010). Research indicates that absent intervention, secondary teachers in all core subject areas use lecture as the predominant mode of instruction (ACT, Inc, 2006; Blanton et al., 2007; Reisman, 2012; C. Smith & Ochoa-Angrino, 2012; Vaughn et al., 2013). A recent study of instructional time use in high school classrooms found that students spend the majority of class time in listening activities such as lecture and film in all subject areas (Fisher, 2009). In large part, secondary teachers lack the know-how to simultaneously build students' academic literacy skills and engage them in rigorous subject area study (Heller & Greenleaf, 2007; Lee & Spratley, 2010). Yet even if teachers have the knowledge and skill to provide literacy instruction, there are significant barriers to engaging students actively with text (Ness, 2008; Reed, 2009), including difficulty balancing content and literacy instruction and the prevalence of whole class direct instruction reinforced by high stakes assessments that emphasize content coverage and low-inference reading comprehension (Beach, 2011; Polikoff & Struthers, 2013). Furthermore, teachers may believe that secondary students lack the capacity to engage in intellectually demanding disciplinary reading and reasoning activities that require students to analyze, evaluate, interpret, and synthesize information (Conklin, Hawley, Powell, & Ritter, 2010)

The Potential of PD to Support Curricular Reform

A serious problem facing literacy reform is thus how to transform traditional content area instruction dominated by teacher lecture into the kind of instruction that supports students in acquiring the complex reading and reasoning skills and processes envisioned in current literacy reform initiatives. Influenced by decades of research on teaching and learning (Bransford, Vye, Stevens, Kuhl, Schwartz, Bell, … others, 2005) and by recent studies of college and career

readiness (Achieve, Inc., 2007; ACT, Inc, 2006; ACT, Inc., 2009), current literacy reforms underscore the importance of instruction that situates the intellectual work with students as a means for fostering in-depth understanding and engagement with disciplinary learning (Bryk, Nagaoka, & Newmann, 2000; Fullan & Langworthy, 2013; King, Newmann, & Carmichael, 2009; Saye & SSIRC, 2013; Scardamalia & Bereiter, 2006). Such cognitively demanding literacy activities require both teachers and students to take on roles that are unfamiliar to them (Cobb & Jackson, 2011; Hall & Comperatore, 2014; Kober & Rentner, 2012; Litman & Greenleaf, 2014; Porter et al., 2011).

While attempts to increase cognitive challenge and engagement have included a variety of curricular and standards reforms, efforts to improve instruction through such initiatives have been inconsistent and generally disappointing (Berman & McLaughlin, 1978; Coburn, 2003; Darling-Hammond & McLaughlin, 1995; Hamilton, Stecher, & Yuan, 2008; Roderick, Easton, & Sebring, 2009; Rose, 2015). Research on the impact of top-down initiatives aimed at increasing the complexity of literacy learning opportunities offered to students at the classroom level suggests several sources of potential mismatches between the intellectually ambitious goals envisioned by such reforms and teacher enactment (Cobb & Jackson, 2011; Hamilton et al., 2008; Hill, 2001; Lefstein, 2008; McNeill & Pimentel, 2010; Osborne, 2007; Roderick et al., 2009; Smith, Hardman, Wall, & Mroz, 2004). Notable among these, traditional conceptions of knowledge, teaching, and learning may cause teachers to unconsciously adapt curricular innovations so that they conform to existing beliefs and practices (Gresalfi, Barnes, & Cross, 2012; Huberman, 1995; Remillard, 2005; Rogers, Cross, Gresalfi, Trauth-Nare, & Buck, 2011; Spillane, Reiser, & Reimer, 2002). In a case study drawn from England's National Literacy Strategy implementation, Lefstein (2008) observed that even when teachers taught directly from the prescribed materials, "curricular contents were

recontextualized into habitual classroom interactional genres, and the open questions that constituted the primary aim of the lesson were suppressed" (p. 704). Likewise, secondary science teachers implementing an educative disciplinary literacy curriculum simplified cognitively demanding tasks to align more closely with traditional classroom practices (McNeill & Pimentel, 2010). Thus, rather than encouraging students to grapple with complex texts and ideas in the service of building disciplinary knowledge and deepening understanding, there is ample evidence to suggest that in many classrooms, literacy practices targeted by curricular reforms will be assimilated into traditional fact orientations and instructional genres (Litman, Greenleaf, Charney-Sirott, & Sexton, 2012; Valencia, 2014).

In fact, it may be difficult for teachers to recognize that they do not have the knowledge or skill to teach to new literacy standards. Despite the wide gulf between current literacy practices and instruction mandated by the Common Core (Cobb & Jackson, 2011; Kober & Rentner, 2012; Porter et al., 2011), two-thirds of teachers responding to the recent ACT National Curriculum Survey (ACT, Inc., 2013b) anticipated making only slight adjustments to their current curriculum and instruction to align with the Standards. Professional development designed to support teachers in enacting reforms is often characterized by the very models of transmission pedagogy that they are attempting to transform (Anderson & Herr, 2011; Lefstein, 2008), thereby likely contributing to teachers' tendency to under-appreciate the goals and challenges of implementing literacy reform. Commenting on this mismatch, Lefstein (2008) noted: "This contradiction is not merely an issue of logical consistency: The professional development's hidden curriculum communicates ideas about teaching and learning that undermine its explicit curriculum" (p. 727).

For many teachers, implementing instruction that tightly integrates literacy and content learning in particular requires "re-understanding core issues related to teaching and learning"

(Zhang, 2010, p. 237) rather than the mere extension or elaboration of teachers' current practices (Cobb, Jackson, Smith, Sorum, & Henrick, 2013; Darling-Hammond & McLaughlin, 1995). In order to transform classroom practice, many argue that PD must go beyond fidelity to a prescribed set of procedures, instead supporting teachers to explore the complexities and problematic aspects of implementing new curricular and instructional approaches (Justice, Mashburn, Hamre, & Pianta, 2008; Penuel, Gallagher, et al., 2011; Smith et al., 2004; Van den Bergh, Ros, & Beijaard, 2014) in ways that produce knowledge transformation and transfer to new tasks that cannot be solved by previous routines (Bransford et al., 2005; Lai, McNaughton, Timperley, & Hsiao, 2009; Reznitskaya & Wilkinson, 2015; Supovitz & Turner, 2000; Zhang, Scardamalia, Reeve, & Messina, 2009).

Our study investigates the impact of a professional development model designed to support teachers in "re-understanding core issues related to teaching and learning" on students' opportunity to learn complex disciplinary reading and reasoning practices. Of particular interest, teachers who had participated in the Reading Apprenticeship PD had done so in years prior to the observational study reported here. Thus, the study also offers an opportunity to explore the enduring effects of such design-based PD on teacher practice and thereby, on students' opportunity to learn.

The Reading Apprenticeship Instructional and PD Model

To make sense of the contrasts that emerged between the two groups of teachers, it is necessary to briefly summarize the Reading Apprenticeship instructional framework and PD that were part of the shared experience for nearly half the teachers observed. Reading Apprenticeship is a model of academic literacy instruction designed to improve literacy skills and academic achievement for all students. Based on understandings of the close relationship between curricular reform and teacher professional development (Heller & Greenleaf, 2007), Reading Apprenticeship

components include both an instructional framework and associated PD model for secondary and post-secondary teachers across the academic subject areas. The Reading Apprenticeship instructional framework and PD models are products of extended collaborative design research processes, informed by sociocultural learning theory and research in language and literacy development (Greenleaf & Schoenbach, 2004; Schoenbach, Greenleaf, & Murphy, 2012). While predating current literacy reform efforts, Reading Apprenticeship is aligned with the principles of reform initiatives that specify advanced literacy skills and understandings critical for college and career readiness across the content areas, not just in English language arts. In particular, teachers across the subject areas learn how to build students' capacities to carry out close, intellectually engaged reading, make meaning, acquire academic and disciplinary language, read independently, and set personal goals for literacy development.

Guided by the instructional framework (see Schoenbach et al., 2012), reading instruction is integrated into subject area teaching, rather than being an instructional add-on or additional curriculum. Students are given extended opportunities to read with instructional support, both in assigned texts and in curriculum-related materials of choice, both during class time and as homework. Through an "apprenticeship" process, subject area teachers learn to explicitly teach students the tacit reasoning processes, strategies, and discourse rules that shape successful readers' and writers' work in their disciplines. Metacognitive instructional routines help students to clarify content, discuss the processes they use in reading and problem-solving, practice comprehension strategies in the context of meaningful learning, respond to and elaborate on content, engage in word learning strategies, write to learn and to consolidate learning, and make connections to other related texts.

Mirroring the instructional framework, Reading Apprenticeship PD has been designed to

transform teachers' understanding of their role in adolescent literacy development and build teachers' generative capacity for literacy instruction in the academic disciplines (Greenleaf & Schoenbach, 2004). The PD is inquiry-based, subject area focused, and designed to address teachers' conceptual understandings as well as practical implementation needs. Teachers participate in carefully designed inquiries to help them unlock their own disciplinary expertise in relation to literacy. They learn to identify the features of disciplinary texts that might present stumbling blocks to learners. In PD sessions, they learn and practice with classroom routines to make thinking processes visible, build student engagement, support student collaboration, and foster authentic discussion and problem solving around course texts. They learn to select texts for instruction and build content-linked text sets to offer a range of genres and challenge levels representative of their disciplines. Importantly, they explore and examine expectations of what their students can accomplish and learn new ways to support students' thinking and learning with academic materials. Teachers learn to attend to students' affective and identity issues, creating relevant and affectively safe learning opportunities that help students become better disposed to engage in academic tasks, discipline-based literacy practices, and inquiry, and to develop identities as resilient learners.

In contrast to a conception of teaching as fidelity to pre-existing instructional strategies, the model is based on an understanding that for practice to become truly responsive to the learner needs and varied contexts of teachers' work, teachers must become adaptive and generative in their use of specific practices (Gillis, 2014). By flexibly adapting Reading Apprenticeship ideas and practices to their specific circumstances, teachers' efforts focus on transforming their classrooms into engaging learning spaces where students participate actively and increasingly take on the intellectual work. Elsewhere we have provided a detailed description of Reading Apprenticeship PD (Greenleaf et al., 2011; Greenleaf & Schoenbach, 2004).

Research Questions

We offer Reading Apprenticeship as a "case of" professional development with the attributes we believe are required to build teacher capacity to address the ambitious new literacy standards. The following overarching question guided our research: How does teacher participation in highly-designed, inquiry-based PD focused on tightly integrating disciplinary literacy and content learning impact the opportunities they offer students to engage in reading and reasoning practices targeted by literacy reform efforts currently reshaping the landscape of public education? Specifically, we compared PD and comparison teachers on the following:

- *What opportunities do students have to work with text in observed lessons?*
- *What opportunities do students have to engage in tasks central to disciplinary reading and reasoning?*

The perception that literacy instruction competes with content learning is a significant barrier to literacy opportunity to learn. We therefore examined relationships between reading, reasoning, and content learning activities and tasks:

- *How are tasks assigned in the context of working with text different from tasks assigned when content is delivered by the teacher?*
- *How are various task opportunities to learn related to one another?*

Finally, because transferring ownership of learning to students through opportunities for social collaboration and scaffolding is essential in moving students toward independent academic performance (Lord, Prince, Stefanou, Stolk, & Chen, 2012; Paris & Paris, 2001), we also examined grouping structures as an important element of opportunity to learn:

- *How are different grouping structures allocated across lessons?*
- *Which activities and tasks are associated with particular grouping structures?*

Data and Methods

The data set used in the present analysis consisted of videotapes of 71 lessons taught by 34 teachers, grades 6-12, from 22 urban and suburban schools located in the West Coast or Midwest parts of the United States. Observations were conducted between October 2010 and June 2011. At this time, the draft CCSS had been released, but implementation was not yet expected (http://www.corestandards.org/standards-in-your-state/). The study's focus on disciplinary argumentation from multiple text sources aligned with the intellectually ambitious and integrated model of literacy embedded in the Standards. Observations thus reflect disciplinary literacy instruction immediately prior to implementation of the CCSS.

Sample Recruitment and Selection

This research took place in the context of a larger design-based research project. Teacher recruitment and selection were influenced by this broader research agenda. Teachers in both the Reading Apprenticeship ("PD group") and comparison groups were selected based on perceptions of good instructional practice, and as potential long-term partners in our collaborative design work. Research team members nominated teachers they believed to be effective and engaging teachers in their disciplines. We also solicited nominations for participants from researcher colleagues and district leadership in literacy, English language arts, social studies, and sciences. The teachers we observed taught a wide variety of students in diverse settings representative of schools across the nation as indicated by the percentage of students qualifying for free/reduced lunch in these classrooms, a proportion nearly identical to the national average (48% versus 50%). While these teachers demonstrated an unusual level of professionalism as evinced by a desire for professional growth and willingness to have researchers come into their classrooms, we believed that what we learned from them would inform our understanding of what might be needed to move otherwise

successful teaching practices to the level envisioned by the CCSS and other literacy reforms. Below we describe the recruitment and selection processes for the teachers in the PD and comparison groups. Characteristics of the teachers and lessons are shown in Table 1. Table 1 also compares characteristics of the 34 teachers to a nationally representative sample of teachers from 2011, the year of the study.

PD group. The 16 teachers in the PD group were known to the research team as members of an ongoing professional development network of middle and high school teachers (the Continuing Network) from West Coast urban and suburban communities who had previously participated in a 7-day Reading Apprenticeship professional development experience. We expected that these experienced Reading Apprenticeship teachers would provide extended opportunities for students to read with instructional support and we requested permission to observe their teaching with the aim of identifying features of instruction that were marked by high engagement and appeared to develop advanced comprehension skills. The years in which these teachers participated in the initial Reading Apprenticeship PD and the Continuing Network are shown in Table 2.

Comparison group. The 18 teachers in the comparison group were nominated by research team members and practitioners who had worked with the Midwest area schools and teachers. Team members nominated teachers they believed to be engaging in instruction designed to foster disciplinary literacies and/or who were reported to have good instructional rapport resulting in high student engagement. We also solicited teacher nominations from the district leadership in literacy, English language arts, social sciences, and sciences. In addition, because the sample of West Coast teachers included only two science teachers, we identified two additional science teachers in that area who had not participated in Reading Apprenticeship PD but were recommended by colleagues as strong teachers of science. These science teachers were included in the comparison group.

Video Data Collection Methods

The videotaping protocol focused on teacher talk and behavior. A single tripod-mounted camera was placed at the rear of the room and focused on the teacher, although students were also visible much of the time. In addition to capturing opportunities to learn that were the target of our research, this protocol standardized the videotaping across classrooms and minimized decision-making and time required of observers for setting up and monitoring video equipment (Jacobs, Hollingsworth, & Givvin, 2007).

Data Analysis Process

Coding Scheme

Our coding captured opportunities presented by teachers for students to engage in activities, tasks, and interactions related to the development of complex reading and reasoning skills and processes instantiated in current literacy reform efforts. While we recognize that different students take up opportunities to learn in different ways (Kurz et al., 2014), an extensive body of research has shown classroom opportunity to learn (operationalized as opportunities presented by the teacher to have strong effects on student learning, even after controlling for students' prior ability and academic performance (see Abedi & Herman, 2010). While OTL has been measured in a variety of ways, our analysis focused on *exposure*, the amount of time teachers actually implemented or enacted various activities and tasks (Smith, 2000). Although we did not directly assess quality of instruction, our focus on implementation of cognitively demanding disciplinary reading and reasoning tasks is a measure of teachers' expectations for student learning, an indicator of instructional quality (Kurz et al., 2014; Porter, 2002). Due to our definition of OTL, we utilized data collection techniques that were designed to capture opportunities presented by the teacher.

While literacy has been defined in myriad ways, our understanding of literacy derives from a

sociocultural notion of practice that emphasizes learning to be literate through participation in literacy practices characteristic of particular communities (Street, 2005). Because literacy practices become increasingly specialized throughout the school career, reflecting the broader activities that characterize the academic disciplines (Heller & Greenleaf, 2007; Lee & Spratley, 2010), our coding scheme was designed to capture opportunities for students to engage in activities central to historical, scientific, and literary reading, reasoning, and knowledge building. For this analysis, we examined three dimensions of videotaped lessons related to disciplinary literacy and content learning: 1. *Content Delivery*, 2. *Task*, and 3. *Grouping*. Below we provide definitions of the three dimensions. Definitions of individual codes are found in Table 3. Elsewhere we have provided the theoretical background for selecting and measuring these dimensions of instruction, along with detailed descriptions and exemplars for each code (Litman et al., 2015).

Content Delivery. This dimension refers to the mechanism by which students are taught content, both in the input phase that generally occurs at the beginning of an assignment and throughout, as students continue to work with lesson content. While we embrace a broad definition of text that includes discourse and various modes of media (Wade & Moje, 2000), the two codes in this dimension differentiate between content delivered by the teacher and content delivered through working with written text because for this study, we were primarily interested in the extent to which students rather than teachers were responsible for accessing and interpreting content.

Task. This dimension captures opportunities for students to engage in various literacy and content learning tasks. Following from our emphasis on practices that characterize the academic disciplines, the task dimension comprises three complex literacy tasks: argumentation, close reading, and cross-textual analysis. Two content learning codes distinguish broadly between tasks with a disciplinary knowledge focus and tasks with a fact acquisition focus characterized by lower

cognitive demand. The task dimension thus comprises five codes: argumentation, close reading, cross-textual analysis, disciplinary knowledge focus, and fact acquisition.

Grouping. The grouping dimension is designed to capture opportunities for different kinds of interactions and support for learning. Grouping codes focus on how students are receiving input or engaging in an activity or task, not on seating arrangement. For example, individual silent reading is coded as *Individual*, even if students are seated at a table group. The grouping dimension includes four codes: individual, pairs, small group, and whole class instruction.

Coding Protocol

Because we operationalized OTL as the amount of time teachers enacted various activities and tasks, our coding concentrated on duration. Total lesson duration was derived by marking the beginning and ending of each lesson, defined by the bell schedule. All subsequent coding occurred within the marked lesson boundaries. We coded the duration of each activity, task, and interaction independently. In addition to yielding absolute durations, this enabled us to calculate percentages for comparing observations of varying lengths (Garnier, Lemmens, Druker, & Roth, 2011). Because classrooms are complex environments where multiple activities, task, and interactions often occur simultaneously, the majority of video footage was multiply coded. In addition, some activities, such as housekeeping, were not coded to any activity, task, or interaction. Consequently, percent time within a dimension may not add up to 100%.

Coder training and reliability. Video data were coded by four researchers, all of whom had classroom teaching experience: two graduate students with expertise in learning sciences located at the Midwest site and two literacy research and professional development staff located at the West Coast site. Researchers coded directly from video footage using NVivo9 qualitative analysis software (QSR International), without transcripts of the lessons. Training and support for coding

was provided by senior research staff. To insure accurate and reliable coding, we held a series of four trainings that employed a Frame of Reference model based on practice, discussions between coders, and feedback from trainers (Melchers, Lienhardt, Von Aarburg, & Kleinmann, 2011). Once we established acceptable inter-rater reliability among the four coders, each video was assigned and coded by a single coder. To insure and maintain good inter-rater reliability, two or three additional videotapes were coded and discussed by intra- and cross-site pairs of coders throughout the coding phase. Percentage agreement was acceptable (above 75%) for all codes.

Data Analysis

Because both the length and the number of observed lessons differed for different teachers, to compare opportunities to learn offered by PD and comparison teachers, we transformed duration codes to "mean percent of class time" variables. As a first step to computing group means, we computed percent of class time variables for individual teachers. For example, for calculating percent of class time a teacher allocated to working with text, we divided the total time coded to working with text for that teacher by total duration for that teacher. In the next step, to compare how much time teachers in the PD and comparison groups allocated to each coded activity, task, and interaction, we used the per teacher percent of class time variables to calculate mean percent of class time variables separately for the PD and comparison groups.

Independent samples t-tests were conducted to compare mean percent class time for PD and comparison allocated to content delivery, task, and grouping variables.

Results

We coded a total of 3,813 minutes of instruction, including 1,944 minutes in PD classrooms and 1,869 in comparison classrooms. Below we report findings from of the analysis of literacy opportunity to learn in these classrooms in two sections: (1) Student opportunity to learn related to

content delivery, task, and grouping, and (2) relationships among these three dimensions of opportunity to learn.

Opportunity to Learn Related to Content Delivery, Task, and Grouping

Descriptive statistics for content delivery, task, and grouping variables are shown in Table 4. Results of independent samples t-tests comparing PD and comparison groups on these variables are shown in Table 5.

Content delivery mode. As shown in Table 4, nearly every teacher lectured and explained content and allocated time for working with text. Nonetheless, we found strong group differences in the mean percent of class time allocated to the two content delivery modes. These differences reached statistical significance. PD teachers spent significantly less time delivering content on average than comparison teachers (12% versus 27%, $t(28) = 2.59$, $p = .015$); and significantly more time working with text than comparison teachers (65% versus 47%, $t(32) = 2.37$, $p = .024$).

Task. Time allocated to various tasks differed by group, with differences greatest for literacy tasks. As shown in Table 4, PD teachers allocated nearly twice as much time to argumentation (13% versus 8%), over four times as much time to close reading (35% versus 8%), and three times as much time to cross-textual analysis (9% versus 3%) as comparison teachers. Differences in time allocated to close reading were statistical significant (t (20) = 3.16, $p < .01$). We also looked at the kinds of content learning tasks students were asked to do. On average, PD teachers allocated somewhat less time to tasks with a disciplinary knowledge (46% versus 58%) and fact acquisition (14% versus 20%) focus compared with comparison teachers.

Grouping. As shown in Table 4, PD teachers allocated class time more evenly across groupings compared with comparison teachers. In particular, PD teachers allocated less time to whole class instruction (44% versus 56%) and more time to working in pairs (17% versus 6%) than

comparison teachers. Differences in time allocated to working in pairs were statistical significant (t (32) = 2.13, p = .04).

Relationships Among Dimensions of Opportunity to Learn

Relationships Between Content Delivery and Task OTL

Table 6 shows the various tasks students were asked to perform when content was delivered by the teacher and through working with text. Task OTL was related to both content delivery mode and treatment group.

Content delivered by the teacher. As illustrated by Figure 1, for both PD and comparison groups, teacher delivery of content was associated with high levels of disciplinary knowledge (47% and 61%) and fact acquisition (22% and 32%) tasks and low levels of reading and reasoning tasks.

Working with text. Not surprisingly, in both PD and comparison classrooms, argumentation, close reading, and cross-textual analysis tasks occurred for a greater percentage of time when students worked with text than when teachers delivered content. Nonetheless, working with text was no guarantee of a literacy focus. As shown in Figure 2, working with text in comparison classrooms was largely focused on content learning and only rarely engaged students in reading and reasoning tasks. In contrast, in PD classrooms as compared with comparison classrooms, in addition to building content knowledge, working with text was also associated with high percentages of argumentation (18% for PD versus 11% for comparison), close reading (44% for PD versus 15% for comparison), and cross-textual analysis (13% for PD versus 4% for comparison). Perhaps more surprising, both PD and comparison teachers allocated a greater percentage of time to tasks with a disciplinary knowledge focus (59% versus 47% for PD teachers; 71% versus 61% for comparison teachers) and less time to fact acquisition (14% versus 22% for PD

teachers; and 11% versus 32% for comparison teachers) when students worked with text than when teachers delivered content.

Relationships Among Literacy and Content Learning OTL

Teachers' perceptions that literacy instruction competes with content learning may be a significant barrier to literacy opportunity to learn. We therefore examined relationships between reading, reasoning, and content learning tasks. Our analysis was based on overlap among tasks for video footage that was coded to multiple tasks.

Disciplinary focus of reading and reasoning. As shown in Figure 3, the literacy tasks of argumentation, close reading, and cross-textual analysis were generally associated with a higher than average disciplinary knowledge focus in both PD and comparison classrooms. While 46% of class time overall was allocated to tasks with a disciplinary knowledge focus by PD teachers, argumentation had a disciplinary knowledge focus 59% of the time, close reading had a disciplinary knowledge focus 52% of the time, and cross-textual analysis had a disciplinary knowledge focus 84% of the time. In comparison classrooms, argumentation and cross-textual analysis—though rare (see descriptive statistics, Table 4)—were likewise associated with a higher than average disciplinary knowledge focus. While comparison teachers allocated 58% of class time overall to tasks with a disciplinary knowledge focus, argumentation was co-coded with disciplinary knowledge focus 60% of the time, and cross-textual analysis was co-coded with disciplinary knowledge focus 100% of the time. However, close reading had a disciplinary knowledge focus only 37% of the time.

Reading and reasoning in the service of building disciplinary knowledge. Because we were are interested in the extent to which reading and reasoning were integrated into content learning in these classrooms, we also examined the percent of time tasks with a disciplinary

knowledge focus were co-coded with various literacy tasks (for example, the percentage of the 63 minutes, on average, PD teachers allocated to disciplinary knowledge focus that was also coded to close reading). As shown in Figure 4, PD teachers allocated a higher percentage of time to disciplinary knowledge focus activities that also engaged students in reading and reasoning, compared with comparison teachers. Disciplinary knowledge focus in PD classrooms co-occurred with argumentation 18% of the time, with close reading 35% of the time, and with cross-textual analysis 12% of the time. These opportunities were rare for students in comparison classrooms, where tasks with a disciplinary knowledge focus co-occurred with argumentation 9% of the time, close reading 9% of the time, and cross-textual analysis 6% of the time.

Disciplinary knowledge focus and fact acquisition. Comparison teachers allocated somewhat higher percentages of time to both disciplinary knowledge focus and fact acquisition tasks. To better understand opportunities presented by PD and comparison teachers for students to engage in content learning tasks with high cognitive demand and those focused on more rote skills (Polikoff & Struthers, 2013), we also examined relationships between disciplinary knowledge focus and fact acquisition. In our coding, disciplinary knowledge focus identifies tasks that engage students with overarching frameworks, concepts, and/or themes of the discipline. Fact acquisition identifies tasks that focus on testing understanding, recall, or rote learning with little or no opportunity for sense-making. Segments of lessons focused on overarching frameworks, concepts, and/or themes of the discipline that at the same time offered little or no opportunity for student sense-making were coded as both disciplinary knowledge focus and fact acquisition. Disciplinary knowledge focus was co-coded with fact acquisition 2% of the time in PD classrooms and 18% of the time in comparison classrooms, indicating that comparison teachers taught disciplinary concepts through rote learning tasks more frequently than PD teachers. To compare the percentage of time

allocated to disciplinary knowledge focus tasks characterized by higher cognitive demand in PD and comparison classrooms, we examined time allocated to tasks with a disciplinary knowledge focus, eliminating video footage where disciplinary knowledge focus was co-coded with fact acquisition and thus assumed the form of rote learning. Looking only at disciplinary knowledge focus tasks that offered opportunities for student sense-making, we found near-parity in the percent of class time allocated to activities with a disciplinary knowledge focus by PD (45%) and comparison teachers (49%).

Reading and reasoning. Reasoning tasks—argumentation and cross-textual analysis—were more likely to involve reading in PD than comparison classrooms. Argumentation was co-coded with close reading 27% of the time in PD classrooms and 13% of the time in comparison classrooms. Similarly, while 37% of time allocated to cross-textual analysis was co-coded with close reading in PD classrooms, cross-textual analysis never co-occurred with close reading in comparison lessons.

To deepen our understanding of the relationship between reading and reasoning tasks, we spread our analysis to occasions when reading and reasoning tasks co-occurred in the same lesson, not just simultaneously. This may be a more accurate measure of relationships between reading, argumentation, and cross-textual analysis in these lessons, reflecting a "zigzagged weave" in which initial understandings of a single text "may be referenced and revised in relation to the constructed meaning of subsequent texts" with the support of linking activities, such as argumentation tasks (Afflerbach & Cho, 2009, p. 79). When we included tasks that occurred sequentially as well as simultaneously, PD teachers were still more likely than comparison teachers to integrate reading and reasoning tasks, and group differences were stronger than in the original analysis of simultaneous co-occurrence. Specifically, 38% of PD teachers provided opportunities for students

to engage in argumentation with close reading and 31% provided opportunities for cross-textual analysis with close reading. Furthermore, 31% of PD teachers taught lessons with all three complex reading and reasoning tasks—argumentation, close reading, and cross-textual analysis—and thus engaged students in text-based argumentation from multiple text sources—arguably the zenith of disciplinary literacies (e.g., Wiley & Voss, 1999). In contrast, only 11% of comparison teachers provided opportunities for students to engage in argumentation with close reading and only 6% (one teacher) provided opportunities for cross-textual analysis with close reading. No comparison teacher taught a lesson that included all three of these tasks.

Relationships Between Grouping Configurations and Content Delivery and Task OTL

Finally, we compared the percent of class time PD and comparison teachers allocated to various content delivery modes and tasks when students worked in different grouping configurations. Results are shown in Table 7. In general, differences between PD and comparison teachers were most pronounced for whole class instruction.

Grouping configuration and content delivery mode. PD teachers allocated less whole class time to delivering content (29% versus 51%), and more whole class time to working with text (43% versus 30%) than comparison teachers. Students in PD classrooms also worked with text for a greater percent of time individually (75% versus 63%) and in small groups (98% versus 76%) compared with students in comparison classrooms. Both PD and comparison teachers allocated a high percent of pair work to working with text (78% and 79%, respectively).

Grouping configuration and task. We also found differences between PD and comparison classrooms for tasks students were asked to perform in various groupings. For example, whole class instruction was strongly associated with content learning in both PD and comparison classrooms. However, while comparison teachers used whole class instruction almost exclusively for tasks with

a disciplinary knowledge (52%) and fact acquisition (25%) focus, PD teachers—who likewise allocated considerable whole class time to disciplinary knowledge focus (51%) and, to a lesser extent, fact acquisition (15%)—also allocated time during whole class instruction to literacy tasks. Specifically, PD teachers allocated 24% of whole class time to close reading, compared with 7% for comparison teachers. While rarer, PD teachers also allocated three times more whole class instruction to argumentation (15% versus 5 %), and five times more to cross-textual analysis (5% versus 1%) compared with comparison teachers. Similarly, PD teachers allocated a greater percent of individual time to close reading (37% versus 12%) and argumentation (6% versus 3%). Although rare overall, the highest percent of cross-textual analysis occurred in peer-led groups, when PD students worked in small groups (28% of the time) and comparison students worked in pairs (9% of the time).

Discussion

Our study found consistent differences between PD and comparison groups in opportunities teachers provided for students to engage in the complex reading and reasoning skills and processes instantiated in current literacy reform initiatives. This was unexpected but heartening. It had been some years since many of the PD teachers had participated in Reading Apprenticeship PD, yet they continued to offer opportunities to learn that reflected core elements of the Reading Apprenticeship instructional framework—(1) to engage students with inherently challenging disciplinary reading and reasoning tasks, (2) to deeply integrate these disciplinary literacy learning opportunities with content learning, and (3) to transfer ownership of making meaning to students through opportunities for social collaboration and scaffolding from both teachers and peers. Our findings thus have implications both for student literacy learning and for the kind of professional development that

supports literacy OTL. Below we discuss our findings in relationship to the potential implications for student literacy learning.

Differential Opportunities for Student Literacy Learning

Reading and reasoning. PD teachers spent significantly less time delivering content and significantly more time working with text than comparison teachers. PD teachers allocated nearly twice as much time to argumentation, over four times as much time to close reading, and three times as much time to cross-textual analysis as comparison teachers. In addition, PD lessons more frequently linked reading with reasoning tasks. Despite our small sample size, these differences reached statistical significance for teacher delivery of content, working with text, and close reading.

Challenging the perception that literacy and content learning are in competition, in classrooms where teachers had participated in Reading Apprenticeship PD focused on tightly integrating literacy and content learning, reading and reasoning tasks were associated with an increased focus on disciplinary knowledge. In comparison classrooms, in contrast, close reading was associated with a decreased focus on disciplinary knowledge. Comparison classrooms emphasized content acquisition over literacy skills and processes, as indicated by the notably greater percent of time allocated to fact acquisition and disciplinary knowledge focus tasks compared with literacy tasks. Given this emphasis, it is noteworthy that close reading in these classrooms often lacked a disciplinary focus. This suggests that comparison teachers may have had difficulty integrating literacy and content learning—a finding that adds weight to the imperative of the research reported here. Decades of research on secondary reading demonstrates that reading in secondary classrooms involves fact acquisition or basic reading comprehension (Kiuhara, Graham, & Hawken, 2009), rather than engaging students in meaning making to learn from texts. The prevalence of close reading and the frequent disciplinary focus of close reading tasks in PD

classrooms thus represents a significant shift in the culture of secondary literacy instruction, and an uptake of the principles explicitly fostered in Reading Apprenticeship PD.

The fact that PD teachers provided more opportunities for argumentation, which occupies a "special place" in the CCSS (p. 24), is also noteworthy given that the Reading Apprenticeship framework and PD did not explicitly address argumentation at the time these teachers participated in the PD. This suggests that Reading Apprenticeship's focus on close reading of disciplinary texts may have served as a gateway to argumentation, a conjecture supported by Toulmin's (1958) model in which arguments originate with data, then move to claims (Fulkerson, 1996). Similarly, Hillocks (2010) describes a process through which students' close reading forms the basis for disciplinary argumentation: "When the data are curious, do not fit preconceptions, they give rise to questions and genuine thinking. Attempts to answer these questions become hypotheses, possible future thesis statements that we may eventually write about after further investigation" (p. 26).

In a previous analysis of these data, we suggested that argumentation could potentially serve as a lever to engage students in actively making sense of text (Litman et al., 2015). However, findings from the current study potentially challenge the directionality of this hypothesis. While argumentation in PD classrooms was often partnered with close reading, in comparison classrooms argumentation tasks focused on content and were only rarely associated with other literacy tasks. Thus it appears that the high levels of intellectually engaged reading in PD classrooms served as a lever for the increased argumentation and cross-textual analysis observed in PD classrooms. It may be that in classrooms that provide opportunities for such engaged close reading, teachers are more likely to assign evidence-based reasoning tasks because this close reading allows students to "become engaged by ideas and to develop as thoughtful, intellectually adventurous people" (Rose, 2015, para. 9). In addition, in PD group classrooms, collaborative meaning-making routines—a

central focus of the Reading Apprenticeship framework and PD—may have supported the enactment of *interactive argumentation* as students engaged in interpretation and argumentation processes to unearth and evaluate possible meanings of challenging text (Chinn & Anderson, 1998). While we lack the data that would allow us to determine whether argumentation begets close reading and cross-textual analysis or whether the opposite is the case, we do know this: these three critical elements work together.

Support for growing independence. Independent, self-directed learning is a major goal of college and career readiness standards and a pillar of contemporary education in general (Paris & Paris, 2001; Zimmerman, 1990). Social collaboration and scaffolding are essential in transferring ownership of learning to students (Lord et al., 2012; Paris & Paris, 2001). Our findings suggest that students in PD classrooms may have greater opportunities for autonomy and self-regulation than students in comparison classrooms and receive greater scaffolding for moving toward independent academic performance, in concert with the Reading Apprenticeship framework. Specifically, students in PD classrooms spent significantly less time listening to teachers deliver content compared with students in comparison classrooms. In addition, students in PD classrooms spent more time working individually and in peer-directed groups and less time working as a whole class compared with students in PD classrooms. Individual and peer-directed activities overwhelmingly involved working with text in both PD and comparison classrooms. However, over 43% of whole class instruction in PD classrooms was also devoted to working with text, while whole class instruction in comparison classrooms more frequently involved teacher delivery of content. Thus, while whole class instruction in PD classrooms often served text-based learning, in comparison classrooms, whole class instruction more frequently—and more typically (ACT, Inc, 2006;

O'Brien, Stewart, & Moje, 1995; Pearson, Moje, & Greenleaf, 2010; Smith & Ochoa-Angrino, 2012)—involved listening to the teacher lecture and explain content.

In addition to greater opportunity for independent, self-directed learning, our results hint that students in the PD group may simultaneously have more teacher support for literacy learning. In particular, PD teachers provided more whole class instruction for argumentation, close reading, and cross-textual analysis tasks than comparison teachers. Furthermore, a subsequent examination of individual lessons revealed that individual and peer-directed groups in PD group lessons were frequently punctuated by whole class text-based interaction in a recursive cycle of individual, peer-directed, and whole class instruction. In contrast, peer-directed groups in comparison classrooms were of longer duration and less frequently punctuated by teacher-facilitated, whole class instruction. A wealth of research demonstrates that productive instructionally focused conversation and argumentation is difficult to achieve and maintain and that simply putting students together is not enough (e.g. Kuhn, 2015; Murphy, Wilkinson, & Soter, 2010; Schwarz & Asterhan, 2010; Soter et al., 2008), suggesting that peer-directed learning may benefit from the type of intermittent support found in many PD classrooms. While our analysis revealed interesting differences between PD and comparison lessons related to grouping structures, it is important to recognize that our coding did not include the level of detail that would allow us to examine the kinds of interactions that occurred within various groupings that affect participation and learning (Applebee, Langer, Nystrand, & Gamoran, 2003; Gresalfi et al., 2012).

Limitations of the Study

While a quasi-experimental design offered a tool to investigate whether participation in design-based PD was related to differences between these groups of teachers, findings are subject to the methodological and interpretive limitations of a post-test-only design. Lack of randomization

and the absence of pretest measurements make it difficult to know whether observed differences are due to teachers' prior experiences of Reading Apprenticeship PD or to confounding variables, such as selection bias. Some reassurance is provided by the fact that literacy practices of the West Coast science teachers who were members of the comparison group appeared to more closely resemble the Midwest teachers than the West Coast Reading Apprenticeship cohort. In addition, our study results are bolstered by previous randomized controlled studies showing that participation in Reading Apprenticeship PD can have large and significant impacts on the classroom practices of subject area teachers, and therefore their students' learning and achievement (Greenleaf et al., 2011).

Conclusions

While all 34 teachers observed in this study were selected on the basis of educational leaders' perceptions of best practice, teachers who participated in Reading Apprenticeship PD focused on integrating disciplinary literacy with content learning provided students with significantly more opportunities and support for disciplinary reading and reasoning. Differences between PD and comparison teachers suggest that professional development can potentially increase literacy learning opportunities presented to students. At the same time, our findings also suggest that the kinds of preparation typically offered to teachers may not be adequate to shift the pervasive emphasis on content mastery above disciplinary reading and reasoning processes (ACT, Inc., 2013c; Porter et al., 2011), even among teachers who are otherwise skilled in fostering subject area learning.

Integrating literacy into content area classrooms, in particular, may depend on providing the highest quality PD to counter ubiquitous content delivery practices (Cobb et al., 2013; Wilson, 2013). Research indicates that secondary teachers typically undervalue the teaching of reading and

reasoning processes (ACT, Inc., 2013a, 2013c). Findings from the ACT National Curriculum Survey (2009; 2013b) suggest that high schools are not focused on teaching the essential literacy knowledge and skills needed for college and career readiness. Despite decades of research and reform aimed at increasing time devoted to teaching adolescent literacy skills (Biancarosa & Snow, 2004), explicit instruction in academic and disciplinary reading practices is still the exception rather than the rule (ACT, Inc., 2009, 2013a). Observational studies confirm that literacy instruction is rare, even in English language arts (Grossman et al., 2010). This suggests that many teachers need help to re-envision and reshape their curriculum and instruction to support the skills and dispositions instantiated in influential literacy reforms such as the Common Core State Standards.

Implications for the Quality of Teacher Professional Development Necessary to Support Disciplinary Literacy Reforms

There is general agreement that teacher PD is essential for implementing literacy reform. For example, a study of progress in implementing the CCSS found that the vast majority of states either required or expected districts to provide teacher PD to support implementation of the Standards (Kober & Rentner, 2012). Nonetheless, changing teachers' knowledge, beliefs, and practices is a challenging undertaking, particularly in relation to pedagogy aimed at integrating literacy and content learning (Cobb et al., 2013; Wilson, 2013) and increasing student participation in the intellectual work of learning (Desimone et al., 2013; Justice et al., 2008; Lefstein, 2008; Osborne, 2007; Smith et al., 2004). How then to transform traditional forms of instruction in which teachers convey and test students' retention of information into active, inquiry-based, learning opportunities?

While pedagogical repertoire matters, building teachers' deep understandings of how students learn particular subject matter through ongoing inquiries into literacy tasks, student work, and the like is more effective than PD focused on teaching technique alone (Rose, 2015). Research has

shown that PD models that focus directly on pedagogical content knowledge (Shulman, 1986, 1987), helping teachers better understand both what they teach and how students acquire specific content knowledge and skill through analyzing student thinking, examining cases of teaching and learning, and reflecting on and critiquing one's own and others' teaching, develop teachers' pedagogical content knowledge and have a positive impact on both subject area and literacy learning (Abell, 2008; Greenleaf, Litman, et al., 2011; Guskey & Yoon, 2009; Kennedy, 1998; Loucks-Horsley & Matsumoto, 1999; Reed, 2009; van Driel, Beijaard, & Verloop, 2001). Furthermore, where professional development leads to increased student achievement, PD is invariably centered directly on pedagogical content knowledge (Guskey & Yoon, 2009; Kennedy, 1998).

These principles of effective professional development are especially salient in relation to pedagogy aimed at increasing student participation in the intellectual work of learning (Desimone et al., 2013; Justice et al., 2008; Lefstein, 2008; Osborne, 2007; Penuel, Fishman, Yamaguchi, & Gallagher, 2007; Smith et al., 2004). A study of factors influencing the implementation and sustainability of federally funded educational innovations dating from the 1950's and 60's found that initiatives that promoted teacher change by actively engaging teachers in integrating reform strategies with current classroom practices were more likely to be successful than projects that were overly planned or prescribed (Berman & McLaughlin, 1978). Furthermore, ambitious reform efforts requiring significant change in teacher practice were *more likely* to succeed than innovations of more limited scope. In fact, the more effort these reforms required of teachers, the more likely teachers were to respond positively. According to Berman & McLaughlin (1978),

> …our data indicate that teachers rise to challenges. Ambitious and demanding innovations seem more likely to elicit the commitment of teachers than routine projects. This is so in part

> because these projects appeal to the teachers' professionalism; that is, we believe a primary motivation for teachers to undertake the extra work and disruption of attempting to change is the belief that they will become 'better' teachers and that their students will benefit (p. 25).

While these understandings originated over 40 years ago and have subsequently generated a rich body of evidence on effective teacher PD (see Desimone, 2009), the reality is that many teacher PD efforts continue to focus on techniques and prescriptions rather than on helping teachers better understand what they teach and how students acquire specific content knowledge and skill. Furthermore, a recent exchange in the pages of *Educational Researcher* over the kind of PD needed to help teachers implement literacy reform demonstrates that the issue is far from resolved (Anderson & Herr, 2011; Bausmith & Barry, 2011). Referencing scale-up pressures related to implementing the CCSS, Bausmith and Barry (2011) challenge the efficacy of efforts to translate the extensive research base on pedagogical content knowledge into PD methods, concluding that "it is likely because these concepts are complex and take time to implement, that a broad scale-up of professional development of this kind to teachers nationally would present challenges" (p. 176). They propose an alternative model of PD focused on building pedagogical content knowledge through a library of online videos demonstrating expert instruction aligned with the CCSS. Yet the rationale that Bausmith and Barry (2011) cite in support of their proposal—i.e., that teachers may not recognize differences between standards and their own practice—seems to contradict this approach. Without the benefit of PD that encourages "re-understanding core issues related to teaching and learning" (Zhang, 2010, p. 237), experience suggests that it is likely that teachers will perceive little difference between the instruction instantiated in the expert videos and their own instruction (Coburn, 2003; Hill, 2001).

Nonetheless, scale-up pressures for implementing literacy reform that Bausmith and Barry (2011) cite are real. In a 2013 survey of American Federation of Teachers members, while 78% of the teachers said they have received training related to the CCSS, fewer than half said that training adequately prepared them to teach to the new standards (AFT, 2013). Furthermore, limited resources have typically been the primary limitation to providing support for implementing standards-based reforms (Hamilton et al., 2008), and the majority of states that adopted the CCSS cite funding as a major challenge in implementing the Standards (Kober & Rentner, 2012). The elephant in the room of this debate is thus not the efficacy, but the resources and will to provide PD with the power to transform traditional forms of instruction into active, engaged literacy learning opportunities. Thus implementing and sustaining the vision of literacy reform requires a new model of PD that is both inquiry-based and efficient.

Based on our findings, and the enduring effect it seems to have had on teachers' generative practice, we believe the Reading Apprenticeship PD experienced by teachers in this study provides one model of the type of PD needed to promote teacher learning. Using collaborative, metacognitive inquiry as a means for learning—for teachers and for their students—the inquiry designs for teacher learning and collegial team work that are the foundation of Reading Apprenticeship PD aim to build teachers' capacity and willingness to engage with students in collaborative meaning-making, problem-solving, and disciplinary reasoning during ongoing instruction with course readings (Greenleaf, Brown, & Litman, 2004; Greenleaf & Schoenbach, 2004). An iterative cycle of PD, classroom implementation, and reflection provides the kinds of learning opportunities necessary to integrate new knowledge into practice (Penuel et al., 2007) and to foster teachers' adaptive expertise (Bransford et al., 2005; Lai et al., 2009), honing teachers' perceptions of the possibilities in the texts and in their students, and building teacher capacity to

surface and model effective ways to address comprehension problems that arise as the varied learners in the classroom interact with course materials. While inquiry experiences for teachers are central, in recognition of the many demands on teachers' time and attention, the model is tightly and strategically focused to work as efficiently as possible to develop teacher capacities (Greenleaf & Schoenbach, 2004).

Thus, we suggest that in order to provide the kind of powerful and transformative learning opportunities for teachers that will make a difference in student learning opportunities and achievement, PD should be intentionally designed to:

- Foster active and collaborative inquiry into learning tasks and processes;
- Provide experiences for teachers of the instruction and pedagogies it is meant to foster;
- Explore and interpret student performance during and on learning tasks;
- Draw on, integrate and build teachers' subject matter knowledge and expertise;
- Assume and build teacher capacity to flexibly adapt ideas and practices to their specific circumstances; and
- Invite ongoing reflection on teaching and learning.

Through such generative, design-based PD, teachers gain enduring professional insights to guide their instruction over time and the capacity to flexibly and adaptably respond to the varied learning needs of their diverse students during the dynamic and ongoing flow of teaching (Gutiérrez & Penuel, 2014; Penuel, Fishman, Cheng, & Sabelli, 2011; Voogt et al., 2015). This is the kind of expertise we suggest will be required to address the spirit, as well as the letter of the new standards, if we are to raise the learning and achievement and life chances of all students.

This study was motivated by the need for continuing research on the kinds of professional development experiences that support teachers in providing instruction that fosters students' in-

depth understanding and engagement with literary and learning. While we acknowledge that "going to scale with effective PD for the entire teacher workforce of 3.7 million will require more research" (Wilson, 2013, p. 312), it is equally important to recognize that a growing body of knowledge points to the kind of PD required to support the intellectually ambitious literacy goals of educational reform efforts such as the CCSS. Indeed, even researchers who argue that teacher learning is affected by a multitude of individual and contextual factors acknowledge that "there are generalizations that we should be able to make about the way professional learning activities relate to teacher learning that are true across different teachers and different school contexts" (Opfer & Pedder, 2011, p. 394). Thus, while additional research and research designs are needed to help determine how to best support teachers (Hill, Beisiegel, & Jacob, 2013), the *will* to provide the kind of PD that is already known to be capable of transforming teachers' beliefs, knowledge, and practices related to literacy teaching and learning is a major barrier to meaningful literacy reform (Darling-Hammond & McLaughlin, 1995). We believe making headway at the scale necessary to provide the kind of literacy instruction envisioned in recent reforms to all students will necessitate providing all teachers the kind of PD experience that has an enduring power to transform classroom instruction in our nation's secondary subject area classrooms. As studies of subject area teaching and school reform in middle and high school classrooms have long demonstrated, to proceed without such transformative learning opportunities for teachers will be a guarantee of failure (Cobb et al., 2013; Gutiérrez & Penuel, 2014; Knapp, 1997; Penuel, Fishman, et al., 2011; Rose, 2015).

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Table 1. Teacher Demographics

Demographic Variable	Categories	PD Group (N=16)		Comparison Group (N=18)		Nationally Representative Sample
		N	%	N	%	%
Gender						
	Female	14	88	12	67	65
	Male	2	13	6	33	35
Total years teaching						
	≤ 5 years	1	7	4	27	26
	6-14 years	8	53	10	67	32
	>15 years	6	40	1	7	40
Number with Master's degree						
	Master's degree	11	73	13	87	55
Teaching certification						
	None	0	0	3	20	16
	Elementary[2,3]	3	20	6	40	--
	Single subject	13	87	6	40	--
Subject(s) taught/observed[4]						
	ELA	8	50	7	39	40
	History	7	44	5	28	28
	Science	2	13	7	39	32
Grade(s) taught/observed[5]						
	6-8	6	36	7	39	49
	9-12	11	69	13	72	51
Number lessons observed						
	1-2	12	75	13	72	--
	3-5	4	25	5	28	--

Note. Demographic characteristics of nationally representative sample based on 2011 statistics from Feistritzer (2011), Goldring, Gray, & Bitterman (2013) and U.S. Department of Education, National Center for Education Statistics (2013)
Note. Data are missing for total years teaching, degree, and certifications for one teacher in the PD group and three teachers in the comparison group. Consequently, percentages for these three variables are based on N's of 15 for the PD group and 15 for the comparison group. All other percentages are based on N's of 16 for the PD group and 18 for the comparison group.

[2] In the Midwest state where the study was conducted, Type 03 (elementary) teaching certificates authorize the holder to teach grades K-9. In the Western state where the study was conducted, Elementary (Multiple Subject) Teaching Credentials authorize the holder to teach in any self-contained, core, or team teaching classroom.
[3] One PD teacher held both an elementary/multiple subject and single subject credential.
[4] One PD and one comparison teacher were observed teaching both ELA and History.
[5] Four PD and two comparison teachers were observed teaching more than one grade.

Table 2. PD Teachers' Participation in Reading Apprenticeship Professional Development and Continuing Network

Initial [Redacted] PD		
	N	%
Before 2005	4	25
2005-2006	1	6
2006-2007	1	6
2007-2008	4	25
2008-2009	3	19
2009-2010	2	13
2010-2011	1	6
Number years participation in continuing network		
0	1	6
1	6	38
2	3	19
3	2	13
≥4	4	25

Table 3. Code Definitions

Content Delivery Dimension.
1. *Teacher.* Content is delivered through teacher lecture, explanation, or PowerPoint, in which the teacher has done the work of understanding, organizing, and delivering material to students. This mode of content delivery may involve some student interaction around presented material, but the primary focus is on teacher-delivered content.
2. *Working with text*. Content is delivered through textual sources. This code is used when students work with text, individually or collaboratively, as a source of curriculum content. *Text* is defined broadly to include reading a wide range of materials, including graphic representations, from a wide range of sources, including computer screens, not just connected text and traditional print material. *Working with text* is distinguished from other Content Delivery codes in that it requires students to access the content provided in textual sources.
Task Dimension.
1. Argumentation. Based on Toulmin (1958), we define argumentation tasks as tasks that ask students to make a claim or assertion that is supported by evidence that connects to the claim in a principled way. This definition recognizes that argument is shaped by the discourses of particular communities and consequently accommodates a wide range of tasks, from reason-giving interpretations of literature to modeling and explanation tasks in science. Argumentation tasks are framed as inquiry into multiple possibilities and/or viewpoints. Tasks may or may not be explicitly identified as "argumentation" by the teacher.
2. Close reading. Close reading tasks are characterized by approaching texts to understand and build meaning rather than only to find factual information. While other definitions of close reading have been advanced, in our coding we defined close reading as active engagement in meaning making with texts. These tasks ask students to engage in interpretation and argumentation processes to unearth and evaluate possible meanings at the local and global levels (Norris & Phillips, 2003), individually or collaboratively.
3. Cross-textual analysis. These tasks ask students to synthesize, evaluate, or critique information from multiple texts.
4. *Disciplinary knowledge focus.* Disciplinary knowledge focus tasks ask students to engage with overarching frameworks, concepts, and/or themes of the discipline.
5. *Fact acquisition*. Fact acquisition tasks focus on testing understanding, recall, or rote learning with little or no opportunity for sense-making. While they may involve brief instructional exchanges between teacher and students, the overwhelming focus is on learning facts/information and right answers.
Grouping Dimension
1. *Individual*. Students work independently.
2. *Pairs*. Students work in pairs.
3. *Small group.* Students are divided into small groups that they generally run themselves.
4. *Whole class*. Teacher interacts with the whole class at once.

Table 4. Descriptive Statistics for Content Delivery, Task, and Grouping Opportunities to Learn

	Total Teachers (N=34)			
	PD (N=16)		Comparison (N=18)	
	% (n) Teachers Allocating Time	Mean % Time Allocated	% (n) Teachers Allocating Time	Mean % Time Allocated
Content Delivery				
Teacher	88% (14)	12%	94% (17)	27%
Working with text	94% (15)	65%	100% (18)	47%
Task				
Argumentation	50% (8)	13%	22% (4)	8%
Close reading	69% (11)	35%	44% (8)	8%
Cross textual analysis	44% (7)	9%	17% (3)	3%
Disciplinary knowledge focus	88% (14)	46%	100% (18)	58%
Fact acquisition	63% (10)	14%	78% (14)	20%
Grouping Configuration				
Individual	94% (15)	17%	83% (15)	15%
Pairs	75% (12)	17%	39% (7)	6%
Small group	63% (10)	17%	56% (10)	19%
Whole class	94% (15)	44%	100% (18)	56%

Table 5. *Independent Samples Test*

		Levene's Test for Equality of Variances		*t*-test for Equality of Means		
	Equal Variances	*F*	Sig.	*t*	*df*	Sig.
Content Delivery						
Teacher	Not assumed	6.40	.017	-2.59	27.86	.015*
Working with text	Assumed	0.11	.748	2.37	32	.024*
Task						
Argumentation	Assumed	0.10	.756	0.82	32	.419
Close reading	Not assumed	12.33	.001	3.16	20.36	.005**
Cross textual analysis	Not assumed	9.70	.004	1.53	23.51	.140
Disciplinary knowledge focus	Assumed	0.04	.845	-1.37	32	.180
Fact acquisition	Assumed	0.02	.901	-0.87	32	.391
Grouping						
Individual	Assumed	0.37	.548	0.51	32	.617
Pairs	Assumed	2.83	.102	2.13	32	.041*
Small groups	Assumed	0.02	.891	-0.28	32	.778
Whole class	Assumed	0.44	.513	-1.38	32	.176

Note. * p<.05, ** p< .01

Table 6. Relationships Between Content Delivery and Task OTL

	Content Delivery Mode							
	Teacher Delivered Content (N=31/91%)				Working With Text (N=33/97%)			
	PD (n=14/87%)		Comparison (n=17/94%)		PD (n=15/94%)		Comparison (n=18/100%)	
Task	% (n) Teachers Allocating Time	*M* % Time Allocated	% (n) Teachers Allocating Time	*M* % Time Allocated	% (n) Teachers Allocating Time	*M* % Time Allocated	% (n) Teachers Allocating Time	*M* % Time Allocated
Argumentation	21% (3)	4%	12% (2)	2%	53% (8)	18%	22% (4)	11%
Close reading	36% (5)	13%	6% (1)	0%	73% (11)	44%	44% (8)	15%
Cross-textual analysis	14% (2)	6%	6% (1)	0%	47% (7)	13%	11% (2)	4%
Disciplinary knowledge focus	64% (9)	47%	88% (15)	61%	87% (13)	59%	94% (17)	71%
Fact acquisition	50% (7)	22%	77% (8)	32%	47% (7)	14%	56% (10)	11%

Table 7. Relationships Between Grouping Configurations and Content Delivery and Task OTL

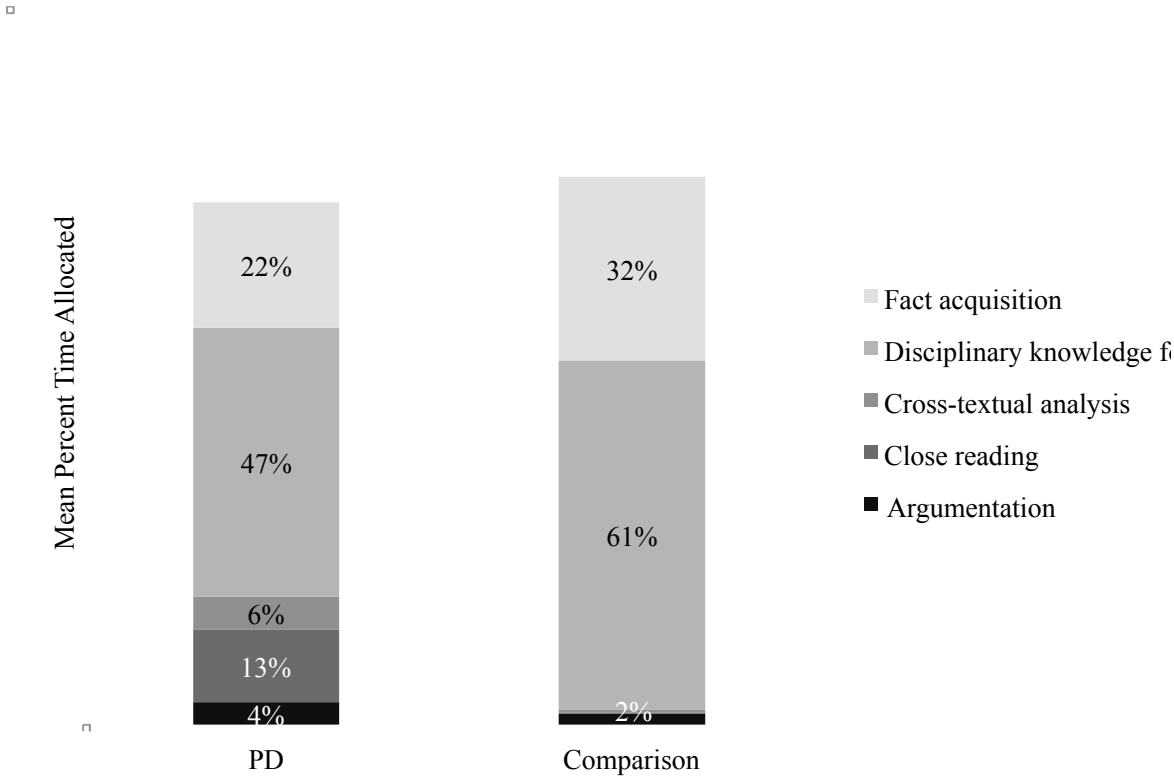
	Grouping Configuration							
	Individual		Pairs		Small Group		Whole Class	
	PD (N=15/ 363 min)	Comparison (N=15/ 257 min)	PD (N=12/ 339 min)	Comparison (N=7/ 118 min)	PD (N=10/ 307 min)	Comparison (N=10/ 316 min)	PD (N=15/ 886 min)	Comparison (N=18/ 1129 min)
	Mean % time allocated (and % teachers who allocated time) given a particular grouping configuration							
Content Delivery								
Teacher	0 (0)	6 (20)	0 (0)	0 (0)	0[6] (10)	0 (0)	29 (88)	51 (94)
Working with text	75 (80)	63 (87)	78 (83)	79 (71)	98 (100)	76 (90)	43 (80)	30 (94)
Task								
Argumentation	6 (27)	3 (13)	10 (25)	24 (29)	24 (40)	15 (20)	15 (47)	5 (22)
Close reading	37 (60)	12 (20)	47 (58)	9 (14)	49 (60)	14 (30)	24 (60)	7 (39)
Cross textual analysis	3 (13)	1 (7)	4 (17)	9 (14)	28 (50)	4 (10)	5 (33)	1 (11)
Disciplinary knowledge focus	38 (67)	51 (67)	48 (75)	52 (57)	73 (90)	80 (90)	51 (87)	52 (94)
Fact acquisition	7 (27)	15 (33)	19 (25)	8 (29)	1 (10)	1 (10)	15 (67)	25 (78)

Note: For calculating percent of time allocated, denominator is minutes allocated to the particular grouping configuration, not total duration. For calculating percentage of teachers

[6] Less than .1%

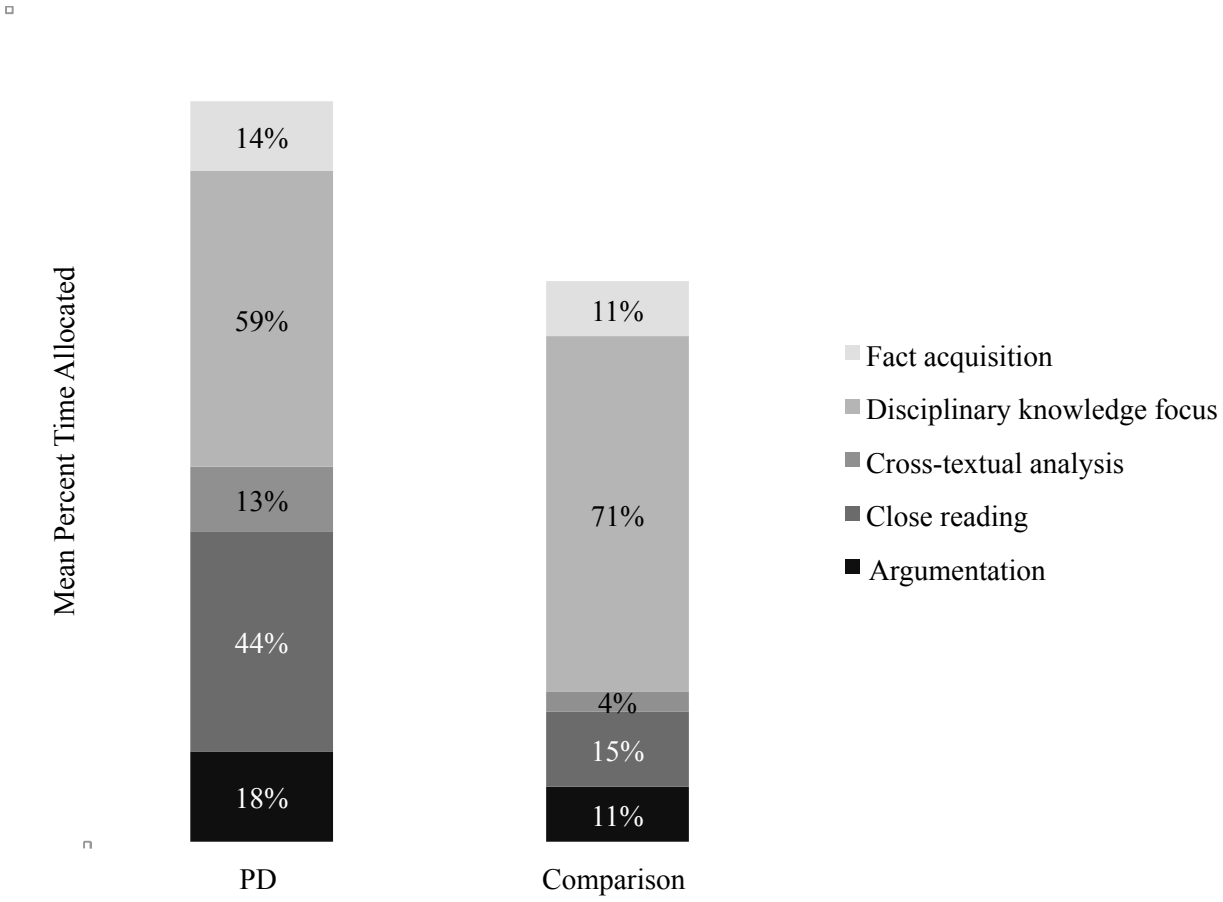
who allocated time to a particular content delivery mode or task, denominator is the number of teachers who used the grouping (i.e., 15 for PD teachers who allocated time to individual work), not the total number of teachers in the group (i.e., 16).

Figure 1. Mean Percentage of Time Allocated to Various Tasks When Teachers Delivered Content



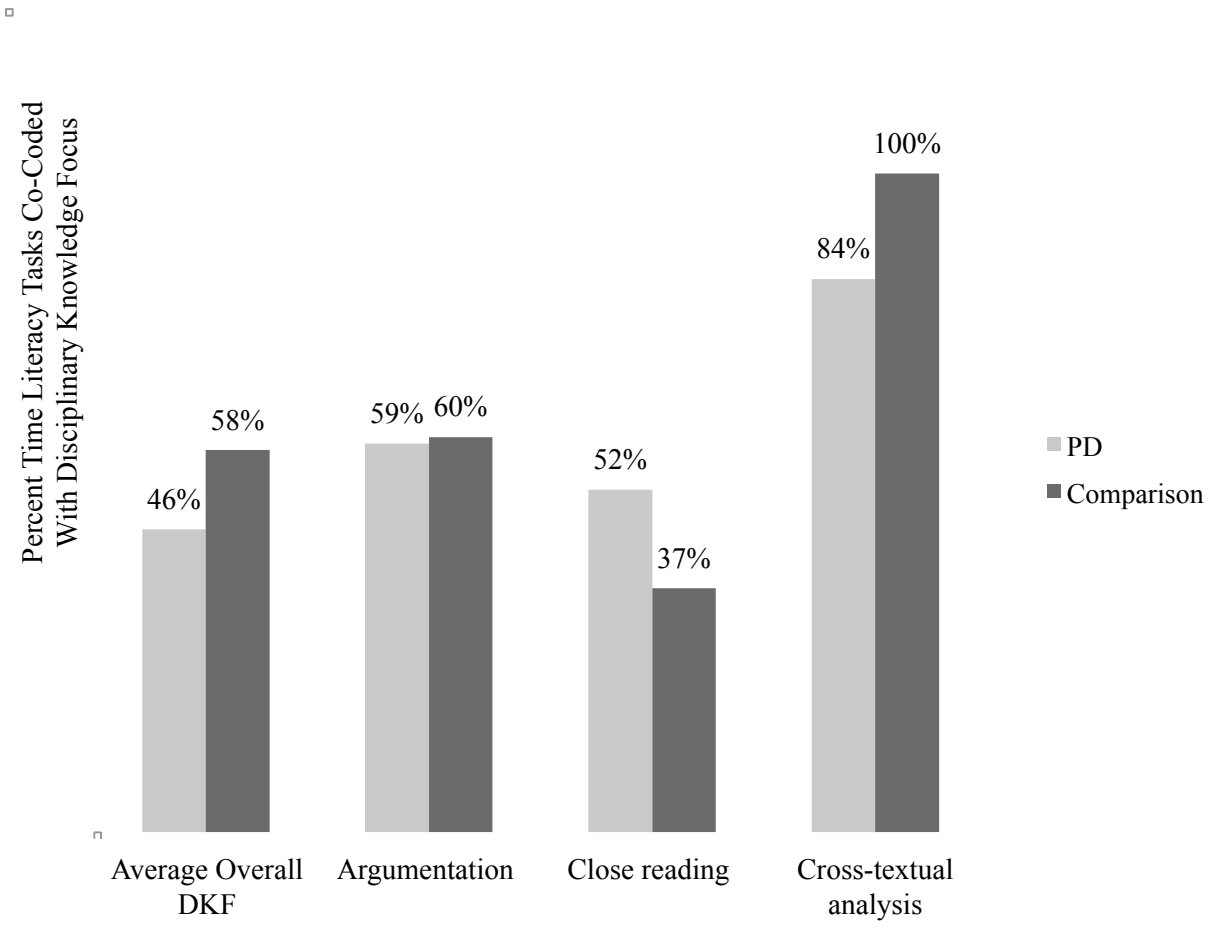
Note. Task durations were coded independently. Because students were often asked to perform mul
tasks while teachers delivered content, percentage time allocated to various tasks does not add up to
of content delivery mode.

Figure 2. Mean Percentage of Time Allocated to Various Tasks When Working with Text



Note. Task durations were coded independently. Because students were often asked to perform multiple tasks while working with text, percentage time allocated to various tasks does not add up to 100% of content delivery mode.

Figure 3. Percentage of Time Literacy Tasks Co-Coded With Disciplinary Knowledge Focus



Note. DKF=Disciplinary knowledge focus

Figure 4. Percentage of Time Disciplinary Knowledge Focus Co-Coded With Literacy Tasks