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Title

Leading Teacher Professional Learning: Shared Language for Shared Goals

Permalink

<https://escholarship.org/uc/item/08t852hg>

ISBN

9781522585169

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Publication Date

2019

Peer reviewed

Handbook of Research on Strategic Communication, Leadership, and Conflict Management in Modern Organizations

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A volume in the Advances in Human Resources Management and Organizational Development (AHRMOD) Book Series



Published in the United States of America by
IGI Global
Business Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue
Hershey PA, USA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: <http://www.igi-global.com>

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Library of Congress Cataloging-in-Publication Data

Names: Normore, Anthony H., editor. | Javidi, Mitch, 1958- editor. | Long, Larry W., editor.

Title: Handbook of research on strategic communication, leadership, and conflict management in modern organizations / Anthony Normore, Mitch Javidi, and Larry Long, editors.

Description: Hershey, PA : Business Science Reference, [2019]

Identifiers: LCCN 2018055820 | ISBN 9781522585169 (hardcover) | ISBN 9781522585176 (ebook)

Subjects: LCSH: Conflict management. | Communication in organizations. | Communication in management. | Leadership. | Organizational effectiveness.

Classification: LCC HD42 .H3663 2019 | DDC 658.4--dc23 LC record available at <https://lcn.loc.gov/2018055820>

This book is published in the IGI Global book series *Advances in Human Resources Management and Organizational Development (AHRMOD)* (ISSN: 2327-3372; eISSN: 2327-3380)

British Cataloguing in Publication Data

A Cataloguing in Publication record for this book is available from the British Library.

The views expressed in this book are those of the authors, but not necessarily of the publisher.

For electronic access to this publication, please contact: eresources@igi-global.com.

Chapter 9

Leading Teacher Professional Learning: Shared Language for Shared Goals

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ABSTRACT

Teacher professional development is a critical component of teacher learning and improving classroom instruction. Effective communication is key in facilitating professional development. In this chapter, the authors present one aspect of communication in teacher professional development, building shared understanding of key terminology and ideas. They present three case studies of professional development programs from across English, history, and science. These cases highlight professional development design and implementation approaches that produced varying degrees of success. The potential pitfalls and effective approaches to facilitating the development of shared language about key ideas are presented. Lessons learned and implications for those who work with diverse groups and conduct professional development are discussed.

INTRODUCTION

Every year, educational leaders and educators come together and spend countless hours, and billions of dollars working to improve instruction in schools (Darling-Hammond & Berry, 2006; Wilson, 2013). They face a challenge found in almost any field, developing a shared understanding of concepts, ideas, and discipline-specific terms as they work collectively in groups (Innes & Booher, 1999). A lack of shared understanding can create confusion, lead to miscommunication and misunderstandings, and undermine collective goals (Dickson, 1999). But how often do we consider these concepts and ideas when beginning to work in collaborative groups? And how do we address different conceptualizations to build shared meaning? In this chapter we examine these questions through the lens of teacher professional development for improved classroom instruction. Professional development often brings diverse groups together. They include school district leaders, researchers, instructional coaches, teacher leaders, and teachers. We present three illustrative cases from English language arts, history, and science to highlight the challenges of developing shared understandings around key concepts and ideas between participating teachers and leaders of professional development. In the three cases, we explain how a lack of shared meaning was identified or avoided and how each group approached the building of shared meaning to facilitate collective work. Our goal through these cases is to show how others may avoid or overcome some of the challenges we encountered.

BACKGROUND

Improving Instruction in K-12 Schools

Improving instruction in the public education system has been an ongoing priority in the United States (Duschl, Schweingruber, & Shouse, 2007). Central to these efforts has been a focus on improving teaching as a critical lever to improving student learning (Darling-Hammond, 2010). A primary approach used to improve teacher instruction has been the implementation of various forms of professional development (Scott & Mouza, 2007). Professional development can take many shapes, but typically involves teachers coming together and working with experts or facilitators that can include teacher leaders, instructional coaches, researchers, and school district staff in a particular learning context (Borko, 2004). Nonetheless, and despite significant financial and human investment, the outcomes of professional development have been mixed (Wilson, 2013). That is, the impact of what teachers learn from professional development, and the impact of professional development on student learning remains negligible at times (Buczynski & Hansen, 2010).

Whereas numerous studies have examined the structures and design of professional development, fewer studies examine more nuanced aspects of professional development and how these teaching learning experiences can adapt and change to better meet teacher needs (Zinger et al., 2017; Guskey & Yoon, 2009). Furthermore, although developing shared understanding has been raised as an important consideration for professional development, there are few examples of how negotiation of language to build common understanding works through this collaborative design (Little, 1988).

A Promising Approach to Improving Professional Development

In recent years, new approaches have been adopted to improve professional development (PD). These approaches are designed to better serve teachers with the goal of creating professional learning opportunities that will improve instruction and student learning (Russell, Jackson, Frank, 2013; Penuel, Fishman, Cheng, & Sabelli, 2011). These includes research-practitioner partnerships (Penuel, Coburn, & Gallagher, 2013), and various design-based implementation research (DBIR) strategies or methods (Fishman, et al., 2013). These approaches have shown promise in the way they support teacher learning (Zinger et al., 2017; Wang, Hsu, Reeves, Coster, 2014) At their heart, DBIR focuses on identifying problems of practice and addressing them in collaboration with teachers. DBIR allows for the renegotiation of more traditional relationships between teachers and those leading the professional learning. The hierarchical relationship is replaced with an open interaction between researchers and teachers who have shared goals to support teaching and learning. The teacher feedback and experiences directly informs the design of the professional development as it evolves to better meet the needs of teachers. By viewing research as central to teacher professional development, by making design and program choices in consideration of where teachers' problems of practice and professional needs, and by considering that the context in which teacher PD programs evolve as a potential source of change in the nature of the program itself, we change deep-rooted perspectives on how research can best contribute to the development of effective teacher PD programs for educational improvement (Supovitz, 2013).

Thus we present detailed cases of how professional developers and researchers worked with teachers to create shared language for shared goals across different types of professional development. We pay particular attention to contexts as these vary and are likely to impact professional learning (Zinger et al., 2017). We offer examples of how professional development can involve participating teachers in building a shared language and moving towards building coherent, collective visions for teaching practices.

THREE ILLUSTRATIVE CASES

The three cases presented below illustrate how common understandings of discipline-specific concepts underlying professional development were created and the impact this shared language had on teacher learning. In the first case, we describe how building shared meaning prior to the development of a program has meaningful effects on teacher professional development. In the second case, we highlight what may happen when explicit questions about shared understanding are raised as a program begins and how it informs program design. In the third case, we highlight what may happen when professional development is enacted without explicit examination of, and consideration for, what teacher may or may not know prior to engaging in a program. We use pseudonyms for the participants in all cases.

Case 1: Close Reading (What Is Close Reading?)

Setting: Southern California, diverse schools

Actors: Mrs. Nguyen

Goal(s): Develop instructional materials that align with ELA teachers' goals for close reading.

Defining Close Reading: The Case of Mrs. Nguyen

Thanh, a 13-year-old English language learner, enters Mrs. Nguyen’s English language arts (ELA) classroom where small, mixed ability groups will be asked to engage in close reading. Mrs. Nguyen invites her students, a culturally and linguistically diverse group, to read today’s learning objective aloud. This class of 32 8th graders reads, *Scholars will be able to analyze the effects of using sentence fragments by engaging in close reading of a memoir*. This specific objective is intended to support students’ larger learning goal to identify features of a memoir and to analyze the author’s style. But what exactly is close reading, and how does it support the language learning needs of Thanh and her peers?

Contemporary Education Initiatives and Close Reading

The Common Core State Standards for English Language Arts (CCSS, 2010) ask teachers to engage students in close reading: “to determine what the text says explicitly and to make logical inferences from it” and to “cite specific textual evidence when writing or speaking to support conclusions drawn from the text” (p. 1).

Similarly, the Partnership for Assessment of Readiness for College and Careers (PARCC, 2011) explains that by focusing on textual meaning and structure, students may “reflect on the meanings of individual words and sentences; the order in which sentences unfold; and the development of ideas over the course of the text, which ultimately leads students to arrive at an understanding of the text as a whole” (p. 7).

Brown and Kappes (2012) describe the activity of close reading in this way:

Through text-based questions and discussion, students are guided to deeply analyze and appreciate various aspects of the text, such as key vocabulary and how its meaning is shaped by context; attention to form, tone, imagery and/or rhetorical devices; the significance of word choice and syntax; and the discovery of different levels of meaning as passages are read multiple times (p. 2).

Brown and Kappes (2012) refer to “focus on discrete elements of the text,” and suggest that in close reading, it is “the author’s word choices and repetition, specific sentences, literary devices, academic vocabulary, or particular passages containing information that is key to the curricular objective” (p. 3). They stress, however, that close reading needs to be situated within a comprehensive literacy framework where it serves disciplinary goals. The challenge for teachers is to develop questions that focus students on text in ways that make the close reading serve those larger goals. Given these education initiatives, it is unsurprising that Mrs. Nguyen and her colleagues place particular emphasis on close reading during their ELA instruction. However, to support ELA teachers in their instructional goals, education leaders and researchers who are responsible for designing teacher professional development opportunities must understand how close reading is being defined and how it is being enacted in the classroom.

Understanding the Context

Mrs. Nguyen took part in a district-wide literacy intervention during 2016-2017 academic year that tested the effects of a digital scaffolding tool on students’ reading and writing outcomes. Other participants included 50 7th and 8th grade teachers from ten middle schools in their large, urban public school district, teaching 170 ELA classes with 3,472 students (2,097 8th graders; 1,375 7th graders; 73% eligible for free

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or reduced price lunch). Twenty-seven percent of these students were English language learners, 44% were redesignated as English Language Proficient, and 27% were native speakers of English. As part of the intervention, ELA teachers taught reading for 50 minutes each week (i.e. treatment classes were exposed to digitally reformatted texts and control classes were exposed to traditionally formatted texts). The results of the broader study indicate that students who read with visual-syntactic text formatting (VSTF) earned significantly higher overall scores on California state assessments for ELA compared to students who read traditionally formatted texts (Tate et al., 2019).

To maximize teachers' use of the reformatted texts, and to support their implementation of these materials through intervention-related PD, the research team needed to understand the nature of reading instruction and the nature of teacher PD in the district. The following table highlights the ways that researchers and district education leaders worked toward a shared language for PD and reading instruction, broadly, and the design of close reading materials, specifically, prior to and throughout the intervention year.

Designing Close Reading Materials

This multi-tiered approach to developing a shared understanding of how close reading is defined and enacted throughout this district's ELA team allowed for the development of close reading materials that 96% of teacher reported using throughout the intervention year. Because these materials were designed using teacher-reported instructional goals, they fit seamlessly into their grade-level curricular pacing guides and supported teachers, like Mrs. Nguyen, in engaging students in close reading of informational and literary texts. Below, we provide an example of one close reading document. It features a text-dependent question, theoretically-informed close reading tip, and an excerpt from the informational text.

Enhancing Close Reading Materials

A shared understanding of what these teachers' goals were for supporting teaching and learning in the classroom supported the design and implementation of the close reading materials during the intervention

Table 1. Information seeking activity and corresponding insight gained

Information Seeking Activity	New Insight for Shared Language
Researchers were invited to participate in a six-hour, district-level PD facilitated by curricular experts on reading for language and meaning	District PD sessions used specific strategies for same-site and cross-site collaboration; these strategies were incorporated into intervention-related PD.
Researchers were invited to attend ten 90-minute, school-site PD sessions facilitated by TOSAs on Google Apps for Education and one-to-one mobile technologies	Teachers' experience and comfort with instructional technology varied within and across school sites; focal areas were identified for intervention-related PD; teacher leaders were identified and invited to share best practices during intervention-related PD.
Researchers were invited to observe 250 hours of classroom instruction across 10 schools and participated in research-practice work groups with the district's curricular experts and teacher leaders	Through the Gradual Release of Responsibility Instructional Framework, teachers first asked students to read for gist understanding. Next, they engaged in close reading using specific, visually organized documents that featured analytical text-dependent questions, corresponding excerpts, and space for text annotation; 124 close reading analysis tasks (62 in VSTF and 62 in traditional format), including theoretically-informed close reading tips were developed for teachers' use during instruction.

Figure 1. Sample close reading document featuring theoretically-informed reading tip

1. Read As you read lines 1—31, begin to collect and cite evidence. Circle the question at the beginning of the essay. In the margin, explain what Vernikos says about the human spirit in lines 5—7. Then, underline the main idea in each of the next two paragraphs.

<p>Close Reading Tip: Locate the words "human spirit". Notice that the sentence with those words has two parts, highlighted by the two verbs in red. What does the human spirit 'seek'? What does the process of 'seeking' help the human spirit to 'explore'? What is 'human endurance'? How can 'endurance' be both physical and psychological? Answer these questions to restate what lines 5-7 are telling us about the human spirit.</p>	
Annotate	Explain
<p>Why explore? Asked why he kept trying to climb Everest, English mountaineer George Mallory reputedly replied, "Because it was there." Exploration is intrinsic to our nature. It is the contest between man and nature mixed with the primal desire to conquer. It fuels curiosity, inspiration and creativity. The human spirit seeks to discover the unknown, and in the process explore the physical and psychological potential of human endurance.</p>	

year. This understanding, too, helped researchers identify ways that they could enhance the materials for greater teaching and learning outcomes. This took place from the development of theoretically-informed close reading tips that were featured on select text-dependent questions.

At the end of the intervention year, teachers were surveyed about their experiences participating in the study. Specifically, teachers were asked “*Have the close reading tips helped you learn anything new about supporting close reading? If so, what?*”, and “*Did the close reading tips help students succeed who would have struggled with the analytical tasks? How do you know?*” Teachers reported that they learned that close reading should focus on specific, short segments of a text and that students need to be given specific steps for engaging in this activity. Teachers also reported that the close reading materials designed to be used during the intervention were structured and stimulated classroom discussion, the tips drew attention to pivotal passages, and provided students with ways to tackle complex texts. These teaching and learning outcomes related to close reading were made possible through a shared understanding of what it means to engage in close reading in service of larger learning goals.

Results of Shared Language for Shared Goals

Successful close reading requires attention to the language an author uses, in service of coming to deeper understand of meaning of the text being read (Moore & Schleppegrell, 2014). By focusing on a shared language and through shared goals, close reading tips were developed and used to enhance the established curricular materials and activities. This offered teachers new ways of thinking about support for close reading by drawing attention to the ways language works to present meanings of different kinds.

By using the close reading materials, Mrs. Nguyen and her colleagues supported their students’ English language development by engaging them in interaction that drew their attention to the relationship between language and meaning in text. Teachers reported that the close reading tips were typically

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used in activities where students interacted with each other to answer the questions, or participated in whole class discussion about their thinking as they read closely. Most importantly, by drawing students' attention to particular aspects of the language authors use, the close reading tips helped students consider larger questions relevant to English language arts: how characters develop, how conflicts are introduced and resolved in a narrative, how arguments are structured and what counts as evidence, and how authors' craft creates meaning in language choices. This is the overarching goal of close reading: to support students' disciplinary learning in ELA as they engage in literary analysis and exploration of informational and argumentative texts. Ultimately, by investing in a solid understanding of the nature of this district's teacher professional development and how ELA teachers conceived of close reading, the education leaders and researcher team created meaningful instructional materials and learning experiences intended to meet these groups' shared goals.

Case 2: Historical Thinking (What Is Historical Thinking?)

Setting: East Coast of the United States, diverse schools

Actor: Jamie Collins

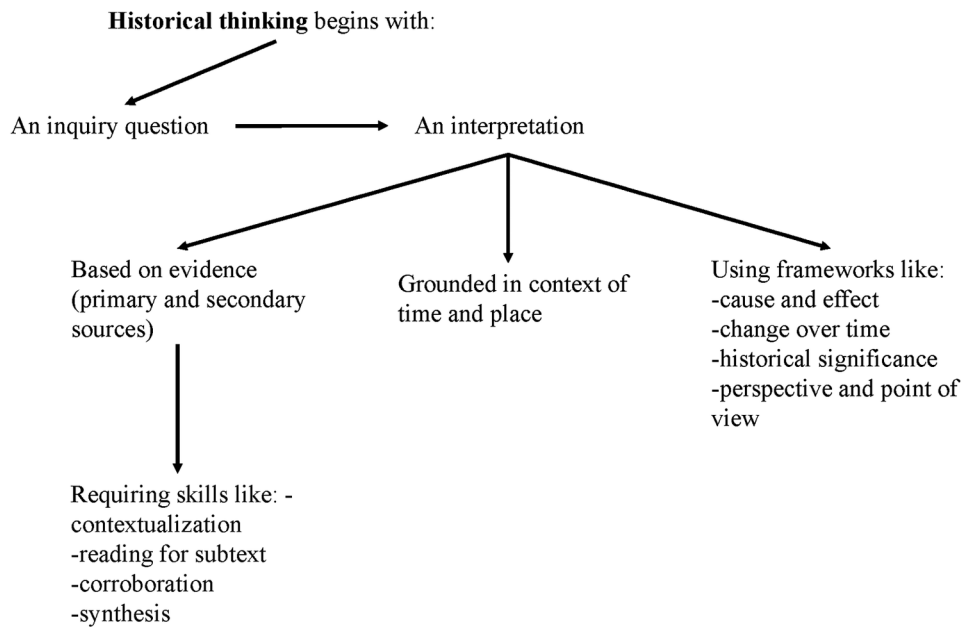
Goal(s): Teachers learned disciplinary skills to implement a digital archive in their history courses

What Is Historical Thinking, an Overview?

Ask most adults about their history classes and they will either complain that they were required to memorize too many dates or will rave about a teacher who told the best stories. Through both of these responses, it is clear that history class once consisted mainly of teachers sharing narratives that required students to remember what happened in the past. We assumed that current history teachers have a deeper understanding of history and historical methods than most adults, but as we started our professional development program with teachers, we thought we would ask them what they thought historical thinking was. Our purpose was to better plan professional development that would focus on the skills of historical thinking, rather than memorization. In order to create meaningful workshops, we acknowledged it was important to know what teachers already knew about historical thinking.

We hoped that participant definitions would connect or overlap with a definition of historical thinking that we had previously developed. Our definition of historical thinking is based on literature in the field and emphasized primary sources like the kind teachers would have access to while in this professional development program. While there is no one definition of historical thinking shared by experts in the field, the methods employed by historians include: inquiry and developing questions, primary and secondary source analysis, and the use of conceptual frameworks such as point of view and change over time (Seixas, 2013, Wineburg 2001, Duquette, 2015, Lesh, 2011). In working with this group of teachers, we shared a definition of historical thinking on the first day and provided specific models of this concept, hoping to expand upon the teachers' own understandings of historical thinking and to preview the types of activities we hoped to share later on. We defined historical thinking as an interpretation that responds to an inquiry question and uses evidence (primary and secondary sources) to make meaning grounded in a deep understanding of a particular time and place. To construct an interpretation, we rely on certain conceptual lenses and practices involving discipline-specific skills. Conceptual lenses are the ways that historians organize their interpretation to provide an explanation for what happened in the past. These lenses include: cause and effect, change over time, historical significance, and perspective/point of view.

Figure 2. Historical thinking graphic



The skills that historians (and students of history) engage in that allow them to make meaning from primary and secondary source material include the skills of contextualization, reading for subtext, corroboration, and synthesis. This definition of historical thinking has been informed by the work of scholars engaged in history education and cognition (Seixas 2013, Wineburg, 2001, Duquette, 2015, Lesh, 2011).

The Context of Teaching Historical Thinking

Our study is situated in the context of a professional development program aimed at high school history teachers who were taught in the use and implementation of a digital archive of primary sources. This digital archive was a searchable platform that allowed users (teachers, students, or the general public) to search for artifacts and sources, collect them into groups for instructional purposes, and annotate the sources for future use. Primary sources are documents from the past and are the foundation for the work that historians do; they are the “stuff” of history. The teachers in this program were all high school history teachers from or near a large city in the Eastern United States. Most of the participants were experienced teachers, with 27 of the 29 teachers having taught more than four years, and the majority of those having taught for over eleven years. Eight had degrees in history, eight others had degrees in humanities or social sciences; so most of the group had training in history at the post-secondary level.

At the outset, we wanted to know what these teachers thought about historical thinking, in order to help build a shared language and develop stronger plans for future professional development sessions. At the beginning of the first meeting with teachers, we asked them to individually define historical thinking in a written response (see figure 3). This would help us establish a baseline of the teachers’ knowledge. Most definitions contained ideas, lists, and a description; these included full sentence descriptions, whereas others drew images. Some answers include: “Understanding moments in history,” “What is the story the narrative,” and “Knowing dates.” Other responses focused on the skills of history, such as:

Teaching About Historical Thinking

To offer examples of historical thinking at each session, we shared strategies, modeled inquiry and analysis, and allowed teachers to develop lessons around collections of primary sources. We wanted teachers to understand how to incorporate primary source materials in a way that emphasized inquiry and so built lessons around collections of source material that teachers would use to construct a narrative. For example, in the digital archive, we created a collection of primary sources relating to East Coast immigration in the early 20th century and allowed teachers to experience instruction as students, and consider how they might develop a narrative based on these sources. We also provided teachers with model questions, such as “How did ordinary people respond to the Depression?” that they could use as a basis for developing their own set of primary sources. These sources would then be used in the classroom and students would analyze them and use them as evidence to develop a historical interpretation. Teacher feedback highlighted that they appreciated the models and time to develop classroom activities. For example, responding to a prompt asking about what was most useful about the workshop a teacher wrote, “Looking at the artifacts especially the images and learning how to formulate questions about them.” Another stated, “I really enjoyed the sessions regarding creating compelling questions, visual thinking strategies, and search techniques.” By modeling these investigations, teachers practiced the skills of close reading, corroboration, contextualization, and synthesis, and developed an interpretation of their own based on the photographs and documents they analyzed. As the professional development program continued, we supported teachers in the development of similar lessons, where teachers would ask their own students to engage in this historical inquiry process. Teachers then had time to reflect on their classroom application as they discussed ideas with each other in our workshops, at their school sites with their team, and through school-site coaching, where each teacher partnered with an expert to develop and discuss implementation.

Teachers deepened their understanding of historical thinking through practical application. As we developed the workshop program, we used teacher feedback to inform our planning for subsequent workshops. Teachers requested time to collaborate and learn from colleagues to research and analyze primary sources and to then translate these experiences into lessons for students. Another teacher comment reflects this approach, as they appreciated, “Sharing new ideas for techniques on how to use [the digital archive], and then actually using those techniques to create an assignment!”

At our last session with the teachers, we asked each teacher to again provide their definition of “historical thinking,” reflecting any new understandings based on the professional development program. After reviewing the data, we developed a word cloud synthesizing their new definitions (see figure 5). While the teacher responses continued to include “event” and “history,” they also highlighted specific historical thinking skills and concepts. The post-professional development response highlights that teachers emphasized specific skills associated with historical thinking, the same skills that we engaged in through the program. These include: analyze, context, and primary sources. Their responses were much more detailed and nuanced as can be seen from the word cloud that includes a variety of specific understandings of how historians construct narratives, such as “cause and effect,” “continuity and change,” and “make.” This highlights that history can be a narrative of the past, but is also subject to interpretation based on specific shared practices and methods that constitute historical thinking.

A post-observation debrief after the lesson also revealed Collin's new confidence with implementing teaching strategies that engaged students actively in making meaning for themselves through the study of primary sources. For example, she identified possible modifications like reducing the number of images in order to allow students more time to focus on each one. Through the professional development program, Collins learned strategies for developing historical thinking skills and implemented these with her students. The opportunity for reflection and feedback on this process offered her an opportunity to further refine these practices to emphasize instruction where students critically engaged with primary sources as a way to develop their understanding of historical content and develop analytical skills at the heart of the discipline.

Collins' definitions and instruction highlight the ways that historical thinking can be reflected in the classroom to support student learning. The professional development program centered on the concept of historical thinking and grounded teachers' learning and practice so that they could engage in the process of historical thinking together. At each session, teachers worked together to develop lessons that reflected these disciplinary methods and then discussed the implementation in the classroom with their colleagues. By beginning our work with a pre-assessment where we collected teacher data on their individual understanding of historical thinking, we could center our work together to discuss what this concept meant for each of us, while moving toward a shared definition of this concept. By modeling specific strategies and instructional practices where teachers did the work of historians, they developed the understanding of how to analyze, synthesize, and interpret primary sources, which they in turn could implement with their students. Creating opportunities for teachers to discuss lesson ideas with each other and during coaching visits at their school-site gave them additional opportunities to develop their definitions of historical thinking and further shape the experiences of the students in their classrooms.

Case 3: Developing Inquiry Science Instruction With Elementary School Teachers (What Is Inquiry in Science?).

Setting: Southern California, school serving historically underrepresented students.

Actors: Expert teachers, professional developers, researchers, classroom teachers.

Goal(s): Improve science instruction and student learning.

Discussion as Part of Scientific Inquiry

As part of a large intervention to improve elementary student science learning, over 80 third through fifth grade teachers participated in a week-long professional development. A significant component of the program focused on preparing participating teachers to teach three inquiry-based Earth science lessons. During the professional development participating teachers engaged in inquiry activities as well as experienced and had opportunities to ask question about the lessons they would be teaching. They were given the curriculum and materials to then teach the lesson in their own classroom.

Once teachers began teaching the lesson, we visited some classrooms to see what instruction looked like. The following unfolded in a veteran teachers' classroom. As the lesson was coming to a close, Alice, the teacher, engaged students in a task where they described each of the steps of weathering, erosion, deposition, and sedimentation. As she walked around the classroom, she reminded students, "so you are *discussing* it, what is the first step?" as she checked on individual groups she praised her students, "My goodness, this is amazing, people are getting all the steps...I hear a lot of good *discussion* there."

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Through the lesson and through the *discussion*, Alice engaged her students in inquiry, or inquiry as she understood and perceived it.

When presented with this scenario, the organizers, instructional coaches, and researchers that developed the professional development that Alice participated in were confronted with a larger problem and question. Although Alice used words such as discussion, her enactment of inquiry and discussion did not align with the vision and goals of instruction of inquiry desired by the program. Specifically, discussion being part of a critical analysis of a scientific inquiry. Alice's perceptions of inquiry were not an isolated case, and reflected the perceptions of inquiry and discussion of nearly all participation teachers. So why was there such a disconnect between the intended goal and understanding of inquiry and the way they were enacted? Before we attempt to answer these questions, we should examine what we know about inquiry instruction and the context of teaching science in elementary grades, which are the backdrop of our inquiry.

The Goals of Scientific Inquiry and Instruction

Efforts to improve science teaching and learning emphasize an inquiry approach where students generate questions, present ideas, and defend their hypotheses while teachers facilitate rather than direct (National Science Education Standards [NSES], Next Generation Science Standards [NGSS]). Indeed, the NGSS represent a shift in what and how students are expected to learn and show mastery of learning. Whereas prior standards focused on students knowing facts, the NGSS calls for students to engage in scientific practices such as discussing, arguing, and defending conclusions they reach (NGSS lead states, 2013). Nonetheless, although inquiry approaches to teaching science date back to Dewey and have evolved over the last century (Barrow, 2006), a precise definition of inquiry which guides some of the NGSS principle is still lacking (Anderson, 2002; Windschitl, Thompson, Braaten, & Stroupe, 2012).

Conceptions of inquiry include specific practices such as planning and designing ways to answer questions, conducting experiments, analyzing data, sharing ideas and receiving feedback (Krajcik, Blumenfeld, Marx, & Soloway, 1994), and examining "why" explanations of the natural world, language and disciplinary thinking, and connecting to student real lives (Windschitl et al., 2012). Additionally, more general concepts such as communicating, problem solving and developing thinking skills have been used to frame inquiry (van Zee, 2000). The lack of precise definition juxtaposed with the ubiquity of the word inquiry may be at the root of the challenge of having a shared definition. That is, inquiry is frequently used to describe a type or set of activities in science classroom. Individuals may have deeply ingrained understandings of what the word means, and assume others share this understanding. Yet even within the community of science education, there are widely varying definitions. Nonetheless, despite the lack of consensus, both reform and inquiry pedagogies point to student-centered and student-generated thinking and processing of information and ideas as cornerstones of inquiry (Anderson, 2002).

Discourse and discussion are critical to engaging student in meaningful scientific sense making. As highlighted by the NRC (2000), in inquiry learning "teachers orchestrate discourse among students about science ideas" (p. 22). Additionally, the NGSS standards call for students to ask questions, and engage in argumentation around evidence (NRC, 2011). Discourse moves can engage students in constructing their own explanations which are central to inquiry teaching (Braaten & Windschitl, 2011). In an inquiry-based classroom, students would be expected to generate questions and demonstrate knowledge building. Indeed, some have used classroom discourse as a way to determine if a class is engaged in inquiry (Marshall, Smart, & Horton, 2010). By these definitions, what we observed in Alice's classroom,

the *discussion* students engaged in would not constitute meaningful discourse or a discussion as it was framed. Students were simply stating steps in a process and were not generating any new meaning. But why do so many teachers perceive this to be inquiry in action?

The Context of Science Instruction in Elementary Grades

Researchers and professional developers of science instruction, and even more specifically of inquiry-based instruction, are often experts in inquiry-based approaches as well as their specific subject area. Nonetheless, the lived experience of elementary teachers is quite different than that of researchers and instructional experts. Elementary school teachers are charged with teaching multiple subjects, including math, English, social studies, physical education, and more in addition to science (Davis & Smithey, 2009). Within science, they are expected to cover a broad range of areas including, life, physical, and Earth sciences (Davis & Smithey, 2009). Furthermore, the vast majority of elementary school teachers have little background beyond their own experiences in the K-12 system in learning or teaching science (Epstein & Miller, 2011). The lack of content area expertise may contribute to the fact that elementary school teachers also tend to feel least comfortable teaching science as compared to other subjects (Banilower et al., 2013).

In elementary grades, the importance of science instruction is nonetheless emphasized through policies and standards focusing on developing children's ideas and concepts of science (NRC, 2007). However, science standards and policies exist in a broader policy context, where English and math may be prioritized over science. Indeed, elementary school teachers report that the time they can allocate to teaching science can be restricted by prioritization of other subjects, as well as limited access to the materials and resources needed to teach science. On the whole, despite efforts from well-intentioned elementary school teachers and their willingness and desire to participate in professional development opportunities, many engage with professional development with limited content knowledge of science and limited instructional experience with science.

Finding the Incongruence

In this case, our work with elementary science teachers was undermined by a lack of shared meaning about key terms and ideas that were central to the learning goal of the professional development. Specifically, the intended definition of *inquiry* and *discussion* that were central to what teachers were being asked to do and their understanding of these ideas were misaligned. Classroom observations, teacher interviews, and teacher surveys were necessary to identify this misalignment. As teachers completed the initial professional development, there were no clear indicators about the misalignment, with teachers largely satisfied with the program. Nonetheless, the leaders and instructors of the professional development had been talking about inquiry as were participating teachers, but were unaware of how they perceived inquiry differently.

Central to the lack of a shared definition was that professional developers understood inquiry and discussion to be closely aligned with the instructional standards and students analyzing, interpreting, questioning, and justifying experimental findings. The teachers, on the other hand saw inquiry as engaging student in some sort of activity. Teachers saw discussion, as exemplified by Alice's talk with students, as potentially rote, such as reciting the steps of the rock cycle. We conjecture that the difference in expertise about the nature of inquiry and their typical work environment between the teachers who led the profes-

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sional development and participated in the program were central to the misalignment. Specifically, the professional development leader included teachers of the year, and science subject area specialists, who were not teaching all subjects as a typical elementary teacher would, or were teaching in school setting very different than those the participating teachers came from.

Beginning to Address the Incongruence

The discovery of the incongruence occurred after the initial round of professional development. Thus, the first step to address the incongruence was to provide the professional development leadership team with a clear picture of the classroom interaction and instruction of the participating teachers. This provided an important perspective of the lived experience of the classroom teachers, the challenges they faced, and why it was that they held the definitions of inquiry and discourse that they did. This helped the leadership team understand the starting point or place where they should meet teachers at. The second step was to critically consider how to meet teachers where they were. Specifically, the team reflected on the complexities of inquiry and considered their own level of expertise and how they built it. Ultimately, the team decided to focus on one component of inquiry, questioning and the formulation of questions as a realistic entry point for the subsequent professional development. The team realized that trying to unpack the entirety of inquiry was unrealistic, and the use of questioning would be a good starting point. Specifically, the goal for the subsequent professional development became to facilitate the participant's understanding of the type of learning and engagement students would experience given different types of questions. Different types of questions were ultimately tied to the inquiry that they afforded.

CONCLUSION

In the three cases presented in this chapter we saw improvement minded instructional leaders and classroom teachers working together to improve instruction. We saw some common themes emerge across the cases, including (a) attending to the teachers' lived experiences and meeting them where they are instructionally; (b) using multiple types of data to identify incongruences and misunderstandings; and (c) the importance of developing a shared or common understanding of key ideas and terms. We also saw some differences in the cases in terms of the impact of identifying the incongruences or misunderstandings at different points of the professional development process. Specifically, we saw how identifying incongruences prior to a large scale rollout, or early in a large scale rollout provided teachers better learning opportunities. We detail each of these emergent themes.

Understanding where teachers were coming from was fundamental to developing shared understanding with the participating teachers in all three cases. Indeed, in all three cases, the leaders of the professional development were experts in the areas they were addressing—close reading, historical thinking, and scientific inquiry. These leaders, however, were not experts, at least not initially, in what the daily lives of the teachers were like and how their classrooms operated. Indeed, the more specialized knowledge that was the strength of the professional developers provided them with little insight into where to meet the participating teachers as learners. Once the leaders became aware of the teachers' lived experiences and existing understanding of key ideas, they were better able to design and implement professional development for teacher learning.

Central to understanding where teachers were coming from were a number of different data sources and types. We see across the cases that classroom observations, surveys, focus groups, interviews, and instructional materials all played key roles in understanding how and why teachers held particular definitions or made sense of key ideas and terms. We note the importance and challenges to using multiple data sources. We see, for example, that surveys, in the cases of historical thinking and scientific inquiry, were useful in providing a broad overview—the *what*—but classroom observations and interviews helped better understand the *how* and *why*. We are mindful of the challenges and commitments required for more in-depth data collection such as classroom observations. Nonetheless, we note that even small scale observations of just two or three classrooms can provide useful insight and inform a localized professional development program, when used with other forms of data such as surveys.

Ultimately, we saw the importance of developing shared language for shared goals. We saw two examples, close reading, and historical thinking, where negotiating the shared understanding early in a professional development program helped shape the program and produce desired outcomes. Additionally, offering space for teachers to engage in discussions about these shared understandings and disciplinary practices reinforced their learning. In the case of scientific inquiry, we saw how addressing shared understanding helped the subsequent iteration of the professional development, but not the current. This was primarily due to the focus on shared language arising after the professional development, rather than before or early on in the process. Nonetheless, in all cases, we saw that in all programs that the instructional leaders were able to take the information about their participating teachers and put it into action for systematic improvement.

IMPLICATIONS

Although our focus here is on teaching, implications may be useful to other groups and individuals who lead professional learning or training. Our three cases highlight the importance of using multiple sources of data to understand learners, especially as it related to the key ideas and concepts that are central to the professional development. Additionally, the cases point to the value of investing time and efforts early on in projects to design meaningful learning experiences. Developing and implementing professional development with little regard for what the participating teachers know, or do not know, is likely to be an ineffective endeavor. It may be equally ineffective to make claims about participating teachers without understanding their lived experience.

Our three cases illustrate that learning outcomes of participating teachers are likely to improve when in addition to the substance or content of what is intended to be taught, the participant's background knowledge is considered. We suggest that investing time in classroom visits, surveying participating teachers, and talking to individual or groups of participating teachers is a critical step in obtaining important information that can productively shape a professional development. Taking this approach will provide professional developers with information that allows them to meet their learners where they are rather than providing generic instructional opportunities that only benefit a few participating teachers.

FUTURE RESEARCH DIRECTIONS

Looking forward, we see opportunities to extend on the work presented here by examining approaches to professional development that more deliberately and systematically establish shared language early in the process to facilitate understanding between facilitators and participants of professional development. We also see opportunities to extend on this approach and focus on shared meaning around key ideas in other aspects of schooling, such as in the classroom, where terminology can often have multiple and complex meanings. Beyond the field of education, there are opportunities to examine how shared meaning or lack thereof around key ideas or terms supports or constrains the work of groups towards a common goal.

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KEY TERMS AND DEFINITIONS

Close Reading: A multi-step process of reading that moves beyond a cursory understanding of a text and attend to the fine details of a text.

Design-Based Research: Research that focuses on problems of practice identified collaboratively with practitioners and researchers. The goal of design-based approaches is to address problems of practice as well as develop theory that can be applied more broadly for systematic improvement.

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Discussion, Scientific: A form of talk in which scientific sense-making and analysis is central. Discourse between individuals where participants contribute more than simple canonical knowledge or regurgitate scientific facts.

Historical Thinking: Interpretation that responds to an inquiry question and uses evidence to make meaning grounded in a deep understanding of a particular time and place.

Professional Development: A formal structure or program within schools where teachers gather with facilitators or experts to work on improving some aspect of instruction. Professional development may be ongoing, occurring multiple times, or in a single event.

Shared Understanding: Having a common interpretation of a concept or idea which may have multiple and varied meaning even within a specific context.

Visual-Syntactic Text Formatting (VSTF): A format designed to display text in a cascading pattern rather than a block approach. The format is intended to facilitate identification of grammatical structures in text.