Collaborative Professional Learning and Disciplinary Literacy:

An Approach for Systems Coherence During Pedagogical Change

by

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ABSTRACT

The purpose of this study was to explore what role collaborative professional learning may have on teachers' collective efficacy when confronted with pedagogical change. Academic standards introduced between 2010 and 2014 included new content-specific communicative practices including discipline-specific language, discursive methods, and ways of knowing. Adoption of the new standards accompanied a shift to standards-based assessment and reporting, and teachers at this international school offering an American curriculum felt unprepared to simultaneously implement these changes. As a means of empowering and equipping a multi-disciplinary, grade-level team of five high school teachers to accomplish these pedagogical changes, I designed a series of workshops centered on the theory, strategies, and tools of Disciplinary Literacy. Guided by an interpretivist lens grounded in the theories of Transformative Learning, Collective Efficacy, and Disciplinary Literacy, I adopted a mixed-methods action research approach to answer the following research questions: 1) what role does collaborative professional learning have on teachers' collective efficacy when confronted with pedagogical change; and 2) in what ways does an understanding of Disciplinary Literacy equip teachers to address the pedagogical changes of adopting and reporting to communicative practice standards in their subject areas? Findings from the study indicate the important nuances between collective efficacy and collaborative teamwork, the critical significance of ensuring systems coherence during paradigmatic pedagogical shifts, and the potential role of Disciplinary Literacy as a tool for systems coherence when implementing standards-based learning through concept-based, transdisciplinary units centered on authentic, topical issues of global competency and social justice.

DEDICATION

Pray as though everything depended on God, and act as if

everything depended on you.

– attributed to St. Ignatius Loyola

For those who harness the power of language with logic, love, and civility in order to advocate for social justice – past, present, and most especially the future – thank you.

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CHAPTER 1

BACKGROUND TO THE STUDY

Introduction and Rationale

As we enter the second decade of the 21st-century, terms such as "future-ready" and "innovation" dominate the conversations among educators. Leaders of schools, corporations, and public institutions are concerned that the skills and aptitudes of an emerging workforce and global citizenry may not be sufficient to meet ensuing demands (Malen, 2003). According to a United States Chamber of Commerce study (2011), 82% of employers want employees who can think critically and solve problems, and 69% need employees who can analyze and synthesize information. In 2013, Google's human resource staff conducted an extensive analysis of their hiring, firing, and promotion data from the past fifteen years. They found that top performers succeeded at the company not because of their technological prowess, but because they were able to make connections across complex ideas and possessed insights into others' points of view (Davidson, 2017). Students, and subsequently adults, who are able to discern information and contribute to a knowledge-based economy will also be able to think critically about existing social issues and either self-advocate for change within their own lives or advocate on behalf of myriad causes (Moje, 2007).

Over the past decade, a surge of youth activism drew the world's attention to the potential impact of young people's voices on our global condition. Empowered with the "language of engagement" (Leonardo, 2004, p. 16), young people worldwide harnessed the power of the hashtag to comment on issues as far-reaching as the environment, gun control, LGBTQ and women's rights, school safety, clean water, and more. Malala

Yousafzai's personal tragedy drew outrage against the injustices of women and girls' education under Afghanistan's Taliban government, spurring attention to similar situations for females around the world (Nobel Media AB, 2015). Greta Thunberg, Isri Hirsi, and Jamie Margolin sparked global student walk-outs concerning world leaders' collective inaction against climate change (Cranley, 2019). At age 22, Shamma bint Suhail Faris Mazrui was named the United Arab Emirates' Minister of State for Youth Affairs because of her advocacy (Simmons, 2017). Eight-year-old Amariyanna "Mari" Copeny drew President Obama's attention with her public letter concerning the deplorable quality of water in her hometown of Flint, Michigan (Felton, 2016). Marley Dias sparked an awareness campaign concerning the lack of characters of color in children's books because she was "sick of reading about white boys and dogs" (Carley, 2019). Desmond Napoles' flamboyant and outspoken advocacy for youth visibility among the LGBTQ community inspired RuPaul to name him "the future of America" (Stevens, 2018). Emma González, David Hogg, and other students from Florida's Marjory Stoneman Douglas high school joined a growing list of school shooting survivors across the United States who advocate against mounting gun violence in the country (Yee & Blinder, 2018).

Despite their ubiquitous media presence, however, these few young people represent a negligible percentage of the 600,000 youth ages 15-19 in the world today (United Nations Department of Economic and Social Affairs, 2019). Merely liking social media posts and following celebrities and causes does not equate to savvy global citizenship. Stanford History Education Group researchers (2016) found these so-called digital natives' consistent inability to discern the credibility of online sources to be

"bleak" (p. 4) and a "threat to democracy" (p. 6). Even more alarming in a future dominated by artificial intelligence and machine labor, students who do not question, collaborate, and care for others may simply become "second-class robots and not first-class humans," warned Andreas Schelicher, head of the Organisation for Economic Cooperation and Development's education division (Anderson, 2019).

Young people's blasé attitude may not be a generational character flaw but the result of a failed element of the educational program to which they belong. As Labaree (2011) laments, current school systems do not engage students in a discourse that challenges predominant inequities within the larger systems in which they exist. In order to "confront social inequalities…students must have access to discourses that pose critical questions about the new world order" (Leonardo, 2004, p. 13). Therefore, the most important skills for future-ready, innovative citizens are not the ability to regurgitate facts and figures but the ability to think critically, analyze the credibility of information, synthesize complex ideas from numerous sources across various disciplines, understand the underlying epistemology of others' ideas, and move between numerous discourse communities at both the local and global level.

Designing a curriculum that is more skills-based and student-driven than content-based and teacher-led is a radical change from traditional approaches to K-12 schooling. To be successful in implementing these future-ready and innovative approaches to teaching and learning, students and teachers must be well-versed in the content knowledge, skills, and communicative practices of the various disciplines. In 2010, the newly-launched Common Core State Standards (CCSS) included "Literacy in History/Social Studies, and Science and Technical Subjects" standards for Grades 6 - 12

that broadly outlined practical skills in reading, writing, and communicating to complement content found in other standards sets. Additional academic standards introduced over the next three years, such as the Next Generation Science Standards (NGSS), National Core Arts Standards (NCAS), and the College, Career and Civic Life (C3) Framework for the Social Studies, delved deeper into the communicative practices of their disciplines to place an equal if not greater importance on subject-area skills than content knowledge.

Inherent in these new academic standards is the idea that scientists, mathematicians, historians, artists, etc. all see the world differently, and each comprises a "unique culture of practice (with) its own norms for how knowledge should be created, shared, and evaluated" (Shanahan & Shanahan, 2014, p. 636). This pedagogical approach, known as Disciplinary Literacy, teaches that each discipline uses specific words and discursive methods to convey their understandings of the world and make new meanings from their observations and debates. Although there are numerous definitions of Disciplinary Literacy, scholars agree that the essential components include the ability to read, write, listen, speak, observe, and understand the world like a professional in any given subject matter (McConachie, 2010; Moje, 2007; Shanahan & Shanahan, 2008).

Teachers have expressed concerns that these new standards necessitate a shift away from traditional task-based grading to assessing and reporting student growth toward specific knowledge and skills (Guskey & Brookhart; 2019; Hany, Proctor, Wollenweber, & al-Bataineh, 2016). According to Muñoz and Guskey (2015), reporting student progress toward standards rather than their performance on quizzes and tests provides tailored feedback for growth toward student-friendly learning objectives and

"creates a straightforward link between curriculum and assessment" (p. 6). There are numerous approaches to reporting student progress in a standards-based system. Some schools have chosen to report individual Power Standards (Ainsworth, 2013, 2014) resulting in multi-page report cards while others classify related subject standards into three or four overarching reporting categories (Guskey & Bailey, 2009).

With the introduction of new standards specifically addressing literacy practices in the disciplines, many schools are grouping standards into categories that express what the student knows (content knowledge), can do (subject-area skills and practices), and can tell us (communicative practices of the discipline). For example, schools may group NGSS Science standards into four categories named Core Ideas & Concepts, Investigating Practices, Sensemaking, and Critiquing Practices (McNeill, Katsh-Singer, & Pelletier, 2015) while reporting CCSS Math standards in three categories titled Concepts & Procedures, Problem Solving & Modeling, and Communicating Reasoning (Smarter Balanced Assessments Consortium, 2015). However, if teachers are unsure how to teach and assess in this new approach, or if policies and expectations concerning grading and reporting are unclear at the school level, teachers can be reluctant to make changes in either curriculum or grading (Guskey & Brookhart, 2019; Hillman, 2015).

Teachers may also feel overwhelmed, isolated, and unprepared with the simultaneous introduction of new standards coupled with changes in grading and reporting paradigms (Guskey & Brookhart, 2019). Some teachers are embarking on these new challenges through their own personal professional development despite the move away from individualized learning to learning in collaborative teams (Kunnari, Ilomäki, & Toom, 2018; Little, 1993). Often when individuals engage in their own professional

development, they have trouble translating that learning into their workplace because others do not share in the vision or pedagogical understanding (Wenger-Trayer, Fenton-O'Creevy, Hutchinson, Kubiak, & Wenger-Trayner, 2014). However, when professional learning is designed to be collaborative and sustained, according to Wenger-Trayner et. al (2014), "the trust that develops over time through such shared work becomes a foundation for crossing real and imagined boundaries" (p. 141). These real and imagined boundaries involve all of the reasons for teacher reluctance to implement the new standards and reporting requirements, yet when teachers confront these boundaries together, a sense of collective efficacy emerges (Hendricks, Botha, & Adu, 2016; Kunnari et al., 2018).

Engaging in professional development as a community of learners is one of the greatest determinants of collective efficacy. Researchers found that 80% of teachers in an Alberta, Canada school district believed that participating in professional learning was most valuable when it was done as a community of learners (Beauchamp, Klassen, Parsons, Durksen, & Taylor, 2014). Another group of researchers in Miami-Dade County, Florida found nearly 90% of teachers agreed that collaboration was helpful to instructional and assessment practice (Killion, 2015). Relatedly, collective teacher efficacy is the greatest determinant of student achievement (Donohoo, Hattie, Eells, 2018).

Collective efficacy has gained prominence in education parlance since Eells (2011) captured the attention of education researcher and author John Hattie. In his 2016 speech at the annual Visible Thinking conference, Hattie hailed collective efficacy as the "new number one" among 195 effects regarding student achievement, five times more

impactful on students' achievement than inquiry-based teaching and almost three times as effective as direct instruction (Hattie, 2016). Similarly, Bandura (1997) argues that

> people's beliefs in their collective efficacy influence the type of futures they seek to achieve, how well they use their resources, how much effort they put into their group endeavor, their staying power when collective efforts fail to produce quick results or meet forcible opposition, and their vulnerability to discouragement (p. 764).

In other words, developing collective efficacy should be at the core of professional learning experiences aimed at empowering and motivating individuals and edifying teams.

As this previous scholarship demonstrates, effective teachers' professional learning for transformative change might offer teachers the best opportunity to implement these new standards and reporting requirements. That learning, however, must be focused on a specific pedagogical framework designed to address these unique changes. Disciplinary Literacy is such a framework because it enables "advanced literacy instruction embedded within content area classes (to include) the specialized knowledge and abilities possessed by those who create, communicate, and use knowledge within each of the disciplines" (Shanahan & Shanahan, 2008, 2012). These practices reflect two aspects of Moje's Four Lenses of Disciplinary Literacy (2007): 1) the ability to engage in content area sense-making and knowledge creation based on an epistemological understanding of the discipline, known as the epistemological approach; and 2) the effective use of specialized vocabulary, text structures, and discursive methods of professionals in that subject area, known as the functional linguistics approach. These specific elements of Disciplinary Literacy provide the basic skills for students to navigate

the nuances of the subject areas and utilize language for personal empowerment and societal change.

Problem of practice and Context of the study

The problem of practice underscoring this study was the introduction of new communicative practice standards and standards-referenced reporting categories that replaced traditional grading at the study site. The participants were Ninth Grade teachers who are utilizing the CCSS, NGSS, NCAS, and C3 academic standards which include benchmarks addressing subject-specific vocabulary, discourse methods, and ways of thinking to demonstrate knowledge about the content material. The Innovation was a series of workshops concerning Disciplinary Literacy, the pedagogical framework best suited to address these disciplinary-specific communicative practices. The purpose of the study was two-fold: 1) to understand the ways in which collaborative professional learning might impact collective teacher efficacy when confronted with pedagogical change; and 2) to explore the teachers' individual growth in the theory and strategies of Disciplinary Literacy as a way of understanding the new skills-based focus of teaching.

The study site was an international private school in the Middle East. Since 1955, the PreK-12 school has provided an American educational experience for the children of diplomatic, corporate, and foreign families. Faculty are predominantly from the United States and Canada, and all instruction is conducted in English with the exception of Spanish, French, and Arabic classes. Students originate from 40 different countries, providing a truly multicultural feel to the community. Because of its grounding in U.S. pedagogy, any new academic standards or changes in curriculum, instruction, and assessment originating in the States are adopted by the school as well.

Over the last five years, teachers at this school taught their classes while simultaneously aligning them to new standards and also serving as curriculum coordinators and assessment designers in creating vertical alignment of content and skills across three divisions. To support this work, teachers engaged in professional development concerning assessment literacy, subject-specific content training in traditional literacy, mathematics, and science, and formed professional learning communities. Given the high turn-over in international schools, however, the curriculum development was not as consistent as one might find in U.S. school districts where full-time curriculum professionals are dedicated to creating curricular scope and sequence, common assessments, and curriculum maps. Therefore, the introduction of standards-based grading and reporting in the high school was delayed nearly four years behind the elementary and middle schools.

With the shift to a new grading and reporting paradigm in 2020-2021, high school teachers were immersed in professional development concerning the transition. Outside the scope of the study, teachers engaged in additional workshops aligning assessments to learning objectives derived from the standards, providing students with specific feedback toward those learning objectives, and reporting progress in content knowledge, practices and skills, and communicating in the discipline. As a senior administrator and Director of Learning, I facilitated this professional learning with subject area teams as they revisited their assessments and redesigned them to align with the new reporting categories. While these assessment design workshops were only tangentially related to this study, they provided context for the larger work of the high school teachers as they prepared for the transition. Because every subject area had at least one reporting

category related to disciplinary-specific literacy practices that track progress toward using content-specific vocabulary, structures, and discourse methods, teachers needed to deepen their understanding of Disciplinary Literacy to meet the reporting needs of the new grading paradigm.

During preliminary cycles of research preceding this study, the Ninth Grade teachers began a very introductory study of Disciplinary Literacy in the school year preceding this study. In January 2019, the team leader sought advice from me about the best ways to create interdisciplinary units among subject areas that seemed to have very little in common. As a first step, I asked the teachers to respond to a common provocation using the lens (i.e. epistemology) and language (i.e. functional linguistics) of their respective disciplines. These teachers were intrigued and excited to identify the similarities and differences across disciplines. From that session onward, the teachers were interested in learning more about the ways in which this exercise could inform the creation of an interdisciplinary unit. I have included a more involved discussion of these previous cycles of professional learning concerning Disciplinary Literacy in Chapter 2. For the purposes of this study, the teachers' brief introduction to Disciplinary Literacy as an avenue to building interdisciplinary units served as a foundation for tying the theory and practice of Disciplinary Literacy to the new communicative standards and reporting protocols.

While the Innovation's workshops focused on equipping teachers with the theoretical background and supporting practical skills of Disciplinary Literacy, the driving motivation of the study sought to understand the ways in which teachers' collaborative learning influences their collective efficacy to implement pedagogical

changes. Similar studies in South Africa and Finland indicated that teachers believed levels of collective efficacy impacted their ability to implement new curriculum (Hendricks et al., 2016; Kunnari et al., 2018). Transforming practice and building collective efficacy resulted from learning that "is socially constructed in collaboration with other teachers...building new practices, not as an individual, but as part of a community, taking students' needs and colleagues' needs into account" (Kunnari et al., 2018, p. 123). During the Innovation, participants did this through specific strategies such as developing action plans and curriculum, discussing critical theory, and engaging in reflective activities concerning content, process, and premise (Cranton & King, 2003).

Research questions, Methodology, and Innovation

The purpose of this study was to explore how teachers' collaborative professional learning influenced their ability to understand and apply Disciplinary Literacy in their own classes and fostered collective teacher efficacy in regard to implementing pedagogical changes. The research questions included in this study were:

1. What role does collaborative professional learning have on teachers' collective efficacy when confronted with pedagogical change?
2. In what ways does an understanding of Disciplinary Literacy equip teachers to address the pedagogical changes of adopting and reporting to communicative practice standards in their subject areas?

These complementary questions guided the immediate implementation of professional learning workshops and also informed the future of vertical curriculum alignment and assessment design throughout the high school.

Because the study was framed through an interpretive lens, "rhetorical markers and signifiers related to meanings, understandings, experiences, and participants' perceptions (were) present in the research question(s), which...directly reflects the researcher's theoretical perspective" (Koro-Ljunberg, Yendol-Hoppey, Smith, & Hayes, 2009, p. 694). I used a multi-strand mixed-methods action research design (Ivankova, 2015; Mertler, 2016) grounded in Transformative Learning Theory (Mezirow, 1997, 2003, 2011) as informed by Ajzen's Theory of Planned Behavior (1985) and Bandura's definition of Collective Efficacy (2000).

My Innovation, hereafter referred to as Disciplinary Literacy Professional Development (DLPD), was a collaborative professional learning experience for teachers that originally encompassed a four-month, face-to-face professional development series of workshops with five Ninth Grade teachers. These workshops offered an overview of the theory and practice of Disciplinary Literacy, focusing on the complementary strategies and tools teachers can use when disaggregating both content and communicative practice standards to create aligned assessments and learning activities. Understanding that "reflection and inquiry should be central to (adult) learning and development" (Trotter, 2006, p. 8), teachers examined their aptitudes and attitudes through engagement with professional literature and reflected upon the readings through personal and collective discourse. Individually, teachers evidenced their understanding of Disciplinary Literacy within their own subject area through their analysis of their curriculum maps and lesson plans using a customized Innovation Configuration Map (Appendix A) and complementary standards crosswalk (Appendix B), both of which I designed for this study. Collectively, teachers showed their understanding of the

complementary aspects of Disciplinary Literacy between their subject area and others through their discussions during the workshops and collaborative design and implementation of an inquiry-based transdisciplinary project for the students at the end of the semester.

Original data measures included: a pre- and post-survey with questions organized into three subconstructs of professional development, collective efficacy, and knowledge of Disciplinary Literacy; an Innovation Configuration Map to guide analysis of curriculum mapping and lesson design; a heuristic framework for responding to learning in a personal reflective journal; and my Account of Practice. Data from these qualitative and quantitative measures were designed to indicate changes in teachers' attitudes and beliefs concerning collaborative learning during the DLPD, identify a deeper sense of collective efficacy that may be attributed to the collaborative activities and discussions, and ascertain whether teachers felt they had a deeper understanding of Disciplinary Literacy as a pedagogical approach to integrating the new communicative standards and reporting expectations.

Leadership context and researcher positionality

As the Director of Learning at the study site from 2018-2020, I was the school-wide leader for the conceptualization, development, implementation, and monitoring of PreK-Grade 12 curriculum, instruction, assessment, and reporting, including faculty and staff professional learning. I was familiar with the policies and practices of the school from a senior administrative level. As a former principal and curriculum leader in international schools for over a decade, I brought experience guiding faculty at other schools transitioning to standards-based grading and integrating elements of Disciplinary

Literacy. This familiarity allowed me to "engage in inquiry that is directed towards creating and extending professional knowledge, illuminating and improving practice, and influencing policies in an informed way" (Goodfellow, 2005, p. 48).

I have been an educator since 2007, serving schools as a teacher, librarian, and administrator. The "self-awareness, clarity of purpose, commitment to hard work, and internal motivation" (Birks, 2014, p. 6) that I gained through my myriad roles also allowed me to develop a unique empathy with many different members of the school community. This empathy enabled me to connect with teachers in authentic ways and find coherence among all the voices in the larger community discourse. My experience coupled with formal study of Disciplinary Literacy and andragogy lend "an affinity for the topic area and a...commitment to achieving quality outcomes" (Birks, 2014, p. 6). Moreover, the findings from this study will be more credible because of my respectable length of time in the specific field of study (Creswell & Miller, 2000).

Reflexivity, or self-awareness, is an integral element of action research because of the many decisions and value judgments made by qualitative researchers concerning what to study and how (Creswell, 2013). Although I had a collegial working relationship with the participants and an empathy based on my time in the classroom, I still occupied an insider/outsider stance in my positionality as practitioner-researcher (Flores, 2018). The teachers and I collected and analyzed anecdotal data concerning students' understanding of Disciplinary Literacy in previous cycles of research in May 2019 and November 2019. Despite this collaborative work, I alone chose the theoretical framework of the study, the methodological design, and the tools used to respond to the research question. I also chose the strategies and content for the DLPD, accounting for adjustments to be

responsive to teacher needs. Based on this fluid yet limited inclusion of participants-as-designers, my "insider/outsider (status was) less binary…(and more of) a dynamic continuum that shift(ed) throughout the entire research cycle" (Flores, 2018, p. 9). As I moved from participant to researcher and back to participant, I was both cognizant of the role I played at any given time through memo writing in my Account of Practice and reactive to participant needs as reflected in the change of the original study design.

Definition of Key Terms

Given the multiple definitions and understandings among practitioners concerning professional learning, collective efficacy, and Disciplinary Literacy as well as their correlated terms, I composed the following operational definitions and explained how they were applied to this study.

Academic language: Academic language is an umbrella term for all aspects of the "language of school" versus the language of home or social language. Academic language, often associated with English Language Learners based on its roots in Cummins' (1981) work with language minority students, is a gateway to accessing Disciplinary Literacy for all learners (Cummins, 2000; Gottlieb & Ernst-Slavit, 2014; Zwiers, 2008; Zwiers & Crawford, 2011).

American curriculum: For the purposes of this study, an American curriculum included the standards sets, associated curricula, instructional resources, and pedagogical approaches originating in the United States.

Basic literacy: Earliest formal study of language including phonics, phonemic awareness, letter identification and word study, vocabulary, composition, fluency and

automaticity (Shanahan, 2005; Zwiers, 2008). Before students can progress to academic language, they must have a solid grounding in basic literacy.

Code-switching: Code-switching is dually defined as the ability to move between and among languages such as English, Urdu, Mandarin, etc. as well as the discursive methods in the "languages" of various disciplines with their specific vocabulary, tone, syntax, and cultural understanding. For example, a student living outside one's home country may code-switch several times throughout the day when speaking with parents in their home language (e.g. Dutch), shopping or using public transport in the local language (e.g. Arabic), and interacting in school (e.g. English). Even within these languages, the student may change the style, vocabulary, cadence, and tone when chatting in their native language with friends back in their home country over social media versus talking with parents. The same switching applies to their interactions in English with school friends versus teachers. In Disciplinary Literacy, an additional layer is added for communicating like a professional within each subject area (Brown, 2009; Gardner-Chloros, 2009; Gee, 2008; Milroy & Muyksen, 1995; Orellana & Eksner, 2006; Vaughan et al., 2016).

Collective efficacy: I used Bandura's (1997) definition of collective efficacy to frame my methodological approach: "a group's shared belief in its conjoint capability to organize and execute the courses of action required to produce given levels of attainment" (p. 477). Other researchers in collective efficacy propose definitions similar to Bandura's including collective self-esteem, a faculty's collective influence on student achievement, and teachers' impact on students' home life and society (Donohoo 2017; Goddard, 1998; Tschannen-Moran, Woolfolk Hoy, and Hoy 1998).

Collaborative inquiry: A systemic approach to professional learning in which teams of teachers identify teaching practices to examine together in order to improve collective practice and student outcomes (Alcantara, Hayes, & Yorks, 2011; Donohoo, 2017). Teachers were engaged in collective inquiry during the DLPD.

Collaborative professional learning: In-school professional development designed specifically for teachers to learn with and from each other in cycles of inquiry and/or through new initiatives to improve student learning (Cranton & King, 2003; Darling-Hammond, Hyler, & Gardner, 2017; Eady, Drew, & Smith, 2015; Killion, 2015; Scherf, 2018). This study's DLPD was framed through the lens of collaborative professional learning which drove the primary research question.

Cognitive literacy processes: Cognitive strategies that help students access text including vocabulary, engaging in prior knowledge, asking questions of the text, summarizing, and organizing (CEEDAR Center, n.d.; Chauvin & Theodore, 2015; Deshler, Mitchell, Kennedy, Novosel, & Ihle, 2012; Fang, 2014; Moje, 2008; Shanahan & Shanahan, 2008). Used synonymously with "content-area literacy."

Concept-based learning: Based largely on the work of Erickson (1998), concept-based learning is not focused on disassociated, rote memorization of content but rather framed through a particular theme or concept that is "timeless, universal, abstract and broad" (p. 56) that requires students to "see patterns and connections" across ideas and subject areas (p. 75). Concept-based teaching also allows for integrative themes across disciplines, thereby requiring abstract thinking and metacognition (Perkins, 1989).

Content-area literacy: Generic reading and writing strategies that help students approach texts in any subject matter (CEEDAR Center, n.d.; Chauvin & Theodore, 2015;

Deschler et. al, 2012; Fang 2014; Moje, 2008; Shanahan & Shanahan, 2008). While "these strategies help with comprehension, (they) are not sufficient for an in-depth understanding of a particular discipline" (CEEDAR Center, para. 2). Moje (2007) refers to this aspect of Disciplinary Literacy as cognitive literacy processes.

Cultural Modeling Framework: Culturally-responsive pedagogy in which teachers connect students' foundational literacy from home and everyday life with their understanding of subject-area functional linguistic processes and disciplinary epistemologies through a cultural navigation lens (Lee, 2007; Orellana & Eksner, 2006). This is an integral aspect of Disciplinary Literacy's strength as a potential tool for teaching about issues of social justice.

Cultural Navigation Lens: Each subject area is a distinct "culture" with its own language, structure, traditions, and rules of engagement (Draper, 2015; Gee, 1999; Moje, 2007; Wenger-Trayner et al., 2014). Moje (2007) advocates that students need to understand their audience to discern when and where to apply disciplinary-precise language and when to communicate in everyday language. See also "code-switching."

Disciplinary Literacy: For the purposes of this study, Disciplinary Literacy was defined as the ability to engage in content area sense-making and knowledge creation based on an epistemological understanding of the discipline and the effective use of specialized vocabulary, text structures, and discursive practices of professionals in that field of study. For a more in-depth study of the Four Lenses of Disciplinary Literacy, see Moje "Developing Socially Just Subject-Matter" (2007).

Epistemological processes: The underlying "cultural norms and practices of a discipline" (Moje, 2007, p. 17). In other words, the ways of knowing and sense-making

within a discipline that dictate how professionals see and respond to the world and organize their language and discourse to communicate those understandings. Also known as Disciplinary Epistemologies (Moje, 2007).

Foundational literacy: The vocabulary, cadence, nuance, and colloquialisms of home and community that affect a child's earliest literacy development (Lee, 2007; Orellana & Eksner, 2006; Zwiers, 2008). This stage is a person's first introduction to language.

Functional linguistics: Specialized vocabulary, text structure, and discursive elements of the discipline (Moje, 2007; Shanahan & Shanahan, 2012). One of Moje's Four Lenses of Disciplinary Literacy. Functional linguistics is a critical component of the new communicative practice standards in all disciplines.

Innovation Configuration Map (IC Map): One of several tools included in the Concerns-Based Adoption Model change-management approach. An IC Map resembles an analytic rubric by "identifying the innovation's major components and describing various uses ranging from ideal implementation to nonuse along a continuum" (Roy & Hord, 2004, p. 56). The codification tool is designed to maintain systemic fidelity when teachers are tempted to refine and adapt a new pedagogical approach to fit their comfort and compliance levels rather than truly transform practice (Hord, Stiegelbauer, Hall, & George, 2006).

Metacognition: Metacognition is thinking about thinking. In the context of Disciplinary Literacy, metacognition refers to the epistemological approach of the disciplines in order for students to develop a "*conscious* meta-strategic knowledge...[of]

the (disciplinary) context of a specific thinking strategy" (Zohar & David, 2009, pp. 179-80). See also "sense-making" and "ways of knowing."

Professional development: Effective professional development must be sustained, collaborative, and focused on student learning outcomes and achievement (Darling-Hammond et al., 2017; Bill & Melinda Gates Foundation, 2014; Learning Forward, 2017; United Kingdom Department of Education, 2016; Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009). Associated elements include modeling, active learning, coaching, reflection, immediate classroom integration, a focus on specific content, and examination of student work (Cranton & King, 2003; Bill & Melinda Gates Foundation, 2014; Greenleaf, Litman, & Marple, 2018; Jeanpierre, Oberhauser, & Freeman, 2005; Killion, 2015; Organisation for Economic Co-operation and Development, 2009; Scherf, 2018; Takahashi, 2011; Warford, 2011).

Professional development evaluation process: Comprehensive, systemic investigation of professional development efforts by community members who conduct purposeful, systematic data collection and analysis from multiple sources to inform decisions about curricula and programming (Guskey, 2002; Killion, 2002).

Professional learning: Professional learning is a comparatively recent approach to teacher training (Scherf, 2018). Teachers are active co-owners in their learning, focusing efforts on collaborative school goals rather than passive, individual growth. I used the terms professional learning and professional development interchangeably throughout the dissertation to avoid semantic hair-splitting and express an overall approach to building teacher capacity.

Professional learning community: For the purposes of this study, a professional learning community was broadly defined as a group of educators who participate in direct instruction and collaborative inquiry about myriad topics related to curriculum, pedagogy, and assessment. This should not to be confused with the very specifically-defined Professional Learning Communities at Work (PLCs) originated by DuFour and Eaker (1998) who frame their learning around analysis of student work using four critical questions.

Reporting categories: Combining similar standards into one category for ease in understanding student growth and progress, such as grouping standards into content knowledge, subject-area skills and practices, and communicating in the discipline. Essentially, the standards are organized into larger reporting categories that convey what students know, what they can do, and what they can communicate in the discipline.

Sense-making: People conceive their understanding of the world through linkages among existing schemas and their predominant ways of knowing. Disciplines also have their own way of understanding the world based on their existing assumptions and underlying epistemologies (Bruner & Winereich-Haste, 2011; Fitzgerald & Palincsar, 2019; Windschitl, 2019). This aspect of Disciplinary Literacy is central to the new communicative practice standards. See also "metacognition" and "ways of knowing."

Standards: Within each discipline, standards are written statements describing what students should know and be able to do at each defined grade level. Standards sets are often written with the assistance of practicing professionals within the specific discipline (Ainsworth, 2013; Common Core State Standards, 2010; Great Schools Partnership, 2014; Guskey & Bailey, 2009).

Standards-based grading: Student progress is monitored against grade-level standards, generally on a four-point scale. In pure standards-based grading, once students master the initial standards, they move to the next grade-level's standards. Conversely, if they are unable to master standards, they repeat learning and assessment until they do (Heflebower, Hoegh, & Warrick, 2014).

Standards-referenced grading: Student progress is monitored and reported against grade-level standards, but students remain within that grade-level for the entire academic year and progress with their cohort (Marzano, 2010). Schools also use standard-referenced grading when combining similar standards into reporting categories for ease in reporting (Guskey & Bailey, 2009). For the purposes of this study, I use standards-based grading and standards-referenced grading interchangeably based on common industry usage.

Teacher efficacy: Teachers' individual beliefs that they possess the competence and capacity to accomplish a task (Tschannen-Moran et al., 1998; Tschannen-Moran & Woolfolk Hoy, 2001). Also referred to as self-efficacy. This was an important component for the development of my study, as individual self-efficacy impacts collective efficacy (Kurz & Knight, 2004; Parker, 1994) and vice versa (Goddard, Hoy, & Woolfolk Hoy, 2000; Tschannen-Moran & Hoy, 2007).

Transdisciplinary: For the purposes of this study, transdisciplinary was defined as the integration of communicative practices and content knowledge standards from numerous disciplines to create problem-driven learning "that is beyond the disciplines" (Meeth, 1978, p. 10). Students collaboratively construct meaning and address a collective provocation based on their understanding of the epistemologies and discursive

methods of various disciplines (Caldwell, 2015; Harvard T.H. Chan School of Public Health, 2020; International Bureau of Education, 2020).

Transformative Learning Theory: I used Mezirow's definition of his theory: in response to a "disorienting dilemma" (Mezirow, 2011, p. 19), Transformative Learning is "learning that transforms problematic frames of reference – sets of fixed assumptions and expectations (habits of mind, meaning perspectives, mindsets) – to make [people] more inclusive, discriminating, open, reflective, and emotionally able to change" (Mezirow, 2003, p. 58). This transformation process can be accomplished through both personal discourse involving an examination of assumptions and autobiographical contexts of new information, and collective discourse by validating or refuting the assumptions and beliefs of others (Mezirow, 2003, 2011).

Ways of knowing: Humans conceptualize the world through four fundamental patterns: empirics, aesthetics, morals, and personal experiences (Carper, 1978). For those schools that follow the International Baccalaureate (IB) curriculum or have adopted elements of their pedagogical approach, "ways of knowing" expands on these four fundamentals into eight specific epistemological understandings including language, sense perception, emotion, reason, imagination, faith, intuition, and memory (International Baccalaureate, 2014). Moje's Four Lenses of Disciplinary Literacy specifically address the language, reason, empirics, and morals of the disciplines. See also "metacognition" and "sense-making."

CHAPTER 2

LITERATURE REVIEW

> *It is this space of encounter, this boundary between person and text, person and person, or person and world where meaning is open to interpretation.*
>
> *– Melissa Freeman (2008, p. 167)*

In this chapter, I establish my epistemological position as the philosophical basis of the study. I then provide an in-depth treatment concerning the emergence of Disciplinary Literacy and establish why this pedagogical approach requires a carefully-designed professional development program to truly address changes in academic standards and reporting student growth in disciplinary-specific communicative practices. Next, I detail the theories of Transformative Learning, Collective Efficacy, and Planned Behavior separately then interweave them with Disciplinary Literacy. I then briefly discuss the evolution of professional development in K-12 education away from individual study to collaborative learning and inquiry. My literature review concludes with an analysis of empirical studies concerning professional learning specifically focused on Disciplinary Literacy. I conclude the chapter with a discussion of previous cycles of research and tie all the components together to confirm the rationale and design for the methodology outlined in Chapter Three.

Epistemological perspective

As an interpretivist, I believe that people understand the world through one's own contextual interpretations and constructions, and these interpretations create multiple "truths" among people and their communities. My perspective is based on decades of experience living on two continents among disparate cultures, simultaneously existing as

a member of various Discourse communities (Gee, 1999). As a museum professional, librarian, graduate student, historian, educator, administrator, foreigner, and American expatriate, I have co-constructed many "truths" *within* these different communities and empathized *across* the communities based on my ability to communicate with them both literally through a shared language or code mixing (Muysken, 2000) and figuratively based on an understanding of culture and mores. Because different groups of people construct multiple "truths," it is imperative to reflect upon and share our individual understandings in order to advance collaboration and, in turn, collectively transform practice (Creswell, 2013).

This interpretivist view framed my problem of practice both in terms of collaborative learning, wherein knowledge is socially constructed (Mezirow, 1997), and collective efficacy, in which all members of a group hold the same shared belief that their combined individual actions can enact positive change (Bandura, 2000). As an interpretivist, I see collaborative professional learning as more than a way to add information to a personal repertoire of knowledge and skills. Rather, participants share their understandings through collaborative learning in order to concurrently transform internal paradigms and build collective efficacy among teams (Brookfield, 1986; MacGregor, 1990; Romer, 1985). Dewey affirms that people cannot learn in the abstract, that everything is contextual and known through experience, because "there is no such thing as an ability to see or hear or remember in general; there is only the ability to see or hear or remember *something*" (Dewey, 1916, p. 65).

Interpretivism is also an appropriate lens through which to examine Disciplinary Literacy. Disciplinary Literacy is the ability to engage in content area sense-making and

knowledge creation based on an epistemological understanding of the discipline and the effective use of specialized vocabulary, text structures, and discursive practices of professionals in that field. Inherently, Disciplinary Literacy is interpretivist as well, given that professionals in each specialization see the world through their own contexts and use unique vocabulary, syntax, and discourse methods to communicate these understandings (Draper, 2015; Gee, 1999; Moje, 2007; Wenger-Trayner et al., 2014). The specialization of discipline-specific language and epistemological perspectives is an important distinction between Disciplinary Literacy and general literacy practices. Following is an examination of the emergence of Disciplinary Literacy over the last thirty years to illustrate why this pedagogical framework is beneficial for students learning in a standards-aligned system.

Disciplinary Literacy

Disciplinary Literacy is a relatively new and specialized pedagogical approach. Elizabeth Moje coined the term "disciplinary literacy" in her 2007 review of more than a thousand pieces of literature related to literacy in all content areas. She found "a range of perspectives highlighting the different disciplinary traditions, theoretical stances, and research *foci* that undergird current work on disciplinary literacy pedagogy" (p. 2). Moje classified these perspectives into four categories, or lenses, including cognitive literacy processes, disciplinary epistemological processes, functional linguistic processes, and cultural navigation (p. 13). Moje's Four Lenses of Disciplinary Literacy appear to be the most definitive and all-encompassing of the myriad approaches to this pedagogical construct and provide many entry points for content area teachers to

integrate these strategies and processes into their instruction, assessment, and reporting schemas.

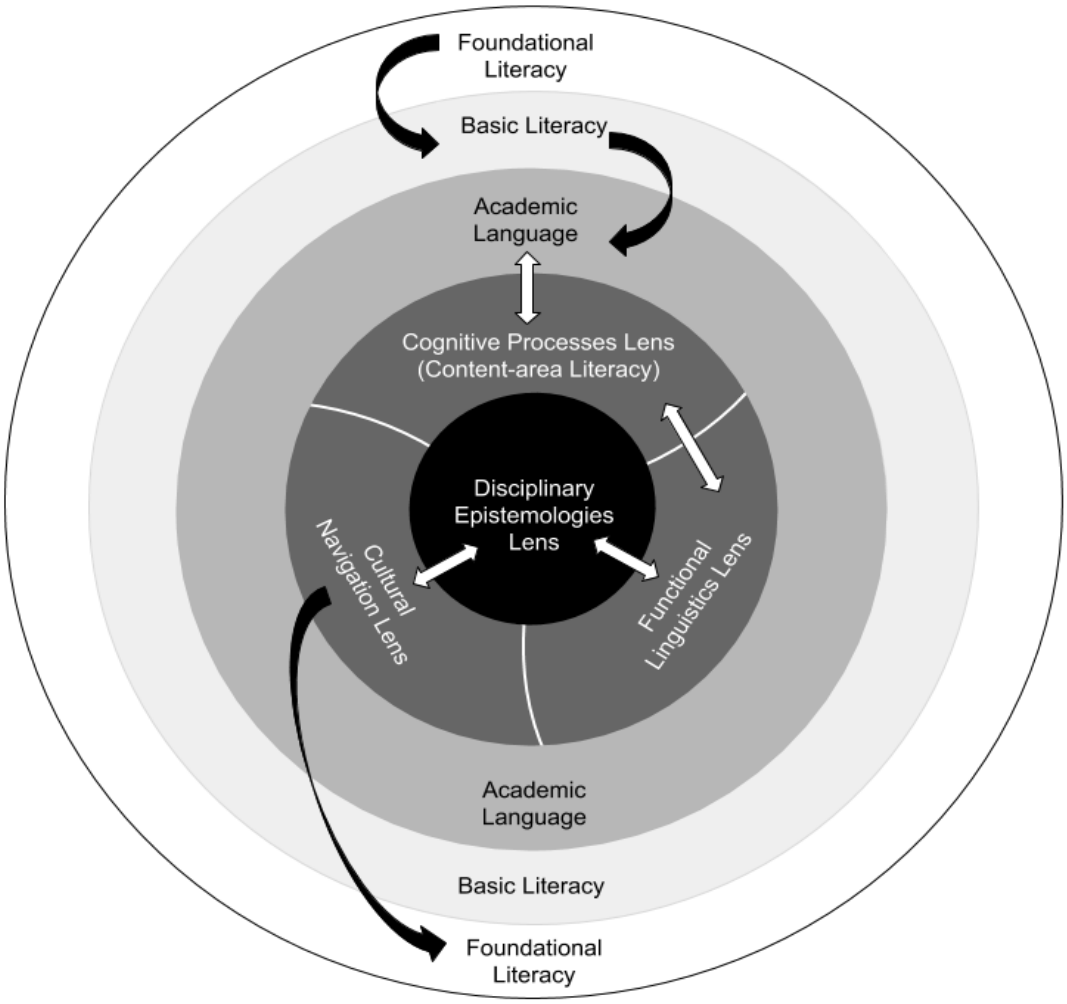
Theory and pedagogy

Long before children enter formal education, the unique linguistic patterns and nuanced speech of parents, siblings, extended family, and community members contribute to a child's literacy development forming their foundational literacy skills (Lee, 2007; Orellana & Eksner, 2006; Zwiers, 2008). When they enter school, children begin their study of basic literacy skills which includes phonics, phonemic awareness, letter identification and word study, vocabulary, composition, fluency, and automaticity (Shanahan, 2005; Zwiers, 2008). The foundational skills of home and the basic literacy skills of early childhood comprise fundamental literacy skills. Once a child gains proficiency in these skills, they progress into general academic language when they first encounter the "language of school" comprised of high frequency academic words, syntactic knowledge, and discourse methods that determine their overall educational success (Friedberg, Mitchell, & Brooke, 2017; Zwiers, 2008; Zwiers, O'Hara, & Pritchard, 2014).

Academic language is the launching point for Moje's Four Lenses of Disciplinary Literacy (Figure 1). Children must first understand the differences between home language and school language to recognize that academic language is formal, complex, precise, organized, substantiated, and rule-bound (Cummins, 2000; Gottlieb & Ernst-Slavit, 2014). Once they realize these differences, students advance into preliminary investigations of discipline-specific vocabulary and discursive elements of the content areas through Moje's cognitive processes lens. The cognitive processes approach

Figure 1

Interaction of various levels of literacy



Note: Moje's Four Lenses of Disciplinary Literacy (2007) include the cognitive processes lens, functional linguistic lens, disciplinary epistemologies lens, and cultural navigation lens at the center of the figure. Arrows indicate the relationships between and among the various levels of literacy.

is more commonly known as content-area literacy because it provides generic literacy tools and strategies for accessing text that can be used in *all* content areas rather than being subject specific (CEEDAR Center, n.d.; Chauvin & Theodore, 2015; Fang, 2014). Content-area literacy promotes the use of tools such as graphic organizers, story

mapping, and know-want-to-know-learned (also known as "KWL") charts (Ogle, 1986) combined with strategies such as question-asking, summarization, and mental imagery to help students' reading comprehension in every subject (Shanahan, 2005).

Teachers use the tools and strategies of content-area literacy to help students move between general academic language and the functional linguistic lens of the disciplines (CEEDAR Center; Chauvin & Theodore, 2015; Deschler et al., 2012; Fang, 2014; Moje, 2007, 2008; Shanahan, 2005). For example, elementary teachers may use the same generic cause-and-effect chart in numerous subject areas to help students learn ways to determine causal relationships between events, people, variables, strategies, or problems. Many middle and high school history, science, math, and fine art teachers (hereafter referred to as "content area teachers") see these generic literacy tools and strategies as the sole domain of English Language Arts teachers. They assume that students will learn these strategies in English class and then automatically translate their use into the other subject areas (Draper, Smith, Hall, & Siebert, 2005; Gillis, 2014). However, content area teachers must explicitly teach students how these tools aid reading comprehension in each discipline (McConachie & Petrosky, 2010; Shanahan & Shanahan, 2008).

Unlike elementary school students, middle school students learn from different teachers who often specialize in one discipline. The structure of language becomes more advanced, and students transit the juncture between academic language and generalized content-area literacy into functional linguistics (Bazerman, 1982; Moje, 2007; Shanahan & Shanahan, 2012; Shulman, 1986). For example, history teachers abandon the generic cause-and-effect worksheet and adopt more specific functional linguistic strategies such

as the Thinking Like a Historian heuristic framework (Mandell & Malone, 2007; Wineburg, 1991). Students begin to internalize understandings of the discipline as a construct rather than using externally-imposed comprehension tools. Teachers integrate metacognitive process strategies such as visible thinking routines (Ritchhart, Church, & Morrison, 2011) and question formulation (Heick, 2018) to prepare students for a move into the ways of knowing and sense-making in the disciplines.

When students matriculate into high school, they shift into Moje's third lens, an epistemological appreciation of the disciplines. Accordingly, based on the communicative practice standards of the Common Core State Standards (CCSS), Next Generation Science Standards (NGSS), National Core Arts Standards (NCAS), and the College, Career and Civic Life (C3) Framework for the Social Studies, students use their established disciplinary vocabulary to engage in inquiry and questioning model texts. They also plan and conduct original work that is supported by evidence and appropriate to task, purpose, problem, and audience. For example, when studying physics, students might utilize a Science Talk-Writing Heuristic (Chen, 2019) to engage in cycles of inquiry and debate concerning scientific claims while using an Origin, Purpose, Content, Value, and Limitations (OPCVL) approach to mirror the historian's practice of examining primary sources (Lynch, 2019) when studying World History.

Students engage in epistemological metacognition by employing these functional linguistic strategies, crafting knowledge claims, and writing for a professional audience (Gee, 2008; Moje, 2007, 2008; Shanahan & Shanahan, 2008; Zwiers et al., 2014). Teachers model metacognitive strategies through visible thinking routines (Ritchhart et al., 2011) as a way to "bridge the gap between expert and novice reasoning"

(Delaney & Golding, 2014, p. 8). In so doing, "educators provide students with access to their specific disciplinary language and assist them to become part of their profession's community of practice" (Delaney & Golding, 2014, p. 8). Students who master the epistemological underpinnings of the discipline are equipped to apply the language, syntax, and ways of knowing to a larger, more altruistic end.

Through her cultural navigation lens, Moje and others view each subject area as a distinct culture with its own traditions and rules of engagement (Moje, 2007; Gee, 1999; Draper, 2015; Wenger-Trayner et. al, 2014). Likewise, youth also comprise a distinct culture with their own semiotic traditions and ways of interacting with the world (Gee, 1999). When students understand the cultures of the disciplines, their own youth culture, and all the associated discourses related to the various cultures to which they belong, they merge these understandings through a cultural modeling framework (Moje, Peek-Brown, Sutherland, Marx, Blumenfeld, & Krajcik, 2004; Orellana & Eksner, 2006) and respond by code-switching between the "languages" of the various cultures (Gardner-Chloros, 2009; Vaughan et al., 2016).

Disciplinary Literacy also offers a potential means to "produce social justice as youth learn to navigate boundaries and question taken-for-granted knowledge, processes, and practices" (Moje, 2007, p. 37). Students who understand the specialized ways of knowing and communicating in the disciplines become "metadiscursive [young adults who] know how and why they are engaging and what those engagements mean for them and others in terms of social positioning and larger power relations" (Moje, 2008, p. 103). Daddow (2015) reminds us that "no literacy is politically neutral" (p. 15), and students empowered with knowledge of the language and epistemology of the established

disciplines can engage in scholarly dialogue and critical consciousness. They can identify language structures that assert a position of authority and respond with a "language of transcendence that complements a language of critique" (Leonardo, 2004, p. 12). Teachers who project their curriculum through a cultural navigation lens empower students to question how knowledge is created in order to disaggregate claims and reconceive them for a modern world.

Development of a theory

Moje's theory of Disciplinary Literacy builds upon several decades of evolving ideas among educational researchers, applied linguists, and literacy experts stemming from an alarmist Cold War-era report on the state of American education. The National Commission on Excellence in Education (1983), in their landmark publication *A Nation at Risk: The Imperative for Educational Reform,* prophesied an economic, political, and social Armageddon based on an "(erosion of) the educational foundations of our society...by a rising tide of mediocrity that threatens our very future as a Nation and a people" (p. 10). In response, literacy and math specialists at both the university and K-12 levels began intense investigations into the ways literacy and numeracy education could be standardized and measured. During the 1980s and 1990s, the United States federal government along with state governments placed a great deal of focus on reading and literacy among K-12 students (Taylor, Peterson, Pearson, & Rodriguez, 2002). At the turn-of-the-century, the National Reading Panel published the results of their three-year qualitative review of almost 400 studies concerning the state of literacy in the U.S. This study became the impetus of the Reading First program mandated under the No Child

Left Behind Act between 2002-2015 and the basis for many literacy-related standards in the Common Core (Shanahan, 2005).

An important finding of the National Reading Panel (1997) concerning reading comprehension directly impacted the evolution of Disciplinary Literacy. Unlike other general literacy skills such as phonics, phonemic awareness, and vocabulary,

> reading comprehension is about the construction of meaning more than about passive remembering...(it is) a form of active and dynamic thinking and includes interpreting information through the filter of one's own knowledge and beliefs, using the author's organizational plan to think about information (or imposing one's own structure on the ideas), inferring what the author does not tell explicitly as well as many other cognitive actions (Shanahan, 2005, p. 28).

To increase students' interactions with texts across all subject areas, the National Reading Panel recommended several distinct reading comprehension strategies including question asking, summation, story mapping, and graphic organizers. They further suggested that *all* content area teachers (math, science, art, history, etc.) be trained to use these generic literacy tools (Siebert & Draper, 2008).

While K-12 educators focused on teaching basic literacy in English Language Arts classes and content area literacy in the subject areas, university researchers investigated other types of literacy. Bazerman (1982), Shulman (1986), and Gee (1999) informed the development of the epistemological processes and cultural narrative lens of Disciplinary Literacy. Bazerman (1982) likened a student's ability to function fully within the various disciplines to a game in which they must "have access to the rhetorical tools" to fully participate (p. 6). Shulman (1986) introduced the idea of pedagogical content knowledge (commonly known as PCK), the combination of subject matter

knowledge paired with a pedagogical understanding of the discipline. Teachers truly aligned with the ideals of PCK not only understand the concepts and ideas of their subject but also how experts in their discipline think, read, write, and understand the world (Ball, Thames, & Phelps, 2008; Delaney & Golding, 2014; Wilhelm & Lauer, 2015). Gee's Discourse Theory (1999) directly informs Disciplinary Literacy by extending beyond reading and writing to encompass the "ways of behaving, interacting, valuing, thinking, believing, (and) speaking…(among) specific groups" (Gee, 2008, p. 3).

Despite the National Reading Panel's claim that every teacher should be a reading teacher (Siebert & Draper, 2008), content area teachers remained largely unconvinced that they should be required to integrate literacy strategies into their teaching. Many content area teachers rejected the contrived manner in which these content-area literacy tools were applied *onto* the subject rather than being integrated *into* or flowing *from* it. This "literacy-content dualism" (Draper et al., 2005) left many teachers confused, conflicted, and complacent. Draper and her colleagues cautioned that the content-area literacy lens failed to account for the epistemological differences noted by Bazerman, Shulman, and Gee. Shanahan and Shanahan (2008) acknowledged that content-area literacy strategies sufficed as tools to foster good readers, but the strategies were too low on the literacy continuum for students to understand and fully engage in the subject matter. Researchers in the new content literacies added the caveat that "every teacher is a teacher...of literacy *as practiced in their disciplines*" (Wilhelm & Lauer, 2015, p. 64). The amalgamation of the National Reading Panel's content-area literacy strategies and the findings of university researchers resulted in the creation of numerous academic standards sets that included elements of Disciplinary Literacy.

Connection to academic standards

Ten years after the National Reading Panel's report, authors of the Common Core State Standards (CCSS) included broad literacy standards to support social studies, science, and technology teachers. These complementary standards enabled history, math, science, and art teachers "to use their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields" (Common Core, 2010, para. 3). Other standards sets such as the Next Generation Science Standards (NGSS), the College, Career and Civic Life Framework for the Social Studies (C3), and the National Core Arts Standards (NCAS) combined content knowledge standards with communicative practice standards specific to the discipline.

While the CCSS remains predominantly tied to generic content-area literacy tools and strategies, the NGSS, C3, and NCAS standards support the Four Lenses of Disciplinary Literacy and the ways in which they can be conceived and applied. With these discipline-specific standards sets, teachers no longer struggle between teaching content and teaching literacy but see the disciplines as "communities of practice as opposed to bodies of knowledge" (Draper, 2015, p. 58). All Four Lenses of Disciplinary Literacy are crucial for students to construct inquiry in a manner that is meaningful and insightful, "for answers are only as deep as the questions that educators and students are able to pose" (Leonardo, 2004, p. 16). Thus, when teachers and students embrace the disciplines as unique communities with their own discourses, they are also able to see the nexus of all the cultures to which they belong for a true transformation of thinking and understanding.

Theoretical frameworks

Disciplinary Literacy is a pedagogical approach that harnesses the power of language and discourse to facilitate inquiry and deepen understanding. Using the strategies of Disciplinary Literacy, students examine the ways of knowing and sense-making among the disciplines. Similarly, tenets of Transformative Learning Theory and Collective Efficacy highlight collective discourse and personal reflection as ways to examine beliefs and adapt to change. I chose these theories as the framework for the study because of teachers' pre-existing beliefs about teaching and learning that are being challenged by the introduction of new standards and grading paradigms. By examining the origins of their underlying beliefs, teachers may be open to truly transforming practice rather than co-opting a veneer of change.

Transformative Learning Theory

The theory of Transformative Learning, developed by Jack Mezirow in the 1970s, is an andragogical exploration into the ways which adults examine current paradigms to enable shifts in personal and social thinking (Mezirow, 1997). Transformative Learning Theory posits that adults are able to transform their pre-existing beliefs and frames of references in response to a "disorienting dilemma" in order to assimilate new understandings and change corresponding attitudes and actions (Mezirow, 2011, p. 19). Mezirow defines the theory as "learning that transforms problematic frames of reference – sets of fixed assumptions and expectations (habits of mind, meaning perspectives, mindsets) – to make people more inclusive, discriminating, open, reflective, and emotionally able to change" (Mezirow, 2003, p. 58). People accomplish this transformation by critically reflecting on their own assumptions that have been framed

from long-developed habits of mind and points of view. This perspective transformation ultimately results in changed actions and critical thinking (Mezirow, 1997).

Transformative Learning Theory is constructivist in conception because it stresses that the learners must actively engage in meaning-making through their own practice and in dialogue with others to understand new ideas and perspectives. Mezirow grounds these types of learning in the Critical Social Theory of Habermas and his domains of knowledge which influence learning (Habermas, 1971). Through instrumental learning, the learner "centrally assess(es) truth claims…with an emphasis on improving prediction and performance" (Mezirow, 2003, p. 59). In communicative learning, the learner focuses on understanding the meaning and motivations of others. Together, these two types of learning enable learners to create their own meaning by examining personal thinking, clarifying the assumptions and intent of others' thinking, and engaging in discourse with the intent of mutual understanding and collective change.

Transformative Learning Theory also recognizes that adult learners often willfully choose to disregard "disorienting dilemmas" that counter their underlying, pre-existing assumptions (Mezirow, 2011, p. 19). This conflict between the new and the known is often the bedrock of resistance to systemic change in organizations, causing teachers to focus professional learning on work-specific, immediately-applicable strategies to comply with change. Such an approach to piecemeal, stop-gap professional development concerning only "core elements without some awareness of a larger theoretical orientation and its underlying purpose [can ultimately become] rudderless teaching" rather than transformative thinking (Taylor, 2011, p. 5). For that reason, professional learning must challenge adults to transform autobiographical contexts through personal

reflection informed by a collective examination of the assumptions and beliefs of others while simultaneously making connections between theory and practice (Mezirow, 1997).

Critics of Mezirow see fault in both the personal and group change process. Howie and Bagnall (2013) believe there is an underlying inability of individuals to truly engage in self-reflective practice, making the theory subject to the logical fallacy of "circular causality dilemma" (p. 819). Taylor and Cranton (2013) cite the Western bias of the theory and a lack of information concerning non-Western ways of learning and knowing. They also echo Collard and Law (1989) who assert that Mezirow fails to make the connections between personal "enlightenment" and collective change. Mezirow cites Freire (1968) in his response to these criticisms, stating that humans shift their mindset through critical dialogue and personal growth rather than through group indoctrination. As such, only through shifts in individual paradigms is there hope for like-minded individuals to engage in collective action (Mezirow, 1989).

Transformative learning is "teaching for change" (Taylor, 2006, p. 3); therefore, schools adopting new pedagogical approaches, new standards, and new reporting schemes must ground teachers' professional learning in inquiry, discourse, and reflection. Alcantara, Hayes, & Yorks (2011) assert that

> collaborative inquiry is aligned with Transformative Learning Theory in three ways: establishing a social space that actualizes the conditions for engaging in effective discourse; following an epistemic framework that is holistic, integrating feeling with cognitive knowing; and fostering critical reflectivity on personally embedded assumptions and premises (p. 252).

As such, transformative professional development must equip the adult learner with the skills and strategies to become critically reflective and engage in discourse with

others engaged in transformation. The Innovation includes aspects of Transformative Learning Theory through the use of metacognitive reasoning processes including personal discourse, meaning the examination of assumptions and autobiographical contexts of new information, and collective discourse, such as validating or refuting the assumptions and beliefs of others (Mezirow 1978, 1991, 1997, 2003).

Theory of Planned Behavior

In this study, I also incorporated Ajzen's Theory of Planned Behavior (1985) to help explain how individuals' behaviors contribute to their motives to participate in transformative change and collaborative professional learning. The Theory of Planned Behavior suggests that people's willingness to learn new things or enact change is affected by key determinants of behavior including a person's antecedent attitudes and pre-existing beliefs toward the desired behavior (or new information), the social norms expected of the person, and the external limitations and factors that affect the person's willingness to change (Ajzen, 1985). Complementing Mezirow's Transformative Learning Theory, the Theory of Planned Behavior supports the idea that adults understand and approach the world through fixed, although not immutable, habits of mind that require individual critique for transforming one's perspective.

Collective efficacy

As professional colleagues undergo transformative learning together, there is a possibility that their common experience will lead to a sense of collective potency. A relatively new theory, collective efficacy is defined as "a group's shared belief in its conjoint capability to organize and execute the courses of action required to produce given levels of attainment" (Bandura, 1997, p. 477). Tschannen-Moran et al.'s (1998)

model demonstrates the interrelatedness of collective efficacy and individual teacher self-efficacy. This model integrates Bandura's four sources for efficacy — mastery experience, vicarious experience, social persuasion, and emotional arousal — with internal contextual factors, such as self-perceptions of competence and external contextual factors including task and availability of resources. An individual's cognitive processing of the four sources for efficacy determines one's perception of task and competence which influences the degree to which s/he experiences efficacious feelings concerning her/his teaching (Tschannen-Moran et al., 1998). In other words, when teachers experience mastery and social approval, they feel competent to perform most assigned tasks with the resources provided rather than blame the constraints of external limitations.

The essential elements of collective efficacy mirror those of self-efficacy because "personal agency operates within a broad network of socio-structural influences...and extends the analysis of mechanisms of human agency to the exercise of collective agency" (Bandura, 1997, p. 6). Although the same common components exist, the analysis of tasks and resources from self-efficacy become targeted at the organizational level, and the assessment of faculty is collective not individual. Collective efficacy, therefore, combines aspects of Mezirow's internal transformation through reflection and group discussion with Azjen's external environmental restraints.

Bandura (2000) discusses two ways by which collective efficacy can be measured: aggregating personal efficacy scales, or aggregating individual responses concerning the group's performance. He uses the analogy of a gymnastic team's score, which is the sum of the individuals' scores, versus the scores of a soccer team, which

results from players working together. Goddard, Hoy, and Woolfolk Hoy (2000) find the aggregating of individuals' self-efficacy scores troubling because "one must consider whether an assessment of collective teacher efficacy should ask teachers about perceptions of themselves or ask about perceptions of the faculty as a whole" (p. 486). Through several years of piloting surveys, these scholars confirmed that collective teacher efficacy is best determined by asking teachers about their team's competence, group processes, and task analysis rather than a summation of individual efficacy beliefs (Eells, 2011; Goddard, 1998). Therefore, in this study, I employed collective efficacy measurement tools designed to assess the ways in which teachers believed their collaborative professional learning contributed to their sense of team and increased their ability to address pedagogical changes together rather than aggregating results from individual self-efficacy scales.

Theoretical congruence

The study's problem of practice centered on the "disorienting dilemma" of pedagogical change (Mezirow, 2011, p. 19). The first research question sought to identify a correlation between *collaborative* professional learning about this pedagogical disruption and the impact on teachers' *collective* efficacy. Transformative Learning Theory's andragogical understanding that adult learning is often job-focused and involves a collective processing of perceptions about competencies and constraints is an essential component of collective efficacy. Without true transformation and collaborative accountability, teachers may merely exhibit momentary compliance with the new standards by co-opting limited aspects of Disciplinary Literacy into existing beliefs rather

than genuinely and deeply changing paradigms for the required shift in pedagogical implementation.

My study was also suited for melding Transformative Learning Theory and Collective Efficacy Theory because it involved "a small number of individuals in a specific context or related to a specific issue" (Taylor & Cranton, 2013, p. 42). Collective efficacy is the result of active and dedicated participation in high-functioning professional learning communities (Voelkel & Chrispeels, 2017) which in turn impacts student learning (Eells, 2011). Through collaborative discourse with other members of their professional learning community, teachers would not only be *transforming their beliefs about* Disciplinary Literacy but *modeling the construct of* Disciplinary Literacy through their use of educational jargon concerning the new communicative standards, instructional design and assessment, and the specialized languages of the disciplines themselves.

Professional development for K-12 teachers

In the following section, I present a review of literature concerning research-based, andragogically-sound theories of professional development that informed the development of the Disciplinary Literacy Professional Development innovation. This review includes systemic and systematic ways for schools to ensure that the design of professional learning programs builds teachers' competence and capacity for student growth and achievement. To place my study in the context of larger scholarly research, I reviewed empirical studies concerning professional development specifically addressing Disciplinary Literacy. I conclude the chapter with an account of the study participants'

prior professional learning about Disciplinary Literacy as informed by students' participation in an application of subject-specific dialogue to a common provocation.

Designing and evaluating teachers' professional learning

Recent studies across numerous countries and educational systems all conclude that effective professional development must be sustained, collaborative, and focused on student learning outcomes and achievement (Darling-Hammond et al., 2017; Bill & Melinda Gates Foundation, 2014; Learning Forward, 2017; U.K. Department of Education, 2016; Wei et. al., 2009). Successful professional development experiences are not born of happenstance, however. Over the last thirty years, educational researchers consolidated and refined numerous methods and tools for designing professional development events and programs (Hord, 1987; Hirsh, 2007). These *Standards for Professional Learning* focus on seven areas: learning communities; leadership; resources; data; learning designs; implementation; and outcomes (Learning Forward, 2017). More than 40 American states have adopted these standards for professional development (Wei et al., 2009), and international schools target professional development toward collaborative, deep learning that is practical, applicable, and measured against student learning (Hewitt, 2018). While discrete professional development workshops may be efficacious for individual teacher growth, systems-wide professional learning plans are necessary to develop the capacities of all faculty and ensure coherence with a school's mission, vision, and student performance goals.

Stakeholders demand accountability for the resources dedicated to upskilling teachers' practice. Evaluating professional development involves comprehensive, systemic investigations by community members who conduct purposeful, systematic data

collection and analysis from multiple sources to inform decisions about curricula and programming (Guskey, 2002; Killion, 2002). Effective evaluation processes include a detailed framework for collecting data about participants' immediate learning, their sustained implementation of new knowledge into practice, the extent of organizational transformation, and the degree of student improvement related to teacher learning (Guskey, 2002). This level of institutional transparency calls for administrators to shift their understanding of professional development from designing solitary events to crafting a holistic system that is inclusive of numerous initiatives, internally-driven by stakeholders' needs, and collaboratively focused on solutions through reflective dialogue (Killion, 2017).

Professional development concerning Disciplinary Literacy

To ensure that my study complemented the existing research concerning teacher professional development about Disciplinary Literacy, I reviewed several empirical studies through the lens of my research questions' subconstructs, looking specifically for aspects of collaborative learning rather than individual study, elements of effective professional development that meet the standards of the field, and indications of impact on collective teacher efficacy. Some researchers investigated the role of professional development in cultivating self-efficacy (Abercrombie, 2018; Keys, 2016; Saraceno, 2019), yet no researcher addressed collective efficacy as a part of their Innovation. Different theoretical beliefs concerning Disciplinary Literacy present in the variations between and among the types of professional learning teachers received.

Content-area literacy focus or holistic Disciplinary Literacy approach

Teaching the communicative practices can be done through an approach focused solely on content-area literacy tools and strategies (Fang, 2014; Gillis, 2014; Greenleaf et al., 2018; Keys, 2016; Saraceno, 2019) or through a more holistic Disciplinary Literacy approach (Abercrombie, 2018; DiDomenico, 2014; Monte-Sano, De La Paz, Felton, Piantedosi, Yee, & Carey, 2017). Melding the epistemology and discourse of the disciplines with content and delivering it in such a way that piques student inquiry and connects them with existing understandings of the world is best addressed through the more holistic approach (Moje, 2007, 2008; Shanahan & Shanahan, 2008). However, the ultimate decision depends on the needs of the students, the theoretical beliefs of the professionals involved in the design of curriculum, instruction, and assessment, and the school's philosophy concerning professional development.

Collaborative learning, inquiry, and reflection.

The importance of collaborative learning and inquiry featured predominantly in many of the professional development studies, most concluding that "teachers who developed the richest inquiry relationships described themselves as having the opportunity to work with others who shared compatible or complementary interests, working styles, philosophies, expertise, and/or backgrounds" (Butler & Schnellert, 2012, p. 1214). Numerous studies linked inquiry with transformative professional development, finding professional collaborative communities who engaged in inquiry-based professional development benefited from the trust, respect, and different learning styles of their colleagues (Abercrombie, 2018; Greenleaf, et al., 2018; Steyn, 2017) .

Reflection is also an integral part of teacher professional development (Ferreira Vesga, 2016; Monte-Sano et al., 2017; and Powell, 2018), especially when tied to collaborative inquiry (Abercrombie, 2018). As teachers cycle between personal reflection and collective discourse about their understandings of theory, strategies, and the disruption to their known paradigms, "they can engage iteratively in accessing resources to inform practice and generating knowledge through reflections on activity" (Butler & Schnellert, 2012, p. 1209). Reading and reflecting on research and reviewing each other's curriculum maps are important components of integrating theory with practice (Abercrombie, 2018). Reflection is also an essential component of Transformative Learning Theory (Mezirow, 1997, 2001).

Integrating theory into practice.

Connecting content area teachers with the thoughts of experts in the various disciplines is a critical component of professional learning (Darling-Hammond, et al., 2017). Engaging teachers with professional literature or through conversations with experts reinforces their understandings about the epistemology and discourse methods of the disciplines (Aumen, 2017). If teacher training fails to connect with the deeper theory of why these changes are needed, then teacher learning will be superficial and focused on the use of layering generic tools on top of existing content rather than the multiple, deeper lenses of disciplinary-specific investigation and communicative practices (Hillman, 2015; Powell, 2018).

Impact on the Innovation.

Building upon the aforementioned existing research, the DLPD addressed the need for a study incorporating a) *collective* efficacy; and b) intentionally making

connections between and among *all* lenses of Disciplinary Literacy with a focus on functional linguistics and disciplinary epistemology (Figure 1). The methodology was purposeful in its design so that all data collected was meaningful and informative to the research questions (Aumen, 2017). Activities and resources were directly tied to upcoming changes in school policies and adoption of new communicative standards (Aumen, 2017; Fang, 2014; Hillman, 2015; Powell, 2018), supportive of teachers' time and workload (Monte-Sano et al., 2017), and immediately impactful on practice (Abercrombie, 2018). For example, teachers examined their own curriculum maps using an Innovation Configuration Map (Appendix A) I designed specifically to help guide the integration of discipline-specific communicative practices. In addition, I created a crosswalk (Appendix B) among all the standards sets and the Innovation Configuration Map, highlighting entry points for transdisciplinary endeavors. To support teachers in using these practices, I provided strategies such as visible thinking routines, question formulation, heuristics, noticing protocols, and cross-disciplinary writing strategies. The original design also included personal reflection through their Teacher Reflective Journals, collaborative inquiry through common professional readings (Aumen, 2017; Butler & Schnellert, 2012; Greenleaf, et al., 2018; Steyn, 2017), and "teaching on a diagonal" (McConachie, 2010) through the creation of an inquiry-based, transdisciplinary lesson.

Previous cycles of action research

Many teachers in the study participated in previous school-based professional learning concerning Disciplinary Literacy. I initiated the first workshops after the leader of the Grade Nine Faculty Team approached me in January 2019 concerning strategies

for designing an interdisciplinary unit. From mid-January through the end of May 2019, teachers met for eight sessions to examine standards for communicative practices in their own subject area and others in order to find entry points for connecting content and discourse. We used a very basic approach to Disciplinary Literacy as the lens for these activities. My research focus for what came to be Cycle One revolved around whether the co-construction of a common provocation for students would inform teacher understanding of Disciplinary Literacy in other content areas and if collaborative learning impacted teacher self-efficacy.

After the first session, the complexity of Disciplinary Literacy and its connection to solving their problem of creating interdisciplinary units left them confused and frustrated. I abandoned all my previous ideas and reconceived the entire approach to "learning by doing" – an active, intentional, authentic process of integrating the content and communicative practices of experts into project-based inquiry through a design thinking lens (Dewey, 1916; Spires Kerkhoff, Graham, & Lee, 2014). In the second session, I showed the teachers a painting by Hudson River School artist Thomas Cole entitled *The Course of Empire: Desolation* (Figure 2) giving only the prompt, "respond to this painting using the lens and language of your discipline." They wrote for fifteen minutes then shared their reflections.

The Science teacher talked about wave action, plants, and other aspects of nature while the artist mentioned color, tone, and technique. The Math teacher discussed several aspects of geometry, commenting on the fractals found in the ferns. The English teacher wrote a poem, and the Social Studies teacher recounted the collapse of the Roman empire. Finally, the Physical Education teachers remarked that the artist must have had a

Figure 2

Cycle One provocation to begin discussion of Disciplinary Literacy

Note: *The Course of Empire: Desolation* by Thomas Cole, 1836. Oil on canvas. Used with permission of the "Collections of the New-York Historical Society".

decent fitness level to climb to such a vantage, if it was done from life, and they most insightfully calculated the daily caloric intake needed by the people who built the structures depicted in the painting. Everyone marveled at the ways in which every single person connected with the common provocation while seeing something completely different. They were most impressed with the myriad ways different teachers used the same word, such as "value," with very different meanings. Each teacher left the session thinking more deeply about the ways in which they used language in their classroom. The Social Studies teacher mentioned "how I don't do this much detail for my students as

I did for this exercise." The Art teacher[1] "thought about the power of teacher modeling – 'this is how I think about x…' – which gives (students) a greater appreciation for the specialist thinking of their teacher."

During the next session, I shared more about the theory and method of Disciplinary Literacy as it connected to the previous activity. Teachers came to see how fusing Disciplinary Literacy, design thinking, and project-based inquiry could result in students' critical analysis about a problem or condition, make connections across different disciplines, empathize with the perspectives of others, and synthesize information for argumentation and presentation (Dam & Siang, 2019; Spires et al., 2014). To achieve these same aspirations for our students, we investigated ways to engage the Ninth Graders in a similar exercise to the painting provocation. Teachers submitted provocation ideas applicable to every discipline that also connected to the school's mission. Ultimately, the teachers chose a short video (AJ+, 2015) about a performance artist in China who vacuums the air and makes bricks from the collected particulate matter. They chose this video above others because of its connection to standards in math, science, art, and social studies as well as the school's environmental initiative.

During the last week of school in May 2019, the teachers and students spent a morning engaged in discussions concerning the provocation from the point of view of professionals in their subject. Students selected their top three subject-areas preferences via an online survey, and the teachers and I placed them in "Affinity Groups" to act as

[1] The Art teacher mentioned in these previous cycles of research was not the same as the DLPD participant in this study.

experts in the disciplines. After watching the video, each subject-area group spent twenty minutes responding to the following questions using the professional language of their discipline: What are the things a _____ would "see" in this video?; What would they care about when watching?; What vocabulary of your subject area is unique to this response?; What questions would a _____ ask of this video?; and How is this video a springboard to action for someone in your subject area? While the students charted their responses on a large poster, the subject-area teacher silently noted students' use of disciplinary-specific language, demonstration of conceptual understanding without using discipline-specific vocabulary, and use of the discipline-appropriate discourse methods and epistemological approach.

After 45 minutes, the Affinity Groups shared their posters with an assigned partner group (e.g. math with art and science with social studies). Teachers asked them to note similarities and differences between their group's response and their colleagues' observations in other subject areas. While the students talked, teachers categorized the types of questions and comments the students asked of each other based on three themes: content; language; and ways of thinking (Appendix C). At the end of the morning, the original Affinity Groups reconvened to share their thoughts on the experience.

Students were intrigued by the ways in which the same video was interpreted in many ways. Artists looked at how the brick could be used to make art whereas mathematicians looked at the dimension/volume of the brick and scientists looked at its chemical composition. One group noticed that art and history talked more about why the man made the bricks while science and math focused on how. Another group noted that some groups sought a solution to the pollution problem that caused the particulate matter

while others sought to blame the polluters. One group noticed that artists and mathematicians both used geometry in their response, with one of the students commenting, "music is math you can hear." Based on the data from the Student Exit Surveys[2] (Appendix D), students believed they needed more discipline-specific vocabulary as well as the ability to differentiate between, and make connections among, the "perspectives" (*in vivo* coding for "ways of knowing") of each discipline.

The following fall, the Grade Nine Faculty Team reflected on the previous year's exercise and sought baseline data for the current year's cohort guided by the question: were last year's results unique or systemic? Using the same procedures and data-gathering tool (Appendix C) as the preceding year to ensure consistency across data sets, the teachers and I crafted a new approach to the provocation. Rather than watch a video, the students went on a "Perspective Walk" around the neighborhood to authentically engage with their community. Due to the fall semester timing of the session, the Perspective Walk and corresponding jigsaw sharing session took place over two, 70-minute sessions held one week apart rather than in a three-hour morning session like in May.

Accompanied by a faculty member and shadowed by a plainclothes security officer, each Affinity Group walked a predetermined route around the campus. Before the walk, teachers informed them to look through the lens of their discipline and

[2] The Student Exit Surveys were not included as part of this study's data set because the results did not inform for this study's research questions. Rather, teachers utilized feedback from the exit surveys to inform for their understanding of how Disciplinary Literacy presents in students' understanding of their discipline through the lens and language of their subject matter. This understanding helped them reflect on the communicative practice standards that address the lens and language of their subject area. They were then able to make any necessary adjustments in lesson design and assessment practices using the Innovation Configuration Map (Appendix A) and complementary standards crosswalk (Appendix B). A sample of the Student Exit Survey is included in Appendix D as reference.

document their thoughts however they wished. We decided to allow the students to document their observations and wonderings in any manner they chose, thinking that their choices may reveal the epistemological beliefs of their particular lens. For example, the artists may wish to visually document their observations while the linguists may wish to write. Students walked for 30 minutes then returned to their classrooms and completed their observation poster within their respective Affinity Groups. The following week, student groups completed the jigsaw sharing protocol while teachers made notes of the interactions.

Much like the May cohort, each discipline in the November cohort reacted differently to the provocation. Scientists looked more at the "flora and fauna" while the social scientists and the English students looked at the human aspects of the neighborhood. The scientists commented that the English students only looked at the outside of things while they "look more at the core." The English students responded that scientists set limits to what they see, but their discipline is "practically limitless" in possibilities. All of the students noticed the enormous amounts of trash: the artists noticed the graffiti; the scientists worried about the impact on the environment; and the social scientists cited a cultural understanding of public spaces that differs from the West and further blamed a lack of government intervention. Each disciplinary group also commented about the various types of buildings they observed. The scientists talked about the local sandstone and limestone used in the construction of all the buildings. The social scientists mentioned the architectural style as a reflection of the area's cultural heritage while the artists mentioned that "even though everything is the same beige color, there are different textures and shades." The mathematicians talked about patterns,

angles, and lines, and the English group concocted stories about the people who lived and worked in the buildings.

During data analysis, the teachers and I noted interesting differences between the May and November exercises. The most marked difference was the number of participants and their levels of engagement in the activity. Students in the May 2019 cohort (n = 25) chose to come to school during "dead week" (after final grades are submitted) when many of their classmates chose to remain home. The November 2019 cohort (n = 52) represented a more authentic expression of the population because the sessions were held on a Tuesday during regular school timings when the entire grade level was in attendance. Another consideration was the length of instructional contact for each class. The November 2019 cohort had only received three months of instruction whereas the May 2019 cohort had a full year. This may have affected the students' responses on the exit surveys concerning their comfort in talking about this provocation with an expert "using their specialized language and ways of thinking": 80% of May respondents were "comfortable" or "very comfortable" whereas only 29% of November respondents answered similarly. Relatedly, the cognitive and social-emotional development between the start and end of the first year of high school (Blakemore, 2011) may have accounted for the overall maturity and completeness of the May 2019 responses whereas many of the November 2019 responses were flippant and disconnected from the activity. Finally, dividing the experience over two weeks could have affected the types and number of contributions during the jigsaw sessions based on time between the provocation and sharing their thoughts.

Overall, students in both the May and November groups expressed a desire to learn more about why each discipline reacted differently to the same provocation and how knowing the specialized vocabulary might help them better communicate their feelings about what they saw. Specifically, most students in both May and November were upset about the damage to the global environment and want to act but lack the "right science talk that adults want" in order to do so. Expressed pedagogically through Moje's Four Lenses of Disciplinary Literacy, students want more specific instruction in the epistemology, functional linguistics, and cognitive processes of the disciplines.

Teacher observations of students reacting to provocations through the language and lenses of various disciplines coupled with their own rich narratives confirm the need to be more intentional in teaching communicative standards and informed for targeted professional learning in the DLDP sessions. First, the feedback helped identify which of the communicative standards required the most attention when developing curriculum maps and assessments in each subject area. Second, based on the type of communicative practice (language, discourse, epistemology) identified, I chose tools and strategies that best aligned with the instructional approaches of each subject area and personal style of the teacher. These considerations are noted in the "Innovation: Disciplinary Literacy Professional Development, Part I" section of Chapter Three.

Conclusion

The preceding literature review, summary of previous cycles of professional learning, and analysis of the participants' and my work with students reveal several connections that necessitated this study. Thirty-five years ago, a federal inquiry set in motion a flurry of research and teacher education concerning various aspects of literacy.

This research included a focus on reading comprehension and communicative practices that manifested in new academic standards in all subject areas between 2010 and 2014. Shifts in grading and reporting student progress in the communicative practices accompanied the advent of the new standards. These communicative practices require students to read, write, think, and respond to content knowledge like experts in the various disciplines. Observations of students who were shown a common provocation and then asked to think and speak as experts in respective fields, however, indicated this was a growth area for teachers' professional learning.

These two paradigmatic shifts in teaching and assessment caused disruption among teachers and necessitated professional learning to address immediate needs and facilitate systemic transformation. One way for teachers to address these pedagogical changes is through the panoptic framework of Disciplinary Literacy which includes tools and strategies to address the unique language, discursive methods, epistemological understandings, and cultural orientations that comprise the communicative practices of each subject area (Moje, 2007). Incorporating andragogical strategies and transformative learning theories into deliberately-designed professional development workshops is an essential component to personal growth and institutional change. As Eells (2011) argues, collective teacher efficacy is the primary determinant of student achievement, and yet, there is a lack of empirical research concerning how teachers' collective efficacy influences professional development about Disciplinary Literacy. My study begins to fill this gap in that research *corpus*, as it explored how collaborative professional development among teachers influenced their collective efficacy and contributed to their ability to employ Disciplinary Literacy in their pedagogical changes.

In Chapter Three, I outline the mixed-methods action research approach of this study, including the DLPD, data collection process, instruments, and data analysis approach. I discuss the underlying rationale for each professional development session and detail the ways in which the theoretical frameworks, elements of effective professional development, and findings of similar research are expressed in the content focus, resource selection, and collaborative activity. I also tie the data collection process and associated quantitative tools – survey and Innovation Configuration Map – and qualitative tools – Account of Practice and teachers' reflections – directly to the subconstructs of Research Question 1 and Research Question 2. Tables and figures complement the narrative and provide visual explanations of these complex connections.

CHAPTER 3

METHODOLOGY, INNOVATION, AND DATA ANALYSIS

> *The promise of practitioner-driven research is that the learning emerges from local, situated inquiry, and...that is where the hope is: in the stories, in the data, and in the evidence that emerges from a more relational, contextualized, collaborative, and practice-centered kind of research – the kind that emerges from knowing and caring about people in a setting, the kind that emerges when practitioners take seriously the responsibility to collaborate with, care for, support, and empower ourselves, our colleagues, and our constituencies.*
>
> *– Sharon Ravitch (2014, p. 6)*

Research Design

The purpose of this study was to ascertain the ways in which participation in collaborative professional learning about Disciplinary Literacy impacted teachers' collective efficacy and individual competency to transform practice in response to pedagogical change. I constructed this study through an interpretivist lens with groundings in Mezirow's Transformative Learning Theory (1997, 2003, 2011), Bandura's Collective Efficacy Theory (2000), Ajzen's Theory of Planned Behavior (1985) and Moje's Four Lenses of Disciplinary Literacy (2007). I used a multi-strand mixed-methods action research approach, integrating both qualitative and quantitative data at numerous points in the study to inform and enhance each other (Ivankova, 2015; Mertler, 2016). These data were analyzed using a qualitative-dominant mixed analysis (Onwuegbuzie & Combs, 2011) in order to address the following research questions:

1) what role does collaborative professional learning have on teachers' collective efficacy when confronted with pedagogical change?; and

2) in what ways does Disciplinary Literacy equip teachers to address the pedagogical changes of adopting and reporting to communicative practice standards in their subject areas?

Miskovic and Lyutykh (2017) assert that "merely asking a research question...reveal(s) what we deem important and worth researching" (p. 2712). Embedded in my research questions was the assumption that the most efficacious ways for teachers to transform practice when confronted by a disorienting dilemma is through collaborative dialogue and meaning-making. Many "decision junctures" (Koro-Ljunberg et al., 2009, p. 689) arise when designing a methodology that addresses all of the research questions' constructs. To inform my choices at each of these junctures, I first disaggregated the research questions to operationalize the constructs within each question. These subconstructs informed my research methodology and methods, particularly my data collection and analysis methods, to ensure alignment of methodological congruence (Birks, 2014; Charmaz, 2014; Creswell, 2013).

For Research Question One, I identified three subconstructs. These included collaborative professional development, collective efficacy, and pedagogical change. *Collaborative professional learning* involves in-school professional development designed specifically for teachers to learn with and from each other in cycles of inquiry and/or through new initiatives to improve student learning. *Collective efficacy* involves "a group's shared belief in its conjoint capability to organize and execute the courses of action required to produce given levels of attainment" (Bandura, 1997, p. 477). In the case of this study, the *pedagogical change* involved the adoption of new academic standards coupled with a switch in grading and reporting practices that

included disciplinary-specific skills and communicative practices. This last construct inaugurated the pedagogical framework of Disciplinary Literacy as the focus of the Disciplinary Literacy Professional Development (DLPD) session and the development of the second research question which investigated individual teacher's understanding of the theory, tools, and strategy of Disciplinary Literacy as it related to curriculum and assessment design in his or her subject area.

To guide the forthcoming discussion concerning this study's research design, I included an overview of the methodological congruence among the research questions, theoretical framework, data collection tools, and data analysis methods (Table 1). Each subcontract of the research questions aligned with a specific underlying theory that

Table 1

Methodological congruence

Research Question 1: What role does collaborative professional learning have on teachers' collective efficacy when confronted with pedagogical change?

Research Question 2: In what ways does Disciplinary Literacy equip teachers to address the pedagogical changes of adopting and reporting to communicative standards in their subject areas?

Elements of Research Questions	Theoretical Framework	Data Collection	Data Analysis
RQ1: Collaborative professional learning RQ1: Collective efficacy RQ1: Pedagogical change	Transformative Learning Theory (Mezirow, 1997, 2003, 2011) Collective Efficacy (Bandura, 2000) Theory of Planned Behavior (Ajzen, 1985) and Disciplinary Literacy (Moje, 2007)	*Pre- and Post-Survey* Standards of Professional Learning (Learning Forward, 2017) informed development of professional learning questions 1-9 to measure teacher beliefs about the quality for professional development at their school. "Collective Teacher Beliefs" scale (Tschannen-Moran & Barr, 2004) informed	Compare questions pre- and post-DLPD within each subconstruct using paired sample t-test. Compare questions across subconstructs using descriptive statistics and a paired sample t-test between and among the subconstructs.

RQ2: Disciplinary Literacy		development of collective efficacy questions 10-29 to measure teachers' beliefs about the level of collective efficacy at their schools. Theory of Planned Behavior scale (Fishbein & Ajzen, 2010) informed development of Disciplinary Literacy questions 30-37 to measure personal intent for growth concerning pedagogical change.	
RQ1: Collaborative professional learning RQ1: Collective efficacy	Transformative Learning Theory (Mezirow, 1997, 2003, 2011), especially the idea of *collective* discourse in a professional learning community during this periods of pedagogical change for collaborative accountability.	*Account of Practice* A "systematic and careful documentation of all procedures—an *account of practice*—to provide a record for (my) ongoing contemplation" (Freeman et al., 2007, p. 26).	Thematic analysis, concept-driven *a priori* from subconstructs of survey. Deductive, data-driven coding, identify emerging themes as narrative subcategories as they emerge.
RQ2: Disciplinary Literacy RQ1: Collective efficacy	Transformative Learning Theory (Mezirow, 1997, 2003, 2011), especially the idea of *personal* discourse through a reflective examination of assumptions and autobiographical contexts regarding new information. Collective Efficacy (Bandura, 2000), particularly tenets of emotional arousal and mastery experiences.	*DLPD transcripts, teacher communications, and teacher-volunteered artifacts* Concerning his/her experiences with collaborative learning and understanding of Disciplinary Literacy, modeled off Ross & Rallis (2012) heuristic framework of "do-ability (feasibility), want-to-do-ability (interest) and should-do-ability (ethics and politics)" (p. 114).	Thematic analysis, concept-driven *a priori* from subconstructs of survey. Deductive, data-driven coding, identify emerging themes as narrative subcategories as they emerge. Member checking Narratives will provide thick descriptions during the Integration activity in the Evaluation phase (see Figure 3).

RQ2: Disciplinary Literacy	Theory of Planned Behavior (Ajzen, 1985) and Disciplinary Literacy (Moje, 2007)	*Pre and Post- Individual teacher Innovation Configuration Maps (IC Map)* Teachers will use the IC Map to assess their own curriculum maps and identify areas where they can be more intentional in teaching and assessing the communicative practices.	Compare questions within each concept using paired sample t-test and descriptive statistics. Compare questions across subconstructs using descriptive statistics and a paired sample t-test between and among the subconstructs.
All elements of RQ1 & RQ 2	Transformative Learning Theory (Mezirow, 1997, 2003, 2011) Collective Efficacy (Bandura, 2000), particularly tenets of social persuasion and vicarious experiences.	*Group Innovation Configuration Map* Teachers will use the IC Map for identification and alignment of the common communicative practices amongst all the academic standards sets as the entry point for designing the transdisciplinary lesson.	Compare variables between individuals' and the group IC Map, using a paired sample t-test.

dictated the type of data and analysis methods. For example, collaborative professional learning, a subconstruct of Research Question One, aligned with Transformative Learning Theory because of the constructivist nature of forming new knowledge through personal and collective discourse. To learn participants' feelings about each subconstruct before and after the DLPD, a quantitative survey instrument established *a priori* codes and qualitative teacher reflections through discussion and artifacts were coded for similar themes as they emerged.

Mixed-methods action research

Considering this study directly informs for growth in teachers' professional practice, the methodological approach must be situational, empirical, and actionable. Action research is a flexible, responsive, context-dependent, iterative cycle of

practitioner-led inquiry that seeks to unwind multiple institutional problems one at a time (Butin, 2010; Dick, 2014; Herr & Anderson, 2005; Ivankova, 2015; Mertler, 2016). Action research is inherently designed around collaborative inquiry and reflection making it a logical methodological approach for a study grounded in Transformative Learning Theory (Eady et al., 2015; Gravett, 2004; Groundwater-Smith & Mockler, 2006; Kemmis, 2009; Taylor & Cranton, 2013). Action research empowers practitioners and develops agency, making it is an appropriate approach for a study focused on collaborative professional development and collective efficacy (Cain & Milovic, 2010; McNiff, 2002; Noffke, 1997; Pine, 2009; Zeichner, 2003).

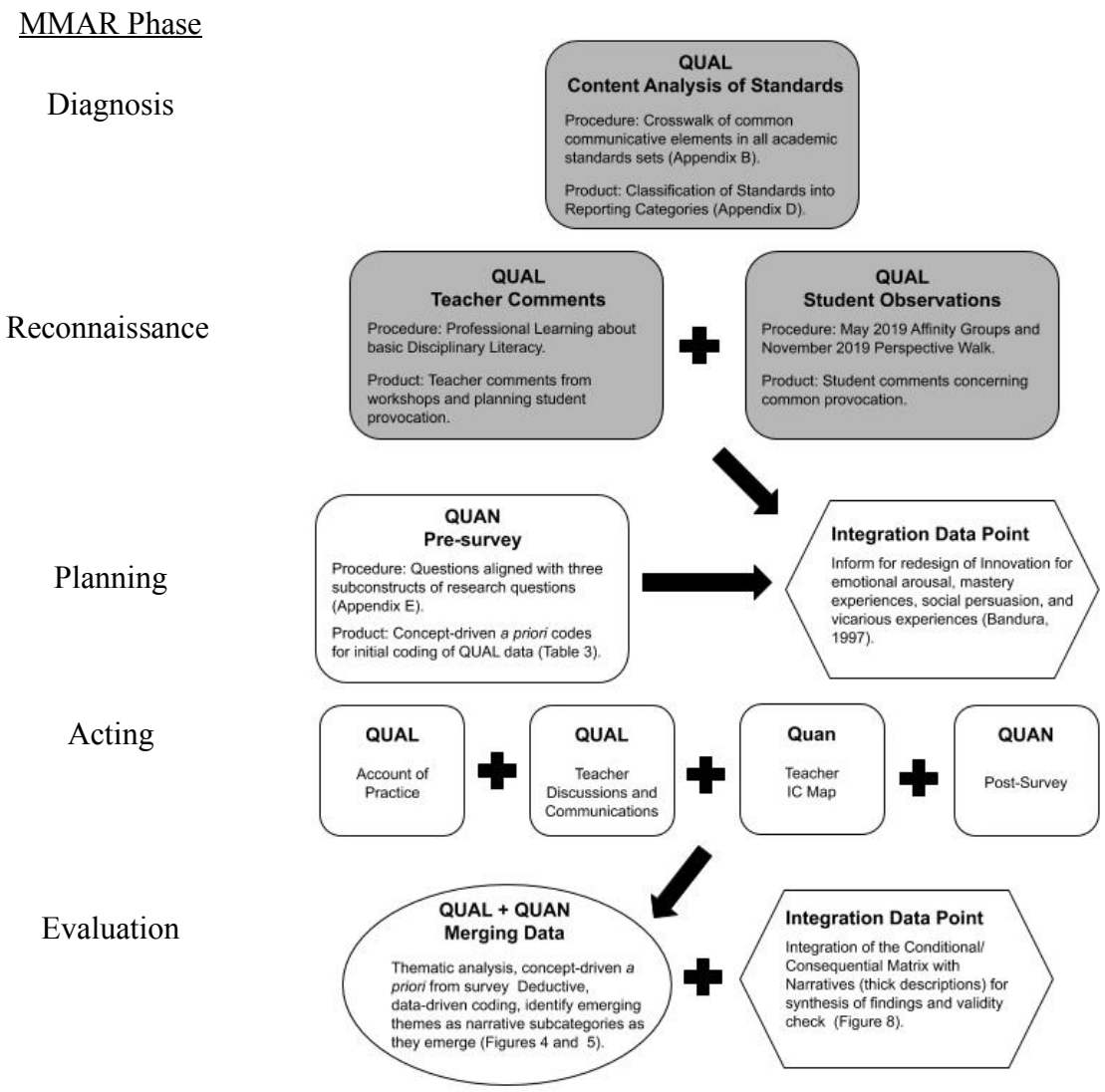
In order to respond to practice-embedded research and answer all elements of the research questions, I chose a multi-strand mixed-methods action research (MMAR). Within this MMAR design (Figure 3), the analyses from both quantitative and qualitative data are "used simultaneously in order to understand the research problem...and informally compared to see if they have yielded similar results" (Mertler, 2016, p. 107). This framework incorporated six distinct phases that informed the iterative, cyclical nature of action research, allowed for flexible data collection and analysis, and explored new questions as data were connected (Ivankova, 2015).

In response to a shift to standards-based grading and reporting in the high school in 2020-2021, I conducted a content analysis of the new standards specifically focused on the communicative practices (Appendix B). Although the analysis was not part of this study, in hindsight it can be classified as the Diagnosis phase. This content analysis and subsequent classification of the communicative practice standards into reporting

categories (Appendix E) led to professional development in assessment design, grading, and reporting. Additionally, teachers approached me in January 2019 to help design

Figure 3

Multi-strand mixed-methods action research design



Note: Rectangles indicate data collection and analysis stages. Ovals indicate points of qualitative and quantitative integration. Hexagons indicates phases of interpretation and meta-inference formation. Plus signs indicate that phases happen concurrently (Ivankova, 2007). Grey boxes indicate previous cycles of inquiry discussed in Chapter 2.

interdisciplinary units. In response, I initiated introductory professional learning workshops concerning aspects of Disciplinary Literacy between mid-January and May 2019. Finally, the provocation and response exercises with the students in May 2019 and November 2019 provided anecdotal data concerning their needs to be able to effectively communicate in the disciplines. Both teacher and student comments from these sessions are now classified as the Reconnaissance phase of the MMAR.I combined data from the pre-DLPD survey administered during the Planning phase with the qualitative data from the Reconnaissance phase that informed refinement of the workshop experiences and measurement tools used in the Acting phase. The results of the various measures were integrated at different points during the DLPD, with a quantitative post-DLPD survey *verbatim* of the pre-DLPD survey ending the Acting phase. These aggregated data from the qualitative and quantitative analysis were organized in a conditional matrix during the Evaluation phase and integrated with descriptive narratives to inform a response to the research questions.

Setting

The host site for this study was an international PreK-12 school in the Middle East that follows an American curriculum. The school is located in a governmental and economic capital which also serves as a regional hub for international organizations working in several adjacent conflict zones. Due to the relative security of the country based on the government's good relations with the majority of the world, many corporations, embassies, consulates, non-governmental organizations, and United Nations missions allow personnel with children to be posted there. As such, many expatriate families as well as national families choose this school for its secular, Western

curriculum. Just over 40% of the 820 students are registered under American passports, with one-quarter being host country nationals and the remainder from other countries.

The school is accredited by one of the four major U.S.-based accrediting agencies which mandates a very well-defined strategic plan. The seven-year accreditation cycle includes strategic performance objectives with measurable benchmarks concerning both student and organizational goals. Each objective is framed within four specific strategic priority areas: teaching and learning; learning environments; community engagement; and healthy balance. The Senior Administrative Team regularly assesses the Teaching and Learning Priorities which are yearly benchmark expressions of the multi-year strategic priorities. They also utilize visiting consultants for professional development when crafting new initiatives to meet the strategic performance objectives.

The school is dedicated to fostering a culture of collaboration through the systemic integration of professional learning time and common planning. K-12 Subject Area Teams meet once a month for 75 minutes during all-school professional development time. At the high school level, teachers within the same subject area have 75 minutes of common planning every other day. Grade-level teams meet once a week for 60 minutes during Core Collaborative Time (CCT) to discuss students of concern with the learning support teachers and engage in specific professional learning. This study was integrated into the weekly CCT schedule.

Disciplinary Literacy has been listed on the study site's Teaching and Learning Priorities since the 2015-2016 academic year. Yet, due to prioritizing myriad other initiatives, Disciplinary Literacy was never instituted. With the shift in the high school to standards-based grading and reporting of communicative practices, Disciplinary Literacy

was a logical consideration as a pedagogical approach to ensuring intentionality in teaching and assessing these practices.

Participants and Sampling

The participants in the study were all members of the Grade Nine Faculty Team (n = 5), some of whom were part of the group who approached me in January 2019 to help construct interdisciplinary units. Since I was first approached, members of the original group changed dramatically based on teachers leaving the school and the shifts in grade-level teams made by the administration. Only three of the original teachers from January 2019 remained, one of whom was assigned to multiple grade-level meetings, and the grade-level team was reduced from nine to five members overall. Still, by definition, this group represented a homogenous and purposefully-selected criterion sampling because they were all members of the same grade-level faculty team whose practice had been disrupted by the same pedagogical change (Teddlie & Yu, 2007). These participants represented all core subject areas as well as Visual Arts. The five participants were demographically represented by four women and one man including two national faculty and three Americans. The majority were veteran teachers with one first-year teacher. Each participant brought different skills, talents, philosophies, professional experiences, and cultural backgrounds to the study as they collectively addressed the dual disorienting dilemmas. Personal identifiers have been removed throughout the study; therefore, teachers will be referred to by the subject area they teach.

Role of the researcher

As the Director of Learning at the study site, I occupied an insider/outsider stance (Flores, 2018). During the DLPD, I was "part of the group's inquiry process while

remaining an observer" (Koro-Ljunberg et al., 2009, p. 690). I facilitated the learning experiences as I kept notes of participant behaviors in my Account of Practice for inclusion into the larger data analysis during the Evaluation phase. Most importantly, I self-monitored my researcher positionality, "interrupting and challenging viewpoints, assumptions, and practices of participating practitioners resulting in transformational learning about (and within) practice" (Eady et al., 2015, p. 106). During teacher discussions, I was a purposeful disruptor, challenging teachers to question their assumptions about how they teach their discipline through the lens of the new communicative practices.

The Innovation: Disciplinary Literacy Professional Development, Part I

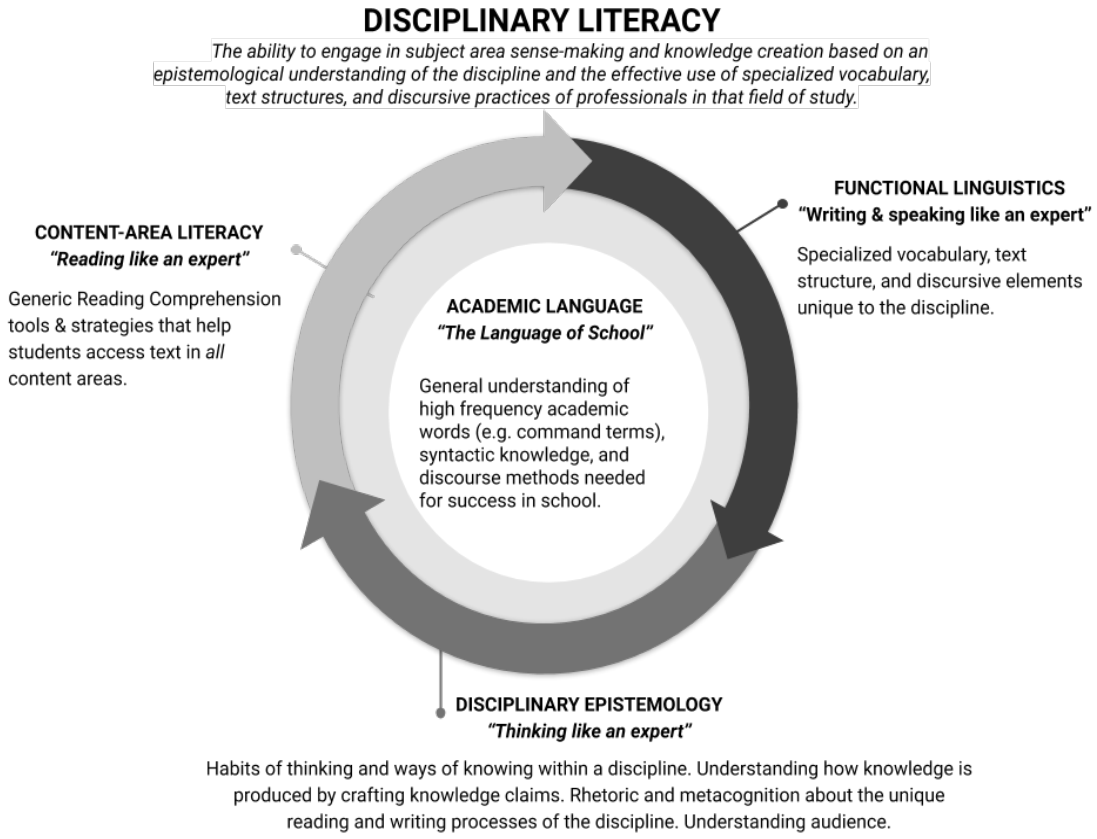
In this study, I implemented a series of seven bi-weekly workshops with the Grade Nine Teaching Team during the 60-minute CCT between February and May 2020. Each session was originally designed to include three parts: professional reading; content-area literacy tools and corresponding strategies; and collaborative learning activities. Personal and collective discourse, the two hallmarks of Transformative Learning Theory, drove the sessions. The original intent was for teachers to keep reflective journals as evidence of their thoughts and feelings about these exchanges, their personal growth in understanding the communicative practices within their discipline, and the ways in which Disciplinary Literacy helps them address these practices. Teachers expressed non-compliance with the outside professional reading and journals due to time constraints, therefore I adapted to transcribing the DLPD workshops and private conversations between me and the individual teachers as data of their

reflective process. Finally, I documented my observations of their collaborative learning, conferring, and planning in my Account of Practice.

Mertler (2016) recommends that the results of previous action research be a data point when crafting new professional development. I plaited together findings from other empirical studies, previous professional learning sessions, and this study's theoretical frameworks to create an Innovation that was "nest(ed) in practice-level inquiry within cycles of self- and co-regulated learning to support systemic change" (Butler & Schnellert, 2012, p. 1206). Each session of the DLPD equipped teachers with the theory, strategies, and tools of specific aspects of Disciplinary Literacy (Figure 4) in order to create pedagogically-sound instruction and assessment of communicative practices. During the face-to-face sessions, I guided teachers through five elements of professional learning: 1) "bridging the world of the disciplinary expert with the world of the teacher" (Aumen, 2017, p. ix) through professional literature about the theory and practice of Disciplinary Literacy; 2) attaining strategies for using content-specific literacy tools and strategies to teach elements of functional linguistics and knowledge construction in the individual disciplines; 3) engaging in collective discourse "around inquiry activities that draw on authentic aspects of classroom practice" (Greenleaf et al., 2012, p. 236); 4) using the Innovation Configuration Map (Appendix A) and corresponding standards crosswalk (Appendix B) as guides to integrate elements of question formulation (Hierck, 2018) and visible thinking (Ritchhart, et al., 2011); and 5) "reflect(ing) on target pedagogies, both individually and with others" (Greenleaf et al., 2012, p. 236), to co-construct an inquiry-based, transdisciplinary lesson (Spires et al., 2014).

Figure 4

Three areas of Moje's Four Lenses of Disciplinary Literacy examined in the DLPD



Note: Academic language is an antecedent literacy level for Moje's Four Lenses of Disciplinary Literacy and is therefore at the core of the DLPD (see Figure 1, *Interaction of various levels of literacy)*. Students who understand the "language of school" can more easily progress into the specialized study of literacy skills unique to the disciplines.

Data collection: Strategies of inquiry

In this study, I collected data from various sources to ascertain the ways in which participation in collaborative professional learning impacted teachers' collective efficacy when confronted with pedagogical change. These data were derived from quantitative tools including a survey and Innovation Configuration Map (IC Map) as well as qualitative tools including my Account of Practice and teachers' reflections through their

DLPD conversations, personal communications, and volunteered artifacts. I utilized a between-strategies mixed-methods data collection approach (Tashakkori & Teddlie, 2009, p. 238), meaning I collected both qualitative and quantitative data using different methods at different times in the study. Despite the differences in data collection methods among the tools, the standards of evidence were maintained because all pieces of data were compelling, observable, gathered in systematic ways, and aligned with the interpretivist perspective and theoretical frameworks of the study (Freeman, deMarrais, Preissle, Roulston, & St. Pierre et al., 2007; Thanh & Thanh, 2015).

Data collection strategies vary depending on the framework of the methodology. Generally, mixed-methods research is based on the degree to which the tool is predetermined, whether the questions posed are open- or closed-ended, and whether the data is numeric or not (Creswell, 2003). Ivankova (2015) explains there are several data collection considerations in MMAR, including the weighting of quantitative and qualitative data, deciding which data are more useful in different phases of the study, assessing which sources to combine or triangulate, and identifying what data are more feasible based on availability.

I collected data over a four-month period in the second semester of the school year between February and May 2020. Originally, each session included a collaborative learning activity, a research-based article examining a theoretical concept of Disciplinary Literacy, and a specific tool and strategy that aligned with one of the five components of the IC Map (Appendix A). In the third session, teachers were to begin constructing the transdisciplinary lesson for implementation in the last session. The original timeline for

data collection (Table 2) outlined the specific activities, articles, and strategies for each session.

Table 2

Original timeline for data collection during the Disciplinary Literacy Professional Development (DLPD)

Timeframe	Objective	Action *Collaborative Learning Activity (CLA)* *Content-Area/Functional Linguistic Strategy* *Professional Reading*	Data Source
Tuesday, 21 January	Understand process of the study, their roles, the data collection tools, and the framework for the journal	Set up online Teacher Reflective Journals Strategy: "Do-ability, Want-to-do-ability, Should-do-ability" (Ross & Rallis, 2012) Reading: *Disciplinary Literacy and Inquiry: teaching for deeper content learning* (Spires, Kerkhoff, & Graham, 2016)	Account of Practice
Tuesday, 11 February	Understand the three lenses of Disciplinary Literacy (Figure 4) and how these present in one's own standards and their colleagues' Analysis of a curriculum map	CLA: Diagnostic of curriculum maps as evidenced against the academic standards (Innovation Configuration Map and standards crosswalk) Strategy: Paired conversation protocol (Zwiers, O'Hara, & Pritchard, 2014) Reading: *Teaching from a Disciplinary Literacy Stance* (Pytash & Ciecierski, 2015)	Pre-DLDP Surveys Journal Entries One Teachers' pre-DLPD Innovation Configuration Maps and corresponding curriculum map Account of Practice
Tuesday, 25 February	Begin crafting ideas for an inquiry-based, transdisciplinary Disciplinary Literacy lesson	CLA Collective discourse; critical friendship; inquiry about shared practices Strategy: Noticing Protocol (Venables, 2011) Reading: *Adapt not Adopt* (Gillis, 2014)	Journal Entries Two Account of Practice

Tuesday, 10 March	Continue crafting ideas for an inquiry-based, transdisciplinary Disciplinary Literacy lesson	CLA: Collective discourse; critical friendship; inquiry about shared practices Strategy: PEEL: point, evidence, explanation/elaboration, link (Humphrey, Sharpe, & Cullen, 2015) Reading: *Disciplinary Literacy design principles by core academic area* (McConachie & Petrosky, 2010)	Journal Entries Three Account of Practice
Tuesday, 24 March	Continue crafting ideas for an inquiry-based, transdisciplinary Disciplinary Literacy lesson	CLA: Collective discourse; critical friendship; inquiry about shared practices Strategy: RAFT: role, audience, format, topic (Santa, 1988) Reading: Continue *Disciplinary Literacy and Inquiry: teaching for deeper content learning* (Spires, Kerkhoff, & Graham, 2016)	Journal Entries Four Account of Practice
Tuesday, 7 April	Continue crafting ideas for an inquiry-based, transdisciplinary Disciplinary Literacy lesson	CLA: Collective discourse; critical friendship; inquiry about shared practices Strategy: Question formulation strategies to foster inquiry (Heick, 2018) Reading: Continue *Disciplinary Literacy and Inquiry: teaching for deeper content learning* (Spires, Kerkhoff, & Graham, 2016)	Journal Entries Five Account of Practice
Tuesday, 21 April	Share experiences on the lesson they designed/gave implementing constructs from the Innovation Configuration Map // Finish the transdisciplinary lesson	CLA: modeling Strategy: Visible thinking protocols for metacognition (Ritchhart, Church, & Morrison, 2011) Reading: *Three directions for Disciplinary Literacy* (Gabriel & Wenz, 2017)	Teachers' Post-DLPD Innovation Configuration Maps and corresponding curriculum map Journal Entries Six Account of Practice
Monday, 18 May	Implement the inquiry-based, transdisciplinary Disciplinary Literacy lesson	Study participants and all Ninth Grade students will engage in the transdisciplinary lesson	Post-DLPD surveys Account of Practice

Data sources

Because of my study's interpretivist stance, data sources focused on identifying the ways in which individual teachers and the group as a whole made meaning from their

collaborative professional learning experience (Hendricks et al., 2016; Kunarri et al., 2018; Thanh & Thanh, 2015). Data from the pre- and post-DLPD IC Maps, private communications and artifacts, and pre- and post-DLPD survey variables related to the subconstruct of Disciplinary Literacy informed for growth in teachers' individual professional competence while data from the DLPD transcriptions and pre- and post-DLPD survey variables related to the subconstructs of Collective Efficacy and Collaborative Professional Learning informed for growth in these two areas.

Survey design

I designed the pre- and post-DLPD survey (Appendix F) to "collect information about people to describe, compare, or explain their knowledge, feelings, values, and behavior" concerning the three subconstructs of the research questions (Fink, 2013, p.1). Each section of the survey was aligned to a specific subconstruct, with questions adopted or adapted from Tschannen-Moran & Barr's Collective Teacher Beliefs Scale (2004), Learning Forward's *Standards Assessment Inventory*[3] (2003), and Ajzen's Theory of Planned Behavior Questionnaire (Fishbein & Ajzen, 2010) as applied to teacher competency in Disciplinary Literacy. To provide a balance between the homogeneity and heterogeneity of items in a survey (Cronbach, 1957), all questions used an ordinal Likert scale with parallel responses ranging from Strongly Agree to Strongly Disagree on a six-point scale , with 0 for "Don't Know/Unsure."

I verified the reliability of the survey through consultation with a professional statistician at Arizona State University followed by a pilot administration and statistical analysis for internal consistency. The professional statistician suggested changes in

[3] Used with permission of Learning Forward, www.learningforward.org. All rights reserved. (Appendix G).

language to provide alignment between the three constructs. In response to her suggestions, I unified the voice among the questions to account for differences in the original language structure without making substantive changes to the researchers' intent. I also added the definition of each subconstruct as it is applied to this study to ensure clarity of understanding among all participants, based on their earlier confusions during the first professional learning session in January 2019.

As the method of checking statistical results for internal consistency among the survey question subconstructs (Diem, 2004), I conducted a Cronbach Alpha test in SPSS25 for Mac using the results from my pilot participants. The results indicated that the sample size (n=8) was insufficient to test the inter-item reliability of the questions. Fortunately, Cronbach himself now "doubts whether coefficient alpha is the best way of judging the reliability of the instrument to which it is applied" (Cronbach & Shevelson, 2004, p. 393). Once the expected initial panic of a statistical neophyte subsided, I realized that the rigorous reliability and validity tests applied to the original instruments which I adopted for this survey were sufficient, and therefore my survey would supply reliable results (Denmark & Weaver, 2012; Fishbein & Ajzen, 2010; Klassen, 2010).

Innovation Configuration Maps

Innovation Configuration Maps (IC Map) are one tool in a change-management approach known as the Concerns-Based Adoption Model (Hord, Stiegelbauer, Hall, & George, 2006). The Concerns-Based Adoption Model is closely aligned with the work of Learning Forward concerning teacher professional learning and systemic change in schools. Designers of the system acknowledge that people pass through different levels

of concern when confronted with a paradigmatic change. Consequently, they created IC Maps to codify operational forms by "identifying the innovation's major components and describing various uses ranging from ideal implementation to nonuse along a continuum" (Roy & Hord, 2004, p. 56). This codification tool maintains systemic fidelity when teachers are tempted to refine and adapt a new pedagogical approach to fit their comfort and compliance levels rather than truly transform practice.

In regard to this study, the "operational form" which the teachers might have been tempted to change were the tools and strategies of Disciplinary Literacy, and the "major components" were the communicative practices of their academic standards. To address these two factors when designing the IC Map, I followed scaffolded steps (Hord et al., 2006) to combine aspects of Moje's Four Lenses of Disciplinary Literacy with common elements found in the communicative practices across all standards sets. The five components of the IC Map (Appendix A) were the result of this process: conversing; reading; inquiring and questioning; investigation, argumentation and justification; and metacognition (EPF for Teaching, 2015; Gabriel & Wenz, 2017; Goldman et al., 2016; Heick, 2018; Hord et al., 2006; Moje, 2007; O'Hara & Pritchard, 2016; Pearson & Dole, 1988; Ritchhart et al., 2011).

I also created a complementary crosswalk (Appendix B) between the five components of the IC Map and associated communicative practice standards in CCSS English, CCSS Math, NGSS, C3, and NCAS. Using the IC Map and associated standards crosswalk, teachers in all disciplines had a common language and depersonalized "third point" to reference during their collective discourse (Thinking Collaborative,

2019). They also had a common framework upon which to build their inquiry-based transdisciplinary project.

The DLPD workshops included aspects that addressed each component of the IC Map. Individually, teachers used the IC Map to assess their own curriculum maps and identify areas where they can be more intentional in teaching and assessing the communicative practices. Collectively, teachers used the crosswalk and IC Map for identification and alignment of the common communicative practices amongst all the academic standards sets as the entry point for designing the inquiry-based transdisciplinary lesson. The IC Map provided data concerning teachers' understanding of Disciplinary Literacy and their ability to integrate it effectively into their practice which responds to Research Question Two.

Goldman et al. (2016) created a similar conceptual framework for Disciplinary Literacy. Their framework also involves five core components including content knowledge, epistemology, inquiry processes, information representation and types of texts, and discourse and language structures. Although far more comprehensive than my IC Map, I chose not to adopt this framework because of that very complexity. The goal of the DLPD was to equip teachers for immediate impact on practice concerning a shift to reporting communicative practices. Therefore, my IC Map and corresponding standards crosswalk directly related to their individual and collective work. I accounted for aspects of Goldman et al.'s and Moje's epistemological processes through the "metacognition" component of my IC Map. While not directly aligned with any disciplinary-specific standards, the metacognition component allowed for teachers to use the most suitable approaches for sense-making and ways of knowing in their subject area.

Teachers' thoughts and reflections

Personal reflection was an essential component of the research design because it provides rich narration concerning the participants' transformative journey (Butler & Schnellert, 2012; Darling-Hammond et al., 2017; Eady et al., 2015; Greenleaf et al., 2018; Mezirow, 1997; Monte-Sano et al., 2017; Trotter, 2006). The original framework of the study methodology included Teachers' Reflective Journals as a means for participants to reflect on learning and dialogue through a "do-ability, want-to-do-ability, should-do-ability" heuristic cycle (Ross & Rallis, 2012, p. 114). This heuristic also aligned with the philosophical intent of the survey design because it addressed participants' feelings about the feasibility, interest, ethics, and politics of pedagogical change and collaborative learning (Hendricks et al., 2016; Kunarri et al., 2018; Ross & Rallis, 2012).

After the first session, it became clear that the teachers had no interest in professional reading or journaling, as their primary focus was on the logistics of the end-of-year student project and understanding the new communicative standards and grading system. Teachers cited "no time" to read or reflect, and "hardly any meetings" to create the transdisciplinary activity "let alone have philosophical conversations." Therefore, I shifted the methodology to recording the DLPD sessions using Otter online recording and transcription software for audio-only recording. I edited the automatic transcription to clearly identify the speaker using the assigned pseudonym, indicate pauses or emotive language, and remove non-words such as "um," and "like" without altering the intent and content of the speaker to ensure validity (Brinkmann & Kvale, 2015; Paulus, Lester, & Dempster, 2014).

I maintained the intent of the original heuristic cycle, sharing passages from the planned professional readings and prompting teachers with specific questions aligned to the highly prescribed components of the workshop design. I asked these questions as a way for them to share their feelings about collaborative professional learning and the ways in which it may or may not be contributing to a growth in collective efficacy among the team. Teachers were asked to reflect on certain aspects of the day's collaborative learning activity or foreshadow how they might use the Disciplinary Literacy tools and strategies introduced in the session. Although the questions were largely emergent in nature, prompts included: "describe one way in which a colleague's comment about Disciplinary Literacy prompted you to think differently;" "in what ways did working with your colleagues today help clarify some questions you have about Disciplinary Literacy;" "what made you mad/grateful/scared/hopeful/excited today," or "how did your students respond when you used a Disciplinary Literacy tool or strategy in your class over the last two weeks"?

Teachers also communicated with me privately via email, messaging, and in person. These conversations were included in the qualitative data set as an expression of their professional learning, mirroring the original intent of the Teacher Reflective Journals. Teachers also volunteered artifacts such as lesson plans, assessments, and rubrics to demonstrate their transformation of practice and receive my feedback for professional growth.

Account of practice

As the final check on the data sources, I kept a "systematic and careful documentation of all procedures — an *account of practice* — to provide a record for

(my) ongoing contemplation" (Freeman et al., 2007, p. 26). Because there are no models for an Account of Practice (Peters, Besley, & Besley, 2006), I chose to follow the "do-ability, want-to-do-ability, should-do-ability" heuristic cycle (Ross & Rallis, 2012) used in the DLPD sessions for teacher discussions. Specifically, I reflected on what I did with new data, what I wanted to do with the next iteration of data or how I refined the DLPD sessions based on teacher feedback, and what I should do with the ongoing data analysis to maintain congruence among the codes and pieces of evidence. My Account of Practice also monitored the unspoken ways in which teachers interacted during the collaborative learning activities as well as interactions with school administrators and others during the course of the DLPD. Each workshop was intentionally designed to foster collaboration, and I was deliberate and purposeful in scaffolding the ways in which teachers interacted with the theory and practice of Disciplinary Literacy despite the multitude of changes over the four months.

The Account of Practice served as a form of memo writing where I recorded any innovative thoughts about methodology or future lines of research, identified any problems with the design, and highlighted interesting observations for use in the analysis and findings (Charmaz & Bryant, 2012). When aggregated, my musings "construct(ed) an authentic, rich, deep account of practice against which wonders or questions [were] raised" (Pinnegar & Hamilton, 2009). Ultimately, my Account of Practice was part of the larger audit trail of decisions regarding the entire research design process and all associated evidentiary supports for those decisions (Cohen & Crabtree, 2006; Lincoln & Guba, 1985).

Data analysis

The flexibility of a multi-strand mixed-methods action research design (Ivankova, 2015) was an ideal choice for this study, as I collected and analyzed data continuously throughout the DLPD (Figure 3). During the previous cycles of inquiry, participants were involved in the data processing and analysis of results to inform collective practice and create actionable plans for the development of the DLDP. Data analysis for this study involved thematic, deductive, data-driven coding to align the transcripts of the DLPD sessions, teachers communications, and artifacts with teachers' pre- and post-IC Maps with the pre- and post-DLPD survey analysis (Charmaz & Bryant, 2012; Schrier, 2013). My Account of Practice notes also informed the construction of qualitative coding methods. Additionally, extended narrative analysis and discourse analysis for thick description added a depth of personality and validity by incorporating participant voices (Ary, Jacobs, & Sorensen, 2010; Creswell & Miller, 2000). I also sought validity through catalytic and outcome criteria (Anderson & Herr, 1999; Newton & Burgess, 2016) as detailed in Chapter Three.

Onwuegbuzie and Combs (2011) distinguished thirteen types of decision criteria concerning data analyses in mixed-methods research. Based on these criteria, I selected information from Figure 3 (*Multi-strand mixed-methods action research design*) and Tables 1 and 2 (*Methodological congruence* and *Timeline for data collection during the Disciplinary Literacy Professional Development*) to detail the types of analyses and when they occurred in the analysis cycle (Table 3). Although the qualitative and quantitative data held equal weight in the collection phase, and the quantitative data dictated the initial *a priori* coding framework because of its direct correlation with the subconstructs

Table 3

Qualitative-dominant mixed analysis

MMAR Phase	Number of Data Types	Priority Sequence	Validity Check
Planning January 2020	QUANTITATIVE: Pre-DLPD survey (n=5)	–	Outcome (continuous reflective planning during analysis)
Acting February-May 2020	QUALITATIVE: Account of Practice (n=1) QUALITATIVE: DLPD Transcripts, teacher artifacts, and communications (n=5) Quantitative: Teacher's Pre-DLPD Innovation Configuration Map (n=5)	Begin with thematic analysis using concept-driven *a priori* from subconstructs of survey. Two iterations of double-coding using Elemental and Affective Methods. Add data-driven, narrative subcategories as they emerge from initial coding.Begin Second Cycle Axial Coding, incorporating Account of Practice, to identify themes.	Outcome (continuous reflective planning through Account of Practice)
Evaluating May 2020-December 2020	Quantitative: Teacher's Post-DLPD Innovation Configuration Map (n=5) QUANTITATIVE: Post-survey (n=5) QUALITATIVE: Account of Practice (n=1)	Merge results from quantitative data analysis (descriptive statistics and paired sample t-tests). Aggregated data from the qualitative and quantitative analysis will be organized in a conditional matrix during the Evaluation phase and integrated with other narratives to suggest steps in the Monitoring phase.	Catalytic (thick description of narratives as they are added to the matrix) Investigator triangulation with similar empirical studies from Literature Review.

of the research questions, I constructed the qualitative tools and analysis plans so that they yielded rich descriptive results. Therefore, this was a qualitative-dominant mixed analysis (Onwuegbuzie & Combs, 2011). In Table 3, dominant analysis data is noted with capital letters and non-dominant data listed in title case. A step-by-step description of the quantitative and qualitative analysis methods follows the chart.

Quantitative analysis

My hypotheses were that teachers' responses to the post-DLPD survey would be higher in all three subconstructs, with confidence in teaching Disciplinary Literacy being the area with the most growth, and a strong, positive correlation between collaborative professional learning and collective efficacy. I also believed that their individual post-DLPD IC Maps would have more "Ideal" ratings than their diagnostic.

Survey analysis

I first ran descriptive statistics for each individual subconstruct including mean, median, minimum, maximum, standard deviation, and population size (n) to determine the variation in the sample data (Table 4). All questions used a Likert scale with parallel

Table 4

Descriptive statistics for pre- and post-DLPD survey in all subconstructs (n=5)

	Collective Efficacy		Collaborative Professional Learning		Disciplinary Literacy	
	Pre-DLPD	Post-DLPD	Pre-DLPD	Post-DLPD	Pre-DLPD	Post-DLPD
Mean	5.037	5.488	4.050	4.100	4.208	4.639
Median	5.166	5.777	4.100	4.200	4.437	5.000
Standard Deviation	1.032	.6065	.7746	,7681	1.484	1.016
Minimum	3.33	4.78	2.70	2.90	1.50	3.00
Maximum	6.00	6.00	4.95	5.00	6.00	5.57

responses ranging from Strongly Agree (6.0) to Strongly Disagree (1.0), with 0 for "Don't Know/Unsure." The mean for Collective Efficacy pre-DLPD survey was 5.037 with a post-DLPD of 5.488. The mean for Collaborative Professional Learning pre-

DLPD survey was 4.050 with a post-DLPD of 4.100. The mean for Disciplinary Literacy pre-DLPD survey was 4.208 with a post-DLPD of 4.639. The minimum scores all saw a rise with the most marked change in Collective Efficacy from 3.33 to 4.78 and Disciplinary Literacy from 1.50 to 3.0. Data indicate participants experienced aggregate growth in all three subconstructs, the most self-reported growth occurring in Collective Efficacy and Disciplinary Literacy.

I also ran Survey Response Frequencies for both pre-DLPD and post-DLPD surveys within each subconstruct and calculated the difference between the mean for each variable before and after the Innovation. I then ranked each variable within each subconstruct from highest to lowest difference to indicate the variables most impactful on teacher growth within that subconstruct (Table 5). While the mean for each subconstruct

Table 5

Survey response frequencies comparison of pre- and post-DLPD by variable

Survey Variable	Pre-DLPD Mean	Post-DLPD Mean	Difference
Subconstruct: Collective Efficacy (CE)			
CE Q6: Teachers in my grade level provide experiences for students to integrate knowledge and skills across subject areas.	3.33*	5.00	+1.67
CE Q5: Teachers in my grade level help students develop the practices of their subject areas.	4.67*	5.40	+0.73
CE Q3: Teachers in my grade level create environments that facilitate learning.	5.33	6.00	+0.67
CE Q7: Teachers in my grade level promote deep understanding of academic concepts.	4.67*	5.20	+0.53
CE Q1: Teachers in my grade level design authentic student learning opportunities.	5.17	5.60	+0.43

CE Q4: Teachers in my grade level help students master complex content.	5.50	5.80	+0.30
CE Q2: Teachers in my grade level help students believe they can do well in schoolwork.	5.67	5.80	+0.13
CE Q8: Teachers in my grade level help students think critically.	5.50	5.40	+0.10
CE Q9: Teachers in my grade level foster student understanding of their subject area's ways of knowing.	5.50	5.20	-0.30
Subconstruct: Collaborative Professional Learning (CPL)			
CPL Q16: My school's professional learning plan is aligned to school goals.	2.83*	4.60	+1.77
CPL Q18: Professional learning at my school focuses on the curriculum and how students learn.	3.17*	4.20	+1.03
CPL Q11: In my school, teachers have opportunities to observe each other as one type of job-embedded professional learning.	2.17*	3.20	+1.03
CPL Q7: Teachers in my school are involved with monitoring the effectiveness of the professional learning.	3.17*	4.00	+0.83
CPL Q3: In my school, learning community members demonstrate effective communication.	4.50*	4.80	+0.30
CPL Q1: My school's learning communities are structured for teachers to engage in the continuous improvement cycle (i.e. data analysis, planning, implementation, reflection, and evaluation).	4.83	4.80	-0.03
CPL Q14: A primary goal for professional learning in my school is to enhance teaching practices to improve student performance.	4.50	4.40	-0.10
CPL Q13: Professional learning in my school includes various forms of support to apply new practices.	5.17	5.00	-0.17
CPL Q20: In my school, professional learning supports teachers to expand and deepen their learning over time.	5.17	5.00	-0.17
CPL Q10: In my school, teachers use what is learned from professional learning to adjust and inform teaching practices.	4.00	3.80	-0.20

CPL Q12: Teachers in my school are responsible for selecting professional learning to enhance skills that improve student learning.	3.50	3.20	-0.30
CPL Q4: In my school, learning communities have a high level of trust among members.	4.00	3.60	-0.40
CPL Q9: A variety of data are used to assess the effectiveness of my school's professional learning.	5.00	4.60	-0.40
CPL Q6: Practicing and applying new skills with students are regarded as important learning experiences among my grade level team.	3.83	3.40	-0.43
CPL Q2: Most members of the learning communities in my school hold each other accountable to achieve the school's goals.	4.67	4.20	-0.47
CPL Q5: Professional learning is available to me at various times during the school year and summer.	5.33	4.80	-0.53
CPL Q19: In my school, professional learning supports teachers to develop new learning.	4.17	3.60	-0.57
CPL Q17: In my school, teachers individually reflect about teaching practices and strategies.	4.67	4.60	-0.67
CPL Q8: In my school, teachers have an opportunity to evaluate each professional learning experience to determine its impact on student learning.	2.33*	3.20*	-0.87
CPL Q15: Teachers in my school receive ongoing support to improve their teaching.	4.00*	3.00*	-1.00
Subconstruct: Disciplinary Literacy (DL)			
DL Q5: My colleagues support me in integrating Disciplinary Learning in my classroom.	3.00*	5.00	+2.00
DL Q8: I have all the resources needed to implement Disciplinary Literacy in my classroom.	3.50*	4.40*	+1.10
DL Q3: I intend to implement Disciplinary Literacy in my assessment and feedback design.	4.33*	5.00	+0.67
DL Q7: I can control the ways in which I implement Disciplinary Literacy in my classroom.	4.83*	5.20	+0.37

DL Q4: Other teachers are eager to implement Disciplinary Literacy.	3.17*	3.40*	+0.23
DL Q1: I believe my students will improve their performance in my class if I integrate Disciplinary Literacy in my teaching practices.	5.00	5.20	+0.20
DL Q2: I intend to implement Disciplinary Literacy in every lesson.	4.67	4.40	-0.27
DL Q6: I understand why Disciplinary Literacy was included in my subject area's Standards.	5.17	4.25*	-0.92

as a whole grew between the start and end of the DLPD, certain variables saw a decline during the Innovation. Note that an asterisk next to a number indicates there was a "Don't Know/Unsure" response that was not calculated in the mean.

Within the Collective Efficacy subconstruct, "Teachers in my grade level provide experiences for students to integrate knowledge and skills across subject areas" grew over one-and-a-half full points from 3.33 to 5.00, and "Teachers in my grade level help students develop the practices of their subject areas" grew almost three-quarter points from 4.67 to 5.40. Because the DLPD sessions were a venue of "equitable communicative space [that] provided for the expression of language that mediated and scaffolded teachers professional learning" (Loughland & Ryan, 2020, para 1), the growth in these variables indicate that teachers came to appreciate the practice of their colleagues. By hearing the thoughts of others and sharing their ideas concerning the creation of the transdisciplinary project, teachers engaged in collegial discussion concerning the ways in which each subject area implemented the lens and language of disciplines. For example, teachers frequently engaged in wonderings about how Disciplinary Literacy presented in various subjects or helped colleagues understand in their own subject:

> Social Studies teacher: What language will they need to know, if they're talking like an artist [who] only speaks art? What language will they be using?
>
> Art teacher: [Students] know how to express themselves, and they know about describing a work of art using elements, the principles of art and design, and adding meaning [but] what was the context, the historical background of the artwork?

These discussions also resulted in several Collaborative Professional Learning variables showing growth. Teachers came to understand, as a team, that they were empowered to observe and comment on their colleagues' practice as critical friends, and that the goals of the professional development sessions were directly aligned to equip and empower them to meet systemic changes in adopting new standards and grading paradigms. Variables such as "My school's professional learning plan is aligned to school goals" (2.83 to 4.60), "Professional learning at my school focuses on the curriculum and how students learn" (3.17 to 4.20), "In my school, teachers have opportunities to observe each other as one type of job-embedded professional learning" (2.17 to 3.20), and "Teachers in my school are involved with monitoring the effectiveness of the professional learning" (3.17 to 4.0) all saw marked growth during the DLPD Innovation.

The most pronounced growth was in the variable for the subconstruct Disciplinary Literacy: "My colleagues support me in integrating Disciplinary Learning in my classroom" with a two point rise from 3.00 to 5.00. This variable also reflected growth in the subconstructs of Collective Efficacy and Collaborative Professional Learning, as the feelings of support felt by teachers resulted from their shared experiences and reflection through the DLPD sessions. Teachers also felt they "have all the resources needed to

implement Disciplinary Literacy in my classroom" (3.50 to 4.40) and "intend to implement Disciplinary Literacy in my assessment and feedback design" (4.83 to 5.20) which indicates an appreciation for the alignment of professional learning with schoolwide goals and the intention of implementing Disciplinary Literacy into assessment design.

To further investigate the relationships between and among the three subconstructs, I conducted a paired sample t-test (Norman, 2010). I chose a t-test because it is a parametric test of interval data (Marshall & Jonker, 2010), the result of which is a probability value (*p* value) that helps determine whether or not to reject the null hypothesis. The null hypotheses for this study are that there will be no correlations between or among the subconstructs nor will there be a change in teachers' behaviors and practice as a result of the DLPD. While the choice of a parametric test may seem troublesome for the reader given the small sample size, "nowhere in the assumptions of parametric statistics is there any restriction on sample size" (Cronbach, 1957, p. 627). Cronbach's clarification of minimum sample size in his own statistical test is also supported by more recent studies concerning sample size (Bujang, Omar, & Baharum, 2018; Yurdugl, 2008). I set the alpha level at the default $\alpha=0.05$ to have a 95% confidence rate of rejecting the null hypothesis (Pereira & Leslie, 2009); therefore, a *p* value lower than 0.05 would reject the null hypothesis. Results of this t-test do not confirm that "the research hypotheses are true, but rather suggest that (they are) plausible" (Allua & Thompson, 2009, p. 108).

I compared all three subconstructs' pre-DLPD and post-DLPD mean results against for fifteen permutations. Very few correlations existed between subconstructs,

with two exceptions: Collective Efficacy post-DLPD mean and Collaborative Professional Learning post-DLPD mean (p = .021) and Collective Efficacy pre-DLPD mean and Disciplinary Literacy pre-DLPD mean (p = .051). This indicates a plausible relationship between Collective Efficacy and Disciplinary Literacy prior to the study and between Collective Efficacy and Collaborative Professional Learning after the DLPD.

Innovation Configuration Maps

Participant pre- and post-DLPD IC Maps also showed positive growth in the practice of Disciplinary Literacy as a means to teach and assess the new communicative practice standards. These data correlated with the survey results. IC Maps codify operational forms by "identifying the innovation's major components and describing various uses ranging from ideal implementation to nonuse along a continuum" (Roy & Hord, 2004, p. 56). This IC Map combined aspects of Moje's Four Lenses of Disciplinary Literacy with common elements found in the communicative practices across all standards sets so that the tool would be directly and immediately applicable to shifting practice. Overall, all but one participant self-reported growth in at least one domain. The biggest gains were in Inquiry (3.20 to 4.40) and Metacognition (3.60 to 4.40) which could be correlated to a deepened understanding of the new communicative practices standards and tenets of Disciplinary Literacy. Analysis of the IC Map results is discussed in depth in Chapter Four.

Qualitative analysis

First Cycle qualitative coding

I began the qualitative coding process by reviewing the *data corpus* through the lens of Miles, Huberman, and Saldaña's (2014) "Five Rs: routines, roles, relationships,

rules, routines, and rituals" (p. 36). Beginning with a framework consisting of the three main categories that align with the three subconstructs of Research Question One (RQ1) and Research Question Two (RQ2) in the quantitative survey design, I reviewed the transcripts of the DLPD sessions, notes from my Account of Practice, and communications from teachers. My Account of Practice was an important triangulation point among the survey responses, transcripts, and participant communications to me outside the workshop. My observations paid particular attention to the ways in which the intentionally-prescribed design of the collegial activities in the scaffolded collaborative professional learning of the sessions contributed to a sense of collective efficacy and growth in understanding and applying Disciplinary Literacy practices. I used HyperRESEARCH 4.5.0 for Mac to analyze the qualitative data.

Based on the initial review of all qualitative data sources, I chose Elemental Methods for the first iteration of the First Cycle because they are "primary approaches to qualitative data analysis [and] the foundation methods of grounded theory…[that] extracts and labels 'big picture' ideas" (Saldaña, 2016, p. 97). The three codes included: *In vivo*, which allows the researcher to capture their own words, to add validity and provide evocative narrative and inform RQ1 and RQ2; Process, which allows the researcher to identify actions alignment with goals and inform RQ1 and RQ2; and Concept, which identifies ideas rather than behavior, to see if teachers co-opted or truly changed thinking and inform RQ2.

After the first iteration, I reviewed the Elemental codes and devised concept-driven *a priori* subcodes to further clarify participants' thoughts and actions concerning Disciplinary Literacy and the collaborative practice of designing the end-of-year student

project. Because the subcategories emerged from the participants' own voices, the *in vivo* coding helped maintain fidelity and added a level of confirmability (Schwandt, 2007). In other words, this method contributed to findings that were shaped more by respondents and less by the researcher's biases or preconceptions. Many of the Process codes reflected teachers' desires to create an engaging activity while Concept codes addressed various aspects of Disciplinary Literacy as well as a shift to standards-based grading. *In vivo* codes were further divided by shared emotions, specifically concerning the change to standards-based grading.

After completing two iterations of Elemental Methods coding, I employed Affective Methods coding to the same *data corpus* through a double coding process using the techniques of grounded theory as proposed by Strauss and Corbin (1998). I chose Affective Methods – specifically Emotion, Values, and Versus – because the themes emerging from the Elemental codes suggested the need for a deeper analysis "of the participants' integrated value, attitude, and belief systems" (Saldaña, 2016, p. 124) as well as a more direct analysis correlated with an underlying theoretical framework of the study, Mezirow's "disorienting dilemma" (2001, p. 19). Emotion codes analyzed for both inter- and intrapersonal reactions to see how collaborative learning shaped changes in beliefs and inform RQ1; Versus codes provided the dilemma analysis to compare thoughts of "old" and "new" systems and thinking which inform RQ1; and Values codes sought to identify paradigm/perspective/positionality and see changes in beliefs over time and inform RQ2.

While the Elemental Methods identified more about participants' *understanding* of Disciplinary Literacy, communicative practice standards, and standards-based grading,

the first iteration of Affective Codes yielded more information about their *attitudes and beliefs* concerning these systemic changes. For the second iteration of Affective coding, I constructed concept-driven *a priori* subcodes for Values and Versus to further assess the nature of the participants beliefs, attitudes, and struggles with the new approaches to teaching and learning and their potential nostalgia for former practice. Subcodes for *In vivo* & Emotion were redundant to reflect teachers' voice but had different results because the Elemental iterations examined feelings about concept and process while the Affective iterations delved deeper into feelings about how their fundamental beliefs about pedagogy were being disrupted.

Transition from First Cycle to Second Cycle

To transition from the first cycle of Elemental and Affective codes to the second cycle of Axial Coding to identify emergent themes, I used a Code Charting approach (Table 6). Code Charting is a process by which the researcher identifies each participant's primary codes and creates a summary observation based on these codes and their Account of Practice (Saldaña, 2016, p. 229). By placing these data in a table, primary codes are easily identified across participants. To ensure brevity in Code Charting, I chose to include only subcodes that were applied five or more times.

Table 6

Code Charting First Cycle qualitative coding results

Participant	Observation Summary	Primary Codes (# times applied)
Art	As a former IB teacher, was aware of the principles of Disciplinary Literacy but not by name. Struggled to integrate into the discussions because she wanted to integrate	DL: Subject-area Concepts (21) DL: Epistemological Lens (16) Hope (12) DL: Functional Linguistics (11) Overwhelmed (9)

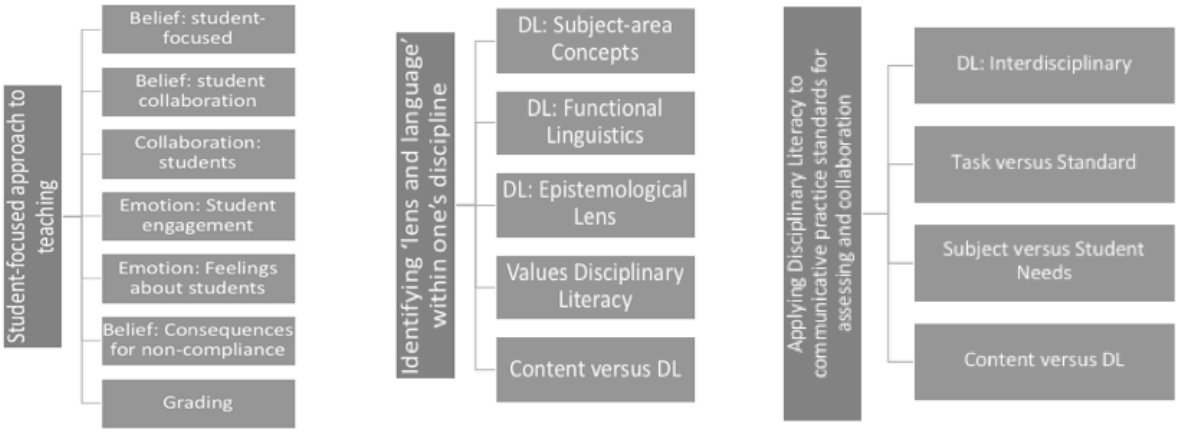
	disciplines rather than focus on logistics. Joined the team after the first DLPD session.	Belief: Student Collaboration (5) Belief: Student-focused (5)
English	Assigned to numerous grade-level teams, therefore did not attend numerous DLPD sessions both pre- and post-remote learning. Member of the grade-level since Cycle One.	DL: Functional Linguistics (12) DL: Subject-area concepts (11) Belief: Student collaboration (5)
Math	Frustrations arose because the Math Department was still using task-based grading categories. Evolved individual assessments with co-teacher while trying to fit Disciplinary Literacy and standards-based grading into existing paradigm. Overall growth in understanding of the "how" yet continued to struggle with "why." Member of the grade-level since Cycle One.	DL: Subject-area Concepts (33) DL: Functional Linguistics (18) DL: Interdisciplinary (18) Feelings about students (13) Belief: Student-focused (12) DL: Epistemological Lens (10) Overwhelmed (10) Skepticism (11) Hope (7) Content versus DL (5) Task versus Standard (5)
Science	Focused a great deal on the logistics of the end-of-year student project. Initially rejected functional linguistics of Disciplinary Literacy as "old school" vocabulary drills. Glimpses of appreciation for Disciplinary Literacy throughout DLPD, especially post-remote learning. Joined grade-level team in Fall 2019.	Project Logistics (33) DL: Subject-area Concepts (17) Student Engagement (16) Belief: Student-focused (10) DL: Functional Linguistics (10) Attitude: Force Field (8) Skepticism (6)
Social Studies	Most engaged in the discussions and reflections on practice. Dedicated to student engagement and collaboration, especially in designing grading schemes. Cheerleader of the group, showing most movement in personal understanding and practice. Member of the grade-level since Cycle One.	Student Engagement (30) Belief: Student-focused (29) DL: Subject-area Concepts (35) DL: Functional Linguistics (27) Values Disciplinary Literacy (25) Grading (17) DL: Interdisciplinary (15) Task versus Standard (15) Assessing (14) Subject versus Student Needs (13) DL: Epistemological Lens (8)

Second Cycle qualitative coding

Based on the primary codes identified for each participant during Code Charting, I chose to apply Axial Coding Methods in the Second Cycle (Figure 5). Axial Coding's

Figure 5

Second cycle axial coding to identify emergent themes among codes and subcodes



purpose is to "determine which codes in the research are the dominant ones" with "emphasis placed on the emergent categories' properties and dimensions" (Saldaña, 2016, p. 244-5) to merge the multiple iterations of the First Cycle. This iterative process sought validity by testing the quality of the main categories' definitions (Lichtman, 2012; Schrier, 2013), avoided "definitional drift" (Gibbs, 2007, p. 10), disconfirmed evidence (Creswell & Miller, 2000; Freeman et al., 2007) and identified new, emerging themes among the subcategories (Hamilton & White, 2000).

Codes addressing student-related issues emerged as the theme "Student-focused approach to teaching." Associated codes and subcodes included the "Belief: student-focused," "Belief: student collaboration," "Collaboration: students," "Emotion: Student engagement," "Emotion: Feelings about students," "Belief: Consequences for non-compliance," and "Grading." Codes addressing the identification of aspects of

Disciplinary Literacy within one's own subject area emerged as the theme "Identifying 'lens and language' within one's discipline." Associated codes and subcodes included "DL: Subject-area Concepts," "DL: Functional Linguistics," "DL: Epistemological Lens," "Values Disciplinary Literacy," and "Content versus DL." Codes addressing Disciplinary Literacy as a means to teach and assess communicative practices standards within one's own subject area as well as a means to foster collaboration for interdisciplinary and transdisciplinary lessons emerged as the theme "Applying Disciplinary Literacy to communicative practice standards for assessing and collaboration." Associated codes and subcodes included "DL: Interdisciplinary," "Task versus Standard," "Subject versus Student Needs," and "Content versus DL."

Issues of trustworthiness

Validity is an essential component of any research, as it builds value and trustworthiness in the study's findings and in the credibility of the researcher herself (Pine, 2009). Validity, confirmability, credibility, reliability, and dependability are especially critical in action research because of the criticisms of the approach including lack of generalizability, rigor, and theoretical framework (Ivankova, 2015; Smith, 2018). One of the goals of mixed-methods action research is moving beyond validity "as a type of intellectual 'policing' to an incitement to discourse" (Pine, 2009, p. 84). Researchers may enhance the credibility of their claims by "seeking convergence and corroboration through the use of different data sources and methods" (Bowen, 2009, p. 28) and offering multiple data points or events that offer evidence of a claim (Creswell & Miller, 2000).

I designed this study to positively impact teacher practice. As such, catalytic validity and outcome validity were appropriate measures of validity and clearly aligned with the appropriate data type. Catalytic validity is the extent to which the research process transformed participants' understanding (Newton & Burgess, 2016). This was shown by positive changes between teachers' pre- and post-DLPD IC Maps and survey results. Similarly, outcome validity is achieved if the outcomes match the intended purpose. Given that the intended purpose was to transform teacher practice, the same measures that indicated catalytic validity can be applied to outcome validity.

Finally, I ensured validity through measures that assesses elements of both design quality and interpretive rigor (Teddlie & Tashakkori, 2009). The mixed-methods action research design was suitable for responding to the research questions because the qualitative discussions during the DLPD sessions and informal conversations with participants addressed teacher feelings about collaborative professional learning, building collective efficacy by co-designing the transdisciplinary student project, and growing personal competency in Disciplinary Literacy. The quantitative methods of surveys and IC Maps verified those responses (Table 1). Further, the types of data aligned with the interpretivist framework and transformative learning theory because they measured perceptions, social constructs, and changes in one's paradigm.

Smith and Glass (1987) list several different threats to validity that were addressed prior to the analysis phase. For my study, the following four threats were applicable: History; Hawthorne Effect; Novelty Effect; and Experimenter Effect. The History threat includes concurrent events that are not directly related to the intervention but can impact the participants' reaction to the dependent variable. As the Director of

Learning, I also led collaborative professional workshops among subject-area teams concerning new changes in assessment and grading prior to the move to remote learning. During these sessions, I clearly differentiated between the two endeavors while explaining how they are linked pedagogically. Further, the majority of the DLPD occurred after a shift to remote learning when teachers were barraged with "helpful tips" from numerous online sources which may have impacted their practice. As Director of Learning, my role during remote learning was to curate resources for K-12 teachers that addressed tools and practices of online learning, and I deliberately chose resources that aligned with the participants' DLPD work.

The second threat, the Hawthorne Effect, occurs when participants know they are "special," and receiving this extra attention and support causes them to work harder or respond differently to the treatment than if they were not part of a distinct study (Smith & Glass, 1987). This is quite possible, since the Ninth Grade teachers were the only cohort engaged deeply with Disciplinary Learning, although the other three grade levels did have one session before moving to remote learning in March.

Another threat to validity is the Novelty Effect. This happens when positive changes are due to the "newness" of a program and the dedication to being on the leading edge rather than a sustained commitment to the program itself (Smith & Glass, 1987). Like the Hawthorne Effect, there was some indication of the Novelty Effect when teachers were disturbed by the number of concurrent initiatives and wanted more time to work on Disciplinary Literacy, especially those who had been involved since Cycle One in the previous school year. I constantly reiterated that this is not something new, but a refinement of our work so that we can expand to other grade levels.

The final threat is the Experimenter Effect. As I learned from other teachers, this was in play during the first two months of the DLPD. One of the study participants asked the principal to give more professional learning time to the Grade Nine Team's work, insisting that there was cohesion and applicability among the Disciplinary Literacy sessions versus "just sitting and getting stuff that doesn't really matter" in the other CCT sessions. This same teacher was a cheerleader among both her grade-level and subject-area teams concerning Disciplinary Literacy and showed the most overall growth in all three subconstructs. Knowing this exchange between teacher and principal, I was particularly attuned not to overly-prescribe positive codes to her data during the qualitative data analysis and particularly careful in reflecting on my Account of Practice regarding my positionality as a practitioner-researcher.

Summary of Methodology and Innovation

I chose a multi-strand mixed-methods action research design that aligned with the epistemological lens and theoretical framework of interpretivism, transformative learning, and collective efficacy. I designed the Disciplinary Literacy Professional Development workshops to include complementary quantitative and qualitative measures that provided insight into teachers' thinking about collaborative professional learning, collective efficacy, and competency with implementing Disciplinary Literacy in response to new communicative practice standards and reporting protocols before, during, and after the workshops. My position as the Director of Learning meant that I was both a participant in the DLPD and an observer of the teachers' individual and collective journey, and my Account of Practice provided an informative check on the qualitative and quantitative data sets. Overall, the instruments, data collection techniques, and data

analysis procedures were methodologically congruent with the theoretical framework, statistically sound, valid, and responsive to the research questions:

1) what role does collaborative professional learning have on teachers' collective efficacy when confronted with pedagogical change?; and
2) in what ways does Disciplinary Literacy equip teachers to address the pedagogical changes of adopting and reporting to communicative practice standards in their subject areas?

CHAPTER 4

FINDINGS

> *We are always simultaneously dealing with specific situations, participating in the histories of certain practices, and involved in becoming certain persons. As trajectories, our identities incorporate the past and the future in the very process of negotiating the present…a sense of trajectory gives us ways of sorting what matters and what does not, what contributes to our identity and what remains marginal.*
>
> *– Etienne Wenger (1998, p. 155)*

Purpose of the study

This study explored what role collaborative professional learning may have on teachers' collective efficacy when confronted with pedagogical change. New K-12 academic standards introduced between 2010 and 2014 prioritize content-specific communicative practices including discipline-specific language, discursive methods, and ways of knowing. These new standards necessitate replacing traditional grading with standards-based assessment and reporting. Teachers feel isolated and unprepared to simultaneously implement these two paradigm-shifting changes (Guskey & Brookhart, 2019). As a means of empowering and equipping a multi-disciplinary, grade-level team of five high school teachers to respond to these pedagogical changes, I designed a series of seven Disciplinary Literacy Professional Development (DLPD) workshops centered on the theory, strategies, and tools of Disciplinary Literacy to answer the following research questions: 1) what role does collaborative professional learning have on teachers' collective efficacy when confronted with pedagogical change; and 2) in what ways does an understanding of Disciplinary Literacy equip teachers to address the pedagogical

changes of adopting and reporting to communicative practice standards in their subject areas?

In this chapter, I present findings from the analysis of the mixed-methods *data corpus* detailed in Chapter Three. In order to fully understand this data analysis and resultant findings, the chapter begins with a review of the Innovation and the teachers' process in co-creating the inquiry-based transdisciplinary project which was the stated product of their collaborative professional learning. The disruption caused by the shift to remote learning due to the coronavirus pandemic which occurred a third of the way into the DLPD – adding another "disorienting dilemma" (Mezirow, 2011, p. 19) for the teachers – was an important factor in considering the findings and reflecting on the original study design. The "Review of data analysis" section highlights the quantitative data analysis and qualitative coding process, highlighting the rationale for merging the data sets into themes that informed findings for the three subconstructs of the research questions. In the "Findings" section, I address each research question through a detailed examination of key aspects from the data analysis and integration of participant voice through the lens of the study's theoretical framework including Mezirow's Transformative Learning Theory (1997, 2001), Bandura's Collective Efficacy Theory (1997), and Moje's Four Lenses of Disciplinary Literacy (2007).

The Innovation: Disciplinary Literacy Professional Development, Part II

As detailed in Chapter Three, the Innovation for this study was a four-month professional learning series of workshops focused on the tenets of Disciplinary Literacy as a way to help teachers address the adoption of new communicative practice standards and shift assessment and grading practices away from points-based achievement to a

system of reporting student competency in the standards. I designed the study to measure both individual growth in Disciplinary Literacy and collective efficacy of the team. Teachers worked collaboratively throughout the DLPD to co-construct an inquiry-based, transdisciplinary project for students similar to those in previous research cycles. Because "setting high quality goals and building commitment to goals significantly affect perceptions of outcomes" (Forester, Thoms, Pinto, 2007, p. 270), the teachers' collaboration on creating the project reified the intangible goal of collective and individual growth in Disciplinary Literacy, a "process of giving form to our experience by producing objects that congeal this experience into 'thingness'" (Wenger, 1998, p.58).

The following sections are a detailed recounting of the DLPD both prior to and after the onset of at-home learning due to the coronavirus pandemic. The first section describes teachers' reactions to the initial professional learning workshops and the requisite change in the original study design based on the teachers' reluctance to complete professional readings and Teacher Reflective Journals prefaces the shift to online learning. The next section relates the teachers' collaborative planning concerning the inquiry-based, transdisciplinary student project and the impact of the immediate shift to remote teaching. These two sections provide valuable background concerning the lived experience of the teachers and their dedication to the study in order to fully understand and appreciate the study's findings.

Originating and adapting the study

The original study design included seven face-to-face professional learning sessions and a final session implementing the project with the students followed by a debrief among the study participants (Table 2). Through this study design, I endeavored

to understand how engaging in a process of collaborative inquiry and cycles of reflection concerning a new pedagogical framework contributed to collective and individual efficacy that transformed professional practice. Teacher reactions to the professional reading and journaling, administrative cancellations, and the onset of remote learning due to the pandemic necessitated changes to the study design during the early stages of the DLPD. These changes included creating a new measurement approach to capture teachers' thoughts and reflections (the original intent of the Teacher Reflective Journals), revising my facilitation strategy to assimilate aspects of the professional readings into the sessions, merging information from one session into the others to compensate for a cancelled session, and a complete re-envisioning of the end-of-year student project.

During the first two sessions, teacher discourse and preoccupation with the logistics of the student project indicated a disinclination toward the professional readings and reflective journaling process. In order to capture their reflections "on target pedagogies, both individually and with others" (Greenleaf et al., 2012, p. 236), I eliminated the Teacher Reflective Journal as a measurement tool and began audio recording and transcribing the DLPD sessions. This new data collection method allowed me to hear individual voices as well as the interaction between and among teachers as they discussed the lens and language of their subject matter in terms of interdisciplinary lesson design and assessment. Further, teachers began to volunteer their thoughts about Disciplinary Literacy directly to me via email and messaging as well as submitting artifacts such as rubrics and lesson plans. These additional data were unanticipated in the original study design and became part of the qualitative data set.

Teacher reluctance to engage in outside reading, most citing the lack of time due to numerous school-wide initiatives, also necessitated a change in my workshop design and facilitation. During one DLPD session, I prompted teacher discussion with passages from the day's reading. This proved insightful based on one of the teacher's visceral reaction to the challenges posed in the reading and the distraction from the logistical planning of the project. After this session, I sought advice from a previous Grade Nine teacher who had been reassigned to a different grade level. This teacher's enthusiasm during the previous cycles of research had continued in his own study of Disciplinary Literacy and shifting assessment practices, and he advised, "it (Disciplinary Literacy) seems very clear, yet also very abstract. Our initial reaction is, 'obviously, I do that,' but when we really examine the standards and our teaching, we don't."

Reflecting on his observation of the teachers' reluctance to deeply engage in discussions concerning Disciplinary Literacy, I realized that high school teachers, being long-practicing content area experts, may have a "curse of expertise" when looking at the standards through their lens rather than the lens of the students. Defined by Fisher & Keil (2015), "this 'curse of expertise' is explained by a failure to recognize the amount of detailed information that had been forgotten [and] while expertise can sometimes lead to accurate self-knowledge, it can also create illusions of competence" (p. 1251). After that realization, I selected key passages from the professional readings that aligned with my observations of the teachers' conversations about Disciplinary Literacy during previous workshops. These observations included misunderstandings of the role of the communicative practice standards, ways in which to implement Disciplinary Literacy in specific subject areas, and ways in which Disciplinary Literacy can serve as the

framework of transdisciplinary unit development. Further, the passages, such as one taken from Gillis in the third workshop, were chosen to prompt reflection on practice by aligning theory with classroom implementation and guide the creation of the end-of-year student project.

Creating the inquiry-based transdisciplinary student project

Throughout the DLPD sessions, teachers co-created an inquiry-based transdisciplinary lesson (Spires et al., 2014) to be administered at the end of the school year. This goal mirrored the student projects from previous cycles of research outlined in Chapter 2; therefore, three of the five participants were familiar with the stated outcome based on their long-standing membership on the Grade Nine Team. For the purposes of this study, transdisciplinary is defined as the integration of communicative practices and content knowledge standards from numerous disciplines to create a lesson based on a contextual, "real world" problem (Caldwell, 2015; Harvard T.H. Chan School of Public Health, 2020; International Bureau of Education, 2020).

Initial planning

From the very first DLPD session, participants focused heavily on the design and logistics of the activity with little reflection on the professional readings or Disciplinary Literacy strategies as applied to their practice. When the Innovation started prior to the pandemic, the teachers' initial idea centered around an Escape the Room activity during which students would work in teams consisting of one "expert" from each of the subject areas and integrate knowledge from different subject areas. This approach differed from preceding cycles of inquiry in which the student Affinity Groups were discipline-specific experts who worked together through the same lens to respond to the

provocation. During the Escape the Room scenario, each team would have at least one subject-area expert to help solve the clues for moving from one scenario to the next, ultimately combining all the smaller clues into the answer for the provocation "who stole the school's mascot?"

Although the participants did not engage in the professional reading, many tried to bring in interdisciplinary approaches and the tenets of Disciplinary Literacy into creating clues. Through these discussions, they attempted to bring in the lens and language of their disciplines and find ways that each subject could complement the other. For example, an exchange between the Math and Art teachers, prompted by an informal conversation about the death of U.S. Supreme Court Justice Ruth Bader Ginsburg, indicated an attempt to deepen or correct their thinking about the other's subject area:

> Math: I think we're still at the point where we're needing like clues in different rooms right so if like, one of the clues might be, you know, looking at Katherine Johnson, or RBG, and comparing them in some way because then you have social studies [civics and History] and color combinations in art – red, blue, green [for RBG].
>
> Art: For artists, it's actually not red, it's magenta, and if they want to get pure color from these three [red, blue, green], they will be very frustrated if you give them the word 'red'. If you give them something like this red [points to a notebook cover], yes they can make all the colors because this lacks yellow. I mean, purple, it's never going to work out. The color mixing is cool but we don't want it to be like, 'oh you pick color mixing and then we check it'. Maybe do it like the rainbow value chart... each color has a number 1234578910 and then they think this color matches with two, so my first number is two, and then now it matches with nine. And so, nine...and now this one matches with three and so…three, something like that. Then I don't know what you would do with those numbers, you would unlock the locker? Or that could be the locker number?

> Math: OK, so maybe this number to divide by this number to find the missing...or you could do each color or something like a set of numbers. This one matches with number two and this one matches with number five and so that's a code for something. And so then that opens a box with a clue in it. Does that make sense?"
>
> Art: Sure we could...those colors are different colors, and if they match the color correctly there's a number associated with that. And then that puts a code into a lock box, and the next clue is in that box, then figure out the code.

As the conversations continued about the Escape the Room scenario in the next two sessions, ideas such as lock boxes with clues inside emerged. Again, teachers explored the idea of using color combining as a means to find the code, while the Social Studies teacher looked at interdisciplinary ways to also assimilate additional subjects:

> Social Studies: Then here's the details in the math section, right, so systems of equations that comes up with codes that lead to coordinates on a map. I mean, can we make it maybe in addition to, or other than, world language[4]?
>
> Math: [The team] talked about the latitude and longitude, using that. So that was like the map reading, which is something… I like systems of linear equations that intersect at a point. So Maybe we say like X marks the spot so they know they mean x in the equation.

Although the teachers were not engaged in collaborative reflection concerning the professional reading for the session as per the original study design, they were involved in sharing the content and skills needed within their disciplines. Throughout the exchanges, I noticed a marked enthusiasm for deliberately finding unique ways in which

[4] The World Language teacher assigned to the Grade Nine Team was a part-time, local hire. Because she was not always present for the professional development time, she was not a participant in the study but did provide periodic insights into the discussions and verbally self-reported growth in understanding the ways in which different subject areas can complement each other.

the disciplines could be combined that would engage students in thinking across subject areas. I was especially thrilled to see the newest addition to the team, the Art teacher, immediately engaging in collegial discussions and bringing other group members back to the larger inquiry of Disciplinary Literacy. When discussing a proposed art activity as one of the clues for the Escape the Room, she reflected aloud, "I like that because to me that's the one that sounds the most specific to the purpose of the activity, right – using the lens and language of art."

Impact of coronavirus pandemic

All of the logistics of the Escape the Room, however, were abandoned after the move to remote learning due to the coronavirus pandemic. The Social Studies and Math teachers continued to integrate aspects of Disciplinary Literacy into their teaching and assessing as they sought to pare down the required standards due to remote learning. The Social Studies teacher was most engaged in shifting her practice and felt passionate about continuing the professional learning discussions and finding a new way to engage the students in the end-of-year project. She and I had conversations concerning the ways in which students could embrace the new online structure for authentic learning. She originated the idea of having students respond to the current pandemic through the lens and language of the disciplines by assuming the role of multiple experts and "[changing hats so] we get to see how their brain switches between the categories."

Three weeks after the shift to remote learning, the Grade Nine Team convened online for the fifth DLPD session which was their first meeting post-lockdown due to the coronavirus. Rather than escaping a room, participants shifted their thinking to escaping the tedium of online learning, the harsh lockdowns of the host country, and a future after

the coronavirus. The Social Studies volunteered her thinking of the past few weeks and suggested that the most timely prompt would examine the coronavirus and its impact on "the new normal," emphasizing that the students were "just trying to really escape from all this corona stuff" and that the new prompt should look toward the future with hope. As Leonardo (2004) observes, "critical educators assist students in mapping the contours of [oppressive conditions] with a language of critique and hope" (p. 16). She also emphasized a transdisciplinary approach while underscoring the content and skills needed in each discipline:

> as a scientist, as an artist, as a mathematician, what would their role be because they have to have a future. So how would they see their future in their roles like, what would they be needing to do to make sure to ensure they have a future? What kind of things would they want society to have in place? What kind of people would they need to be in their different disciplines to actually make it, whereby they have a future? Do you know what I mean – looking forward and not looking back. Not looking at how screwed they are right now kind of thing. If I was a scientist, what would I need, what skills would I be looking at? What would I want in my future? What kind of skills do they need to access in all the disciplines to make that future come true?

Other teachers added to the idea of focusing on the future and finding solutions to the pandemic through the disciplines. The Science teacher shared that the hope for the future from a science perspective is the creation of multi-strain flu vaccines rather than creating a new vaccine for every new influenza virus. The English teacher wondered how the current surge in online publications might continue after the pandemic, stating:

> how do they see this trend that's going on about putting these things free online when we used to have to pay for them? How have the things we traditionally do in a certain way altered so that we still get the benefit? It's kind of the same thing with art.

The Art teacher responded to the English teacher's wonderings, adding her observation about people's need to be part of a community during this isolation through global forums and the positive effects of this collaboration, affirming her belief that "having people work together creates synergy [because] the process is what matters, and definitely when there are more people involved...there's this arc, a public intervention." The Math teacher cited numerous websites tracking the spread as well as infection and death rates:

> the thing that gives me hope as a mathematician is that people understand exponential change in a real life situation now. And so, like, that's what gives me hope is that this is real life math happening before our eyes. Everybody's talking about 'flattening the curve' – what does 'flattening the curve' mean? Is it really what we want it to mean because I guess they're getting more about statistics. So maybe the hope is more math education so you don't have to trust the Fake News source (laughing), you can look at the actual graph or the numbers and figure it out for yourself because [the media source] might be downplaying something that you see to be true.

After each teacher shared individual thoughts about the lockdown, the impact on teaching, and the possibility for a new transdisciplinary project, the discussions shifted to why and how. As was his role during the initial Escape the Room planning, the Science teacher began the logistics conversation with "can we go back to the why, like why are we doing this in the first place? And to me it seems like we're trying to wrap up this whole disciplinary literacy aspect of the year – what is the why?" There was a brief discussion concerning the ways in which the end-of-year project can provide data in the communicative practice standards for teachers who have adopted the new reporting categories (Appendix E) and a way to provide group closure for the Grade Nine students during an unprecedented school year. The Science teacher responded, "so that's the why.

Then what do we want them to produce, if we want them to produce anything? If we're doing it for evidence [grades], then we need them to produce something. Correct?" Teachers shared their thinking about the ways in which students may or may not be graded in their subject and the additional reasons why this project would be beneficial for the students' ability to think critically overall. The Math teacher summed up the project in one sentence: "It's something that, at the end, they go wow!"

Based on this preliminary exchange, the Grade Nine Team devised a new approach for the transdisciplinary project: an Expert Panel responding to the prompt "from your discipline's perspective, what do you see about the future that brings you hope?" The team also accepted the idea of having students change perspectives rather than being assigned a particular discipline. The Math teacher was enthusiastic about the possibility from both a teacher perspective of seeing student growth and the feedback for her own instruction, but also for the students' exploration of their own interests, strengths, and transdisciplinary thinking about concepts and problems:

> It's beneficial for all of them to put on all the hats. I kind of like the idea of putting on a new hat and showing the things that they've learned in this class versus that class. They can say, 'I don't really like this one, and I'm really good at this. So I'm going to show you some of the whole year I've learned things in all these classes...that really is what they're going to be asked to do as professionals, right? 'Here's all the stuff I learned from my teachers and my explorations. Now I'm confronted with something brand new. How do I then apply that learning in a new, unknown situation?'

The next DLPD session focused on the logistics of wearing different hats, assigning students to different online rooms with each teacher, pairing students who would complement each other and engage in discussion, participating in a practice run-

through, and creating a "Look Fors" reference sheet for their colleagues that included discipline-specific language and perspectives from each discipline that students might use during the Expert Panel. Initiated by the Art teacher's request to role play the event, I modeled their moderation and they acted as students. At the end of the role play, the Science teacher affirmed, "I don't feel like that's as big of a deal as I can see now. I've never done this, like a little practice session." I interpreted his sharing of vulnerability among his colleagues as growing cohesiveness as a team.

The "Look Fors" equipped each teacher with words and ideas to listen for as they used the same data collection tool (Appendix C) from previous cycles to record student data concerning Disciplinary Literacy. For example, the Science teacher noted that students should use the term "epidemiological triangle," Art noted ideas about art as public intervention and a universal language, English mentioned numerous reading-related and writing-related terms, Math added terms such as "exponential growth" and "models" while also noting ideas such as "trusting data," and Social Studies contributed several terms related to the thematic lenses of social, economic, political, cultural, science/technology, and environmental impacts.

As part of the revised study methodology to honor teachers' limited time and help them focus student preparations on the lens and language of Disciplinary Literacy for the Expert Panel, I curated readings from different disciplinary perspectives (Appendix H) and created the student assignments based on teachers' observations and suggestions in the previous DLPD session. Some teachers chose to use the curated articles while others worked within their existing resources. In the DLPD session immediately prior to the Expert Panel, teachers had final logistics questions mostly centered on the composition of

the students in each group and the ways in which the features of the online application would work. Each teacher had 10-12 students assigned to her/him in a dedicated online classroom as outlined in a spreadsheet (Figure 6) indicating the URL for the online meeting room, rotation of the student pairs/triads, the disciplinary "hat" they would be wearing, and the time allocated to each round. Students were assigned to the teacher based on their response to the Fall 2019 survey asking them to rank their perceived

Figure 6

Example student rotation for Expert Panel

MATH TEACHER NAME

Class Meet: **meet.google.com/xxx-xxxxx-xxx**

Provocation: From your discipline's perspective, what do see about the future that brings you hope?

Each session will begin with a 5 minute "brainstorming" in small groups (students can use HangOut, Facetime, etc., their choice).
After the five minutes, everyone comes back to the Class Meet for a 1 minute presentation by each group and a 6 minute discussion among all groups.

10:00-10:05	**Review the provocation and procedures**				
	Artists	**Historians**	**Mathematicians**	**Literary Specialiats**	**Scientists**
10:05-10:20		Student 1 Student 2 Student 3	Student 4 Student 5 Student 6	Student 7 Student 8 Student 9	Student 10 Student 11
10:20-10:35	Student 10 Student 11	Student 4 Student 5 Student 6	Student 1 Student 2 Student 3		Student 7 Student 8 Student 9
10:35-10:50	Student 7 Student 8 Student 9	Student 10 Student 11	Student 4 Student 5 Student 6	Student 1 Student 2 Student 3	
10:50-11:05		Student 7 Student 8 Student 9	Student 10 Student 11	Student 4 Student 5 Student 6	Student 1 Student 2 Student 3
11:05-11:20	Student 1 Student 2 Student 3		Student 7 Student 8 Student 9	Student 10 Student 11	Student 4 Student 5 Student 6
11:20-11:30	**All Group Goodbye & Exit Survey**			—	
	Goodbye Meet: meet.google.com/xxx-xxxxx-xxx				

Note: This spreadsheet shows the rotation of each student group among different disciplines during the Expert Panel, allowing them opportunities to respond to the provocation through the lens and language of different subject areas. Each teacher had her/his own unique spreadsheet with the students assigned to the online meeting room listed by name.

subject area strengths for the Cycle Two activity (see Chapter 2). Teachers may not have taught the students assigned to their Expert Panel during the year, so their discussions during the DLPD sessions about students provided background concerning dynamics and ways to prompt discussion.

Inquiry-based transdisciplinary lesson ("Expert Panel")

Each teacher dedicated at least one class session to preparing students for the Expert Panel day in May. The Math and Art teachers were most concerned about student preparedness in their subjects, as they did not teach all the Grade Nine students like their counterparts in Science, English, and Social Studies. After working through the dilemma with their colleagues, the teachers felt that the information gleaned during the Expert Panel would still be valuable and provide data for their grade-level colleagues concerning the vertical integration of the new communicative practice standards.

To prepare the students, each teacher reviewed terminology and concepts within their classes related to the coronavirus pandemic as well as change over time within their discipline. The Math teacher shared the curated article about statistical analysis and constructed a complementary survey with three open-ended questions to prompt thinking including "Where have you seen math outside the classroom (this can be things beyond just the article)," "What have you seen or heard that made you wonder?," and "What might you have liked to know more about?" The Social Studies teacher also implemented the curated articles into her review and revisited the ways in which historians use themes to investigate people, events, and institutions from the past. The English teacher reviewed concepts about reading and writing literature, and the Science teacher reviewed the epidemiological triangle. The Art teacher, because she had so few

Grade Nine students, was unable to engage in review with students, yet the Science teacher brought a level of reassurance to her with his comment: “Let’s let them surprise us.”

The day before the Expert Panel, each student received an email with the format of the session and invitation links to two meeting rooms, one for their small group sessions and the other for a grade level debrief/sharing. The Grade Nine Team decided that all the students should convene as an entire group to “just say thank you guys for doing this and kind of like wishing them a happy summer” (Science teacher) as well as complete a modified Student Exit Survey (Appendix D) used in the previous two cycles. The teachers met in the final DLPD immediately after that meeting to share observations, submit their post-DLPD Innovation Configuration Map analysis, and complete their post-DLPD survey.

Teacher responses to the Expert Panel

All teachers except the Social Studies teacher participated in the final debrief, as she had a synchronous class session immediately following the Expert Panel. The teachers had high energy and were enthusiastic about the students’ responses, especially given the angst shown during the logistics sessions concerning possible lack of engagement if the activity was not assigned a grade. The Math teacher summarized the groups’ unfounded angst about lack of engagement:

> it started out rough. So in the first group, just like one word responses, right? And then by the end, they kind of started to see...even by the end of that first group, they started to see what was expected of them, and then they were able to talk much better. So, at the beginning, they said, ‘aren't we just going to be discussing the same thing’ and I was like, ‘yeah you might, but then it might lead you somewhere else, and it

> might make you think of something new' and so they were able to do that...or we thought about what this person had said, and we were able to add on this part of it.

Other teacher comments regarding the student response implied a sense of being pleasantly surprised at the students' responses. The English teacher found "their interpretation of art [to be] kind of beautiful to me...things like music and poetry." The Science teacher liked "all the differences they came up with, and then the amount of overlap, you know. Even though they were supposed to just be with one hat, they often drifted into the other disciplines."

Overall, the teachers persevered in their professional learning and collaborative creation of the inquiry-based, transdisciplinary student project despite the redesign of the study methodology and the disruption caused by the shift to remote learning. Qualitative data collected from the teachers' collaborative discussions, private communications with me, and artifacts such as rubrics and lesson plans indicated a dedication by some participants to continue their reflection on practice. Quantitative data supported elements of the original hypotheses expressing confidence in teachers' abilities to integrate elements of Disciplinary Literacy into their practice along with a strong, positive correlation between collaborative professional learning and collective efficacy. A review of the data analysis from Chapter Three supports these assertions.

Review of data analysis

I collected and analyzed data continuously throughout the DLPD (Figure 3). Data analysis involved individual analysis and alignment of the qualitative and quantitative data sets (Charmaz & Bryant, 2012; Schrier, 2013). Additionally, both narrative and discourse analysis added validity through participant voices (Ary, Jacobs, & Sorensen,

2010; Creswell & Miller, 2000). I also sought validity through catalytic and outcome criteria (Anderson & Herr, 1999; Newton & Burgess, 2016).

Quantitative analysis

My hypotheses were that teachers' responses to the post-DLPD survey would be higher in all three subconstructs, with confidence in teaching Disciplinary Literacy being the area where they experienced the most growth, and a strong, positive correlation between collaborative professional learning and collective efficacy. I also believed that their individual post-DLPD Innovation Configuration Maps would have more "Ideal" ratings than their diagnostic.

I first ran descriptive statistics for each individual subconstruct including mean, median, minimum, maximum, standard deviation, and population size (n) to determine the variation in the sample data. I also ran survey response frequencies within each subconstruct for both pre- and post-DLPD surveys to show the growth in each variable concerning collaborative professional learning, collective efficacy, and Disciplinary Literacy followed by a descriptive statistics analysis of each overall subconstruct which indicated in which of the three subconstructs participants reported the most growth. To further investigate the relationships between and among the three subconstructs, I conducted a paired sample t-test (Norman, 2010), the results of which will not confirm that "the research hypotheses are true, but rather suggest that (they are) plausible" (Allua & Thompson, 2009, p. 108). I compared all three subconstructs' pre-DLPD and post-DLPD mean results with each other for fifteen permutations. Only two pairs had a probability value that would reject the null hypothesis to connote a possible correlation: the pre-DLPD Collective Efficacy mean and pre-DLPD Disciplinary Literacy; and the

post-DLPD Collective Efficacy mean and post-DLPD Collaborative Professional Learning mean.

Qualitative Analysis

I analyzed the DLPD transcripts, private communications, and teacher-produced artifacts through a grounded theory thematic analysis as proposed by Strauss and Corbin (1998) using HyperRESEARCH 4.5.0 for Mac. Beginning with a concept-driven *a priori* coding framework based on the subconstructs of the research questions, my First Cycle included *in vivo* coding to maintain fidelity and add a level of confirmability (Schwandt, 2007). After the qualitative data corpus was initially coded using Elemental Methods (Saldaña, 2016), I reviewed the first iteration codes along with the session notes in my Account of Practice to create data-driven, narrative subcategories. I then employed a double coding process using Affective Methods (Saldaña, 2016) to the same data to further examine participants' experiences with aspects of the research questions' subconstructs. This multi-iterative First Cycle coding process reflected the participants' feelings, beliefs, and experiences during the DLPD workshops concerning systemic change, collaboration on the transdisciplinary student project, and Disciplinary Literacy itself. I then merged the results of the four First Cycle iterations into a Second Cycle of coding by employing Axial Coding Methods to identify three main themes (Figure 5). Although researcher subjectivity always shapes data analysis, because the subcategories emerged from the participants' own voices, this method contributed to findings that were formed more by respondents and less by the researcher's biases or preconceptions.

I completed the data analysis process by merging the qualitative themes with the results of the quantitative data analysis, citing specific alignment between the quantitative survey

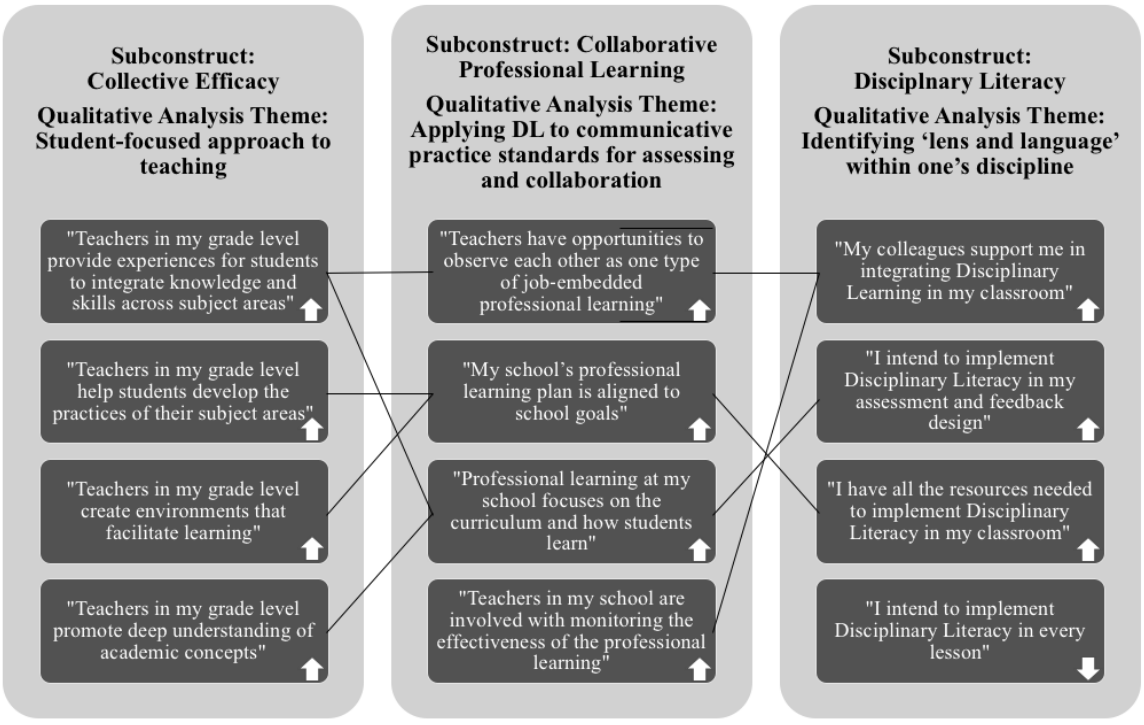
variables and the qualitative themes. My Account of Practice was an important triangulation point among the qualitative and quantitative data sets, and I paid particular attention to the ways in which the intentionally prescribed design of the collegial activities in the scaffolded collaborative professional learning of the sessions contributed to a sense of collective efficacy.

Integrating qualitative and quantitative analyses

Merging the qualitative themes and the quantitative results (Figure 7) showed alignment between the participants' self-reported responses to the survey and IC Map analysis with their words and actions during the DLPD sessions and private communications. As the

Figure 7

Merging quantitative survey variables with qualitative themes



Note: Lines indicate cross-over between quantitative survey variables and qualitative themes to highlight the interrelated nature of the three subconstructs.

design of this study was a qualitative-dominant mixed analysis (Onwuegbuzie & Combs, 2011), the themes from the qualitative analysis served as the primary means of aligning the quantitative results. The three subconstructs of the survey aligned almost directly with the emergent qualitative themes: collective efficacy and a shared student-focused approach to learning; collaborative professional learning and a desire to apply Disciplinary Literacy to communicative practice standards for assessing and collaboration; and Disciplinary Literacy and identifying the "lens and language" within one's discipline.

Analysis of the *data corpus* indicated that multiple variables in all three subconstructs informed for and supported the others. Aspects of collegiality presented in the Disciplinary Literacy subconstruct concerning participants' beliefs that their colleagues support their implementation of Disciplinary Literacy, the Collaborative Professional Learning subconstruct concerning observation of practice, and the Collective Efficacy subconstruct concerning a belief that fellow teachers provide experiences for students to integrate knowledge and skills. Participants' beliefs about the alignment of school goals and professional learning corresponded with a belief in the availability of resources to implement Disciplinary Literacy that create environments that facilitate learning. Participants' intention to implement Disciplinary Literacy in their assessment plans supported a belief that professional learning focuses on the curriculum and how students learn to promote deep understandings of academic concepts.

Findings

Integrated qualitative and quantitative analysis indicated numerous intersections between and among the data sources as related to the research questions. While the study design created overlap between and among the components of the DLPD sessions, there are distinct differences between the two research questions. Research Question One focused on the collective growth of teachers toward efficacious traits that would equip them to collaboratively address systemic change in grading and reporting. Research Question Two focused on the individual participants' growth in the understanding and implementation of Disciplinary Literacy to transform personal practice. The following section details the findings for each research question including an analysis of individual participants' experiences in both areas.

Research Question One

Through the first research question, "what role did collaborative professional learning have on teachers' collective efficacy when confronted with pedagogical change?," I sought to find a correlation between a team's level of collective efficacy and their engagement in collaborative professional learning. This question was of particular interest given the systemic changes at the study site as teachers who taught the same students simultaneously adopted new standards and shifted to standards-based grading and reporting while practicing in the isolation of their disciplines. My supposition was that providing opportunities for inquiry and dialogue among horizontal grade-level team members concerning professional learning about Disciplinary Literacy as a possible way to address the dual pedagogical changes would enhance a sense of collective efficacy.

Eight studies cited in the earlier literature review featured a connection between collaborative learning and collective inquiry, most concluding that "teachers who developed the richest inquiry relationships described themselves as having the opportunity to work with others who shared compatible or complementary interests, working styles, philosophies, expertise and/or backgrounds" (Butler & Schnellert, 2012, p. 1214). Greenleaf et al. (2018) cite over a dozen studies linking inquiry with transformative professional development. Steyn (2017) found that both horizontally and vertically structured professional collaborative communities engaged in inquiry-based transformative learning benefited from the trust, respect, and different learning styles of their colleagues.

The theoretical framework and methodological design of this study both supported my supposition. Collective efficacy, "a group's shared belief in its conjoint capability to organize and execute the courses of action required to produce given levels of attainment" (Bandura, 1997, p. 477), was measured by the participant's experience co-creating the inquiry-based transdisciplinary project. Ajzen's Theory of Planned Behavior (1985) and its determinants of behavior framed the social norms expected of the participants through this collaborative work. Finally, Mezirow's (1997) Transformative Learning Theory and the shared experience of creating the transdisciplinary project provided opportunities for interdisciplinary dialogue concerning discipline-specific communicative practices that resulted in individual perspective transformation and ultimately in changed behavior.

Positive correlations

Results from the paired sample t-test indicated a positive correlation between two of the fifteen possible permutations among the three subconstructs before and after the Innovation: the pre-DLPD Collective Efficacy mean and pre-DLPD Disciplinary Literacy mean had a probability value of 0.051; and the post-DLPD Collective Efficacy mean and post-DLPD Collaborative Professional Learning mean had a probability value of 0.021. Remembering that I established the alpha level to the default $\alpha=0.05$ at the start of the quantitative analysis phase and mentioned that the null hypothesis stated that there would be no correlations between or among the subconstructs of Disciplinary Literacy, collaborative professional learning, or collective efficacy, the results indicate a 95% chance that a positive correlation exists between teachers' feelings about collective efficacy and their knowledge of Disciplinary Literacy prior to the DLPD and a 98% chance that a positive correlation exists between teachers' feelings about collective efficacy and collaborative professional learning after the DLPD. A deeper examination of the differences between "collective efficacy" and its antecedents, as defined by Bandura (1997), and effective collaborative groups may suggest that teachers developed a sense of collegiality rather than true collective efficacy.

An additional inference from this analysis could indicate that teachers were unsure of their own and/or their team members' understanding of Disciplinary Literacy's theory and practice at the start of the DLPD because the composition of the grade-level team had substantively changed from previous cycles and had not yet developed cohesion and trust. Two of the five Grade Nine Team members were new to the school, one of whom joined abruptly at the start of the Innovation replacing a long-standing and well-

regarded Art teacher who had been involved with the previous cycles. Their newness as a team may have meant that all five participants were largely unsure of their colleagues' teaching practice and therefore were unable to rate Collective Efficacy highly on the pre-DLPD survey. Additionally, two of the members were brand new to the ideas of Disciplinary Literacy and the remaining three still wrestled with the concepts despite participating in the previous cycles, both of which may have contributed to their relatively low rating.

During the DLPD sessions, I observed that teachers evolved a general disposition toward collaboration concerning the co-creation of the transdisciplinary student project, particularly after the shift to remote learning. As they completely re-envisioned the project, all teachers valued placing students at the center of their teaching to ensure engagement and collaboration. As the Art teacher summarized, "in the old times, people used to make baskets together...we need to be together, humans have to interact...the voice of science and math [and others] can come together into a project...that makes us come together as a community." This collaborative spirit, however, may not be a true indication of collective efficacy in its truest form.

Collective efficacy

At the end of the DLPD, teachers shared their thoughts about the professional learning sessions and the final result of the transdisciplinary project. The Science teacher, who exhibited skepticism throughout the majority of the DLPD, implied collegial approval for his team members' teaching practices and possibilities for Disciplinary Literacy to foster interdisciplinary thinking when he stated:

> I like all the differences [the students] came up with, and then the amount of overlap, you know. They're talking about looking at something from a historical perspective which bled into science or split into math. So it's kind of cool. Even though they were supposed to just be with one hat, they often drifted into the other disciplines.

Teachers' aggregate post-DLPD survey results also supported a growth in collaborative practice and a belief that their grade-level colleagues "provide experiences for students to integrate knowledge and skills across subject areas," help students "think critically" and "develop the practices of their subject area," and "support me in integrating Disciplinary Learning in my classroom." One characteristic of efficacious teams is when teachers experience mastery and social approval (Tschannen-Moran et al., 1998), and the two-point shift on the Likert scale survey from 3.0 to 5.0 concerning teachers' sense of support from their colleagues in implementing Disciplinary Literacy combined with advances in other variables indicated social approval. Given the inherent organizational structure of schools in which teachers are isolated in their classrooms, only through collaborative professional learning were they able to share and discuss the frustrations and successes of their private practice in order to show this growth. The DLPD sessions allowed teachers to overcome the environmental constraints of isolated practice (Ajzen, 1985) and engage in this collective reflection (Mezirow, 2011) which in turn impacted student learning (Eells, 2011) as demonstrated in the student project. Despite the reflective opportunities on practice, however, teachers did not experience individual mastery experiences in their own practice concerning Disciplinary Literacy. Mastery experiences are one of four antecedents to collective efficacy and a critical determinant between a group of teachers who collaborate on one project and an

ongoing, collectively efficacious team (Bandura, 1997; Larsen, 2018; Loughland & Ryan, 2019; Tschannen-Moran et al., 1998),.

Collaborative professional learning

Variables that saw marked growth during the DLPD included "My school's professional learning plan is aligned to school goals" (2.83 to 4.60), "Professional learning at my school focuses on the curriculum and how students learn" (3.17 to 4.20), "In my school, teachers have opportunities to observe each other as one type of job-embedded professional learning" (2.17 to 3.20), and "Teachers in my school are involved with monitoring the effectiveness of the professional learning" (3.17 to 4.0). The reader should note that the survey variables addressing collaborative professional learning, adopted with permission from the original Learning Forward *Standards Assessment Inventory,* were worded to assess professional learning across the school and not the grade level. Unlike the survey variables for collective efficacy which I adapted from the original Tshannen-Moran and Barr (2004) *Collective Teacher Beliefs Scale* to reflect only the grade-level team, I failed to adapt the Collaborative Professional Learning survey variables to reflect *grade-level* collaborative professional learning and not *schoolwide* professional learning. While I elaborated on the ways in which the DLPD's professional learning design directly aligned to the new initiatives concerning standards adoption and standards-based grading which affected the entire school, I did not stress that the Grade Nine Team's depth of professional learning was unique to them and not generalized to all teachers in the entire school. Therefore, by constantly underscoring the ways in which the design of the DLPD sessions supported the participants in shifting their practice, they

may have generalized the DLPD's grade-level professional learning goals to the school's overall professional learning plan.

My wondering may be supported by participant responses within this same construct that noted a decline in their beliefs about collaborative professional learning between the pre-DLPD survey and the post-DLPD survey. Two of these variables, "Practicing and applying new skills with students are regarded as important learning experiences among my grade level team" and "Teachers in my school are responsible for selecting professional learning to enhance skills that improve student learning," both remained in the 3.0 range. The biggest downward slide occurred in the variable "Teachers in my school receive ongoing support to improve their teaching," moving an entire point downward from 4.0 to 3.0. As the Director of Learning for all three divisions, I observed a general dissent among teachers who wished a return to traditional models of professional development that included teachers being able to travel to self-selected conferences. Also, after the shift to remote learning due to the coronavirus pandemic, teachers expressed feelings of unpreparedness for online teaching mixed with a conflicting desire for professional development yet with a sense of no time for additional learning. The decrease in these results could be associated with a larger discontent about the schoolwide approach to professional learning and not directly associated with this study.

Individual teacher responses to collective efficacy and the DLPD

Based on the analysis of survey data noted above, participants experienced an overall increase in their appreciation of collegial collaboration during the DLPD sessions, especially in regard to crafting the transdisciplinary student project. This also contributed

to a larger understanding of interdisciplinary collaboration through the lens of Disciplinary Literacy, although that understanding did not result in a dedication to implementation. Factors such as personal dedication to transforming practice, time with the team, influence of subject-area team members, and guidance from administration also impacted the aggregate results of the DLPD. To more fully understand the impact of the collaborative professional learning on each teachers' experience and the contribution of these experiences to an aggregate result in collective efficacy, following are the ways in which each teacher may or may not have experienced personal growth:

Art teacher: "work[ing] together creates synergy."

The Art teacher exhibited a natural tendency toward community and collaboration from her entree into the team in the second DLPD session. Joining a new school and an existing team can be daunting, yet the Art teacher embraced the opportunity for discussion from the very first session in which she was involved. In private conversations with me, she noted that she "comes from this culture where you are not the number" and felt that people "can be as you are with me." Her inherent openness to "having people work together creates synergy," and she valued "process [as] what matters, definitely when there are more people involved...there's this arc." In the one session during which the team discussed a professional reading, she admitted, "I need the intellectual colleagues to help me put everything together, because I'm not a reader but I am a visionary." Her overall demeanor for collaborative inquiry, when melded with her artistic epistemological lens, can be summarized in one statement: "Connect people together....I want you to be excited. There will be big black spots but then there will also

be lovely yellow spots and pink and lavender spots, there will be more pink, lavender, and happy spots."

English teacher: emotional safety, an antecedent to collective efficacy.

At the beginning of the school year, Administration assigned the English teacher to two grade level teams, with the majority of her teaching load in upper-level classes. Further, she was also assigned an additional course load at the start of the second semester which corresponded with the start of the DLPD. Therefore, she participated fully in two of the eight DLPD sessions and was partially present for two other sessions. During those sessions, however, she demonstrated a desire to engage in co-creating the transdisciplinary project in ways that would benefit both the students and the team. Her self-effacing comments about a perceived failed attempt to integrate historical context into her media unit led her to share, "I tried to do that this year, a little bit...so maybe I got something wrong...that could be my fault." The safety to express frustration and failure is a theoretical antecedent of efficacious teams (Larsen, 2018).

Math teacher: personal change despite collegial reticence.

The Math teacher had been involved in the professional learning concerning Disciplinary Literacy since the first cycle of research began in January 2019. As a long-standing member of the Grade Nine Team, she deepened her understanding of assessment through the Disciplinary Literacy lens despite a reticence among her subject-area colleagues to adopt new communicative practice standards and reporting categories (Appendix E). When designing the initial Escape the Room scenario for the end-of-year transdisciplinary project, the Math teacher actively worked to bring together Disciplinary Literacy from other disciplinary areas. After the switch to remote learning and the

redesign of the transdisciplinary project, she continued her efforts at interdisciplinary thinking:

> you could do a compare contrast: why wasn't the Spanish flu pandemic as bad as it is now? You didn't have people traveling so quickly or widely then like you have people traveling today. It's gonna take a long time to get across the ocean on a ship versus people that can fly on an airplane.

Like the Art and Math teacher, Math was comfortable expressing her feelings with colleagues, often seeking clarification or "just need[ing] to vent about that."

Science teacher: administrative expectations are required for change.

The Science teacher, along with the entire high school Science Team, was new to the school at the start of the 2019-2020 academic year. Much of his efforts focused on creating cohesion among the subject-area team, yet he dedicated a great deal of time to the logistics of the first Escape the Room scenario. During the DLPD sessions, he engaged in discussions concerning grading and assessment, asking specifically about the practicalities of student engagement without an assigned grade. At the end of the DLPD, he implied an appreciation for the interdisciplinary possibilities across the grade level stemming from an understanding of Disciplinary Literacy.

Social Studies teacher: "feels kind of organic."

Like the Math teacher, the Social Studies teacher was heavily involved in the study of Disciplinary Literacy since the first cycle in January 2019. As her understanding of Disciplinary Literacy deepened, she sought opportunities to align communicative practice standards in both inquiry and investigation across the disciplines. She also originated the revised transdisciplinary project after the shift to remote learning, and encouraged the group to "shape it into something that's different than what we're doing,

then it becomes more exciting. It's going to be something that feels kind of organic with them, too." The Social Studies teacher also served as the primary thought partner for her colleagues who were seeking ways to assess and assign a grade to the student Expert Panel discussion. Recognizing that her Math colleague struggled with old reporting categories that did not yet align with the communicative practice standards or others who were still covering content to the end of the year, she highlighted that the themes of historical thinking contain all of the other subjects and offered the following:

> [I can] take [the grading] on if you guys would prepare them for their role in your subject...so you tell them what would be needed to be a science person which you give to me...and then they work on their own, and I give them time in-class because I've never been this far ahead. I just give them a history grade for their whole thing, because in history we have science, technology, art – we have all these things that they incorporate.

Conclusion regarding Research Question One

Overall, analysis of the *data corpus* indicated that the Grade Nine Team did grow in their willingness to collaborate on creating the transdisciplinary student project as part of their structured Collaborative Community Time on Tuesday mornings. Some members also sought a deeper understanding of Disciplinary Literacy in other subject areas to create interdisciplinary, authentic tasks for the students during the project. However, the first research question sought to identify a correlation between *collaborative* professional learning about the pedagogical disruption of teaching, assessing, grading, and reporting newly-adopted communicative practice standards and the impact of that collaborative learning on teachers' *collective* efficacy. Noting the antecedents of collective efficacy include mastery experience, vicarious experience, social persuasion, and emotional arousal (Bandura, 1997; Larsen, 2018; Loughland &

Ryan, 2019; Tschannen-Moran et al., 1998), the individual team members did not all experience these precursors in order to form a collectively efficacious team. Further, their learning did not result from active participation in high-functioning professional learning communities with the intent to transform practice (Voelkel & Chrispeels, 2017) but contextual compliance to design the transdisciplinary student activity.

Larsen's (2018) study among two teams of secondary school language arts teachers found that "teachers must become effective teacher teams before they could develop collective teacher efficacy, [and] relationships among team members are crucial for successful implementation of other elements" (p. ii). Individual self-efficacy impacts collective efficacy (Kurz & Knight, 2004; Parker, 1994; (Tschannen-Moran et al., 1998) and vice versa (Goddard et al., 2000; Tschannen-Moran & Hoy, 2007), and the individual teachers of this study did not all gain confidence in understanding and implementing Disciplinary Literacy. Although the teachers collaborated in creating a successful inquiry-based transdisciplinary project for students, there was insufficient evidence to indicate whether they met Bandura's criteria of collective efficacy that would be transferred into future collaborations or the establishment of accountability measures for the complementary, horizontal implementation of Disciplinary Literacy in all subjects.

Research Question Two

The second research question sought to discover "in what ways Disciplinary Literacy equipped teachers to address the pedagogical changes of adopting and reporting to communicative practice standards in their subject areas?" Qualitative data analysis indicated that all participants showed some growth in their understanding of Disciplinary Literacy within their subject area while quantitative analysis indicated a hesitancy for full

implementation. An analysis by teacher indicated that there were marked positive changes in the understanding and motivation of the Math teacher to implement Disciplinary Literacy. The Social Studies teacher exhibited the most aggregate growth in her understanding of the theory and practical applications in the classroom. The Science teacher's qualitative and quantitative data were neither conclusively positive nor negative. Because of their limited participation, the Art teacher and English teacher are addressed briefly.

Through the second research question, aspects of Ajzen's idea of personal antecedent attitudes and pre-existing beliefs intersects with Mezirow's idea of personal discourse through an examination of assumptions and autobiographical contexts regarding new information. By design, participants focused on only two of Moje's Four Lenses of Disciplinary Literacy – understanding the epistemological lens of the discipline and the functional linguistics of specialized vocabulary, text structures, and discursive method used by professionals in the field – in their professional learning journey. Abercrombie's (2018) suggestion that future studies concerning professional development about Disciplinary Literacy "explore other disciplinary-literacy perspectives (disciplinary epistemological perspective, linguistic processes perspective, and cultural navigation perspective) to create a more comprehensive picture of how disciplinary literacy can be most effectively used with secondary students" (p. 26) inspired me to focus on these two aspects.

The original study design for data related to Research Question Two incorporated Teacher Reflective Journals as a source of information for the teachers' personal journey with Disciplinary Literacy. As noted previously in this chapter, that plan was adapted

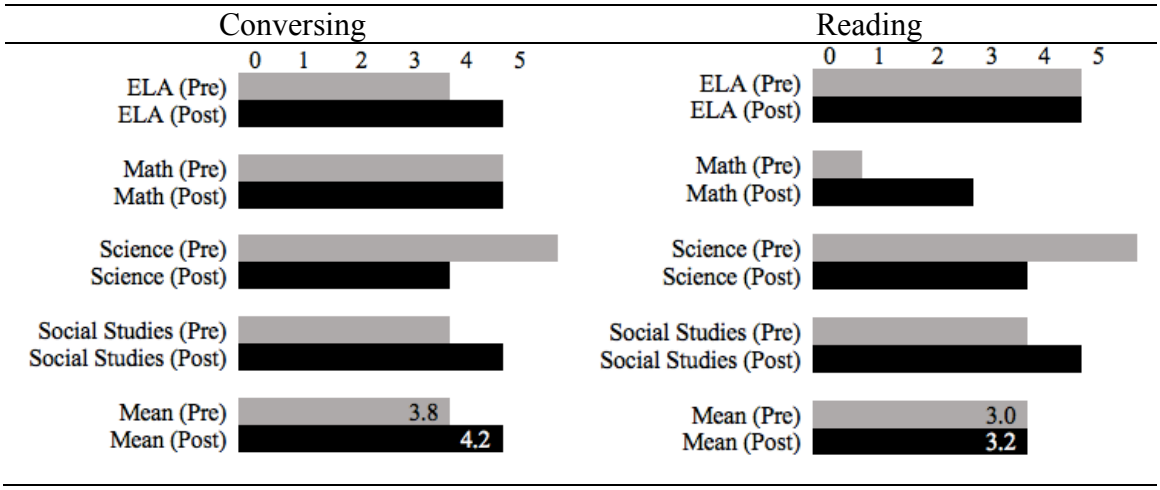
based on teachers' reluctance to engage in the professional readings and journal their thinking; however, the survey and Innovation Configuration Map (IC Map) remained the same as the original design.

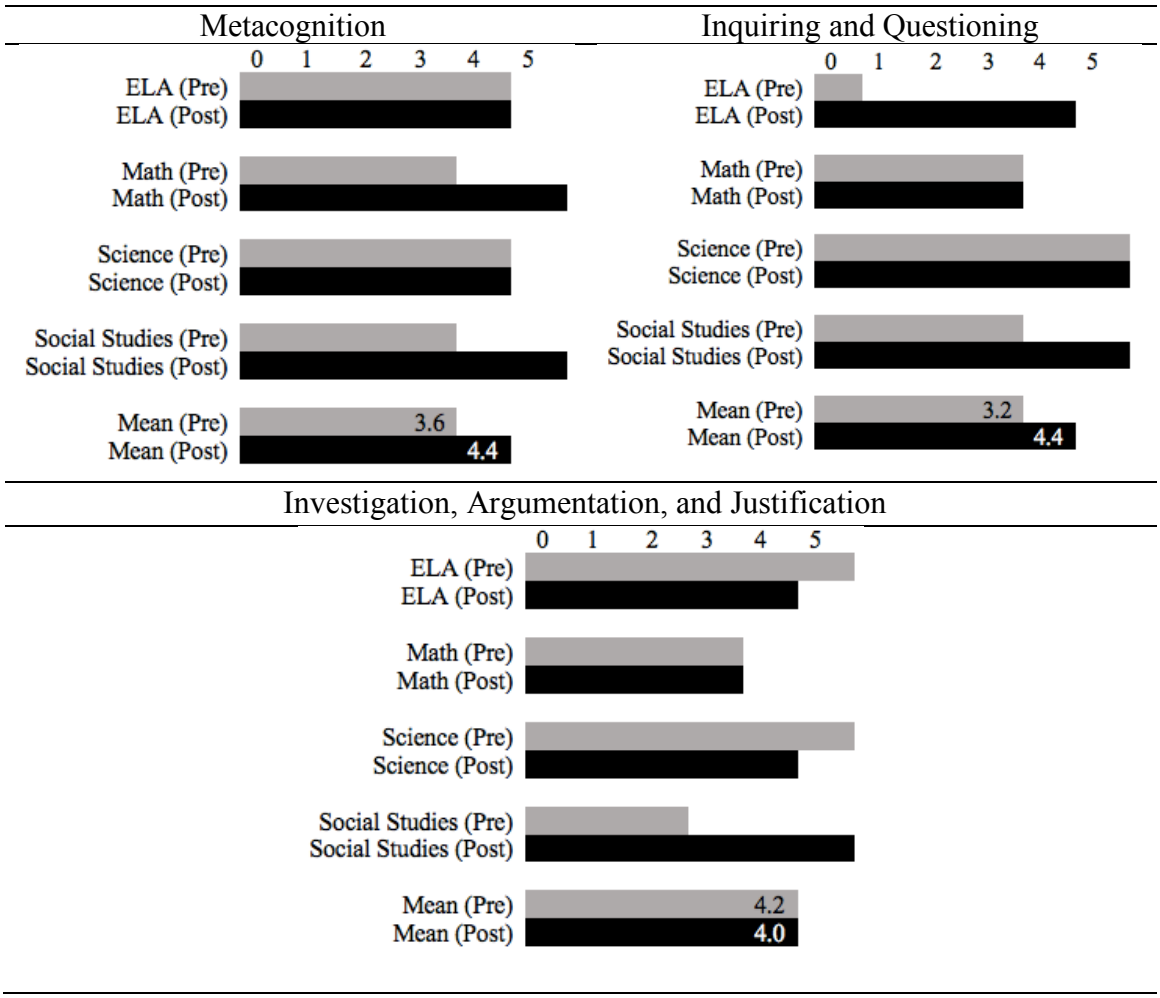
Innovation Configuration Maps

The teachers' self-reported IC Maps provided individualized, quantitative data concerning their growth in the key components of Disciplinary Literacy including conversing, reading, investigation/argumentation/ justification, inquiring and questioning, and metacognition (Appendix A). While completing their IC Maps, teachers referenced the crosswalk (Appendix B) between their standards and the indicators of the IC Map to know exactly which communicative practice standard aligned to each component. To fully understand the scope of each teacher's growth in Disciplinary Literacy and the overall thinking of the Grade Nine Team, I used results from the IC Maps (Table 7) as a member check to inform my interpretations of the survey data and analysis of the qualitative data.

Table 7

IC Map individual and group pre- and post-DLPD mean responses by component





Inquiring and Questioning.

Two participants showed growth in Inquiring and Questioning as expressed by their pre-DLPD and post-DLPD IC Maps while two participants remained the same[5] (Table 7). The indicator for an "Ideal" implementation of Inquiring and Questioning states that teachers "provide multiple, scaffolded opportunities for students to plan and conduct original research using discipline-specific strategies; research is supported by evidence and appropriate to task, purpose, problem, and audience." The Science teacher

[5] Because the Art teacher joined after the study began, she did not participate in the IC Map portion of the data collection process.

ranked himself a 5.0 of 5.0 growth in this area on both the pre-DLPD and post-DLPD surveys, which correlates to the highly structured NGSS Practice 1: Asking Questions and Defining Problems and other aspects of his participation in the Innovation. Likewise, the Math teacher self-reported a consistent 3.0 of 5.0 on both the pre- and post-IC Maps, the 3.0 indicator on the IC Map stating that the teacher "engages students in guided questioning of the materials with limited instruction in the thinking strategies unique to the discipline." Perhaps this rating is because the math department only recently adopted new communicative practice standards — specifically College Board Practice 1: Implementing Mathematical Practice and CCSS Mathematical Practice 2: Reason abstractly and quantitatively — and were still adapting practice to include these standards in their lesson and assessment planning.

The Social Studies teacher indicated her proficiency as 3.0 of 5.0 in her pre-DLPD and a 5.0 of 5.0 in her post-DLPD IC Map regarding Inquiring and Questioning and the implementation of C3 Framework-aligned communicative practice standards of Domain 1: Developing Questions and Planning Inquiries. The school adopted the C3 Framework only four months prior to the study, so her ranking may indicate the recency of adoption and the concurrent professional learning in which the Social Studies department engaged. The English teacher self-reported the most growth in the component of Inquiring and Questioning, moving from a 0.0 to 4.0 of 5.0 based on a realization of the ways in which she can support colleagues in teaching investigative strategies using their communicative standards.

Metacognition.

When comparing pre-DLPD and post-DLPD IC Maps in the component Metacognition (Table 7), both the Math and Social Studies teachers expressed two-point growth (3.0 to 5.0) while the Science and English teachers remained 4.0 of 5.0 in both pre- and post-DLPD reporting. The ideal indicator for Metacognition stated that a teacher "intentionally and regularly integrates visible thinking routines into the curriculum map (naming the expert practice, showing how to use it, and providing a discipline-specific reason for using it)." Metacognition is a direct expression of Moje's Four Lenses of Disciplinary Literacy, specifically the Epistemological Lens through which students "see" the world as an expert in their subject. While there are no direct communicative practice standards that address metacognition, the entirety of all the standards represents the epistemological mindset of the subject-area because experts in those disciplines either wrote or informed them.

There is an inherent connection between the components of Inquiring and Questioning and Metacognition. Metacognition represents the way of knowing within a discipline, appreciating the lens through which experts comprehend and make sense of their world. Understanding that different subject areas approach the same phenomenon or concept in vastly distinct ways also leads to an appreciation concerning the divergence regarding the methods of inquiry and questioning between and among disciplines. For example, mathematicians will seek *truths* through writing proofs by "reason(ing) abstractly and quantitatively" (CCSS Mathematical Practice 2) while artists may seek *understanding* through a creative process of "observation, research, and experimentation to explore unfamiliar subjects through artmaking" (NCAS VA:Cn10.1.IIa). Even within

a discipline, practitioners use different methods for inquiry. In Social Studies, there are distinct types of questions such as compelling questions that address "problems and issues found in and across the academic disciplines that make up social studies" (Grant, 2013, p. 325) and supporting questions that "provide the subject matter scaffolding that allows the inquiry to unfold in a coherent fashion" (Grant, Swan, & Lee, 2017, p. 201).

Because of the symbiotic connection between metacognition and the methods of inquiry in each discipline, teachers exhibiting a complete understanding of Disciplinary Literacy would be expected to show growth equally in both Inquiring and Questioning and Metacognition. Therefore, it is interesting to note that only one participant (the Social Studies teacher) reported growth in both areas. This disconnect emerged during the coding of qualitative data in Chapter Three (Figure 5) and is discussed in more depth in the "Implications for Practice" section of Chapter Five.

Investigation, Argumentation, and Justification.

The component Investigation, Argumentation, and Justification proved to have mixed results from the participants (Table 7). An ideal implementation of this component states that a teacher "provides multiple, scaffolded opportunities for students to plan and conduct original research using discipline-specific strategies; research is supported by evidence and appropriate to task, purpose, problem, and audience." The Social Studies teacher reported a two-point growth from 3.0 to 5.0 which correlates to her understanding of the C3 Framework explained in more depth below. The Math teacher remained consistent at 3.0 both pre- and post-DLPD, while both the English teacher and Science teacher indicated a one point drop (5.0 to 4.0) in this area over the course of the DLPD sessions. In reviewing the qualitative data from these two participants, perhaps

the drop is related to their deepened understanding of the communicative practice standards concerning research opportunities in their discipline and the ways in which they were not fully implementing those specific standards using the discipline-specific strategies of Disciplinary Literacy at the start of the Innovation. The reasons for each teachers' growth, decline, or stagnation in this component of the IC Map are examined in more depth during the following examination of individual teachers' responses below.

Remaining components: Conversing and Reading.

The IC Map components of Conversing, in which a teacher "intentionally builds disciplinary-specific vocabulary and discourse strategies that enable students to share ideas and critique the ideas of others with credibility," and Reading, in which a teacher "integrates model texts that exemplify disciplinary discourse and ways of knowing including unique text structures, specialized vocabulary, visual representations, and use of evidence to support claims," also showed changes between pre- and post-DLPD results. The Social Studies teacher indicated one point growth in both components, moving from 3.0 to 4.0 in each. The English teacher showed one point growth (3.0 to 4.0) in Conversing. The Math teacher indicated a two-point rise in Reading, moving from 0.0 to 2.0, while the Science teacher indicated a two-point loss in Reading, moving from 5.0 to 3.0 (Table 7).

Survey results

Six of the eight variables in the survey addressing the subconstruct of Disciplinary Literacy showed growth overall, and survey variables designed to address the subconstruct Collective Efficacy also aligned with teacher growth in Disciplinary Literacy. Responses including participants' beliefs that their colleagues "Integrate

knowledge and skills across subject areas," "Help students develop the practices of their subject areas," "Promote deep understanding of academic concepts," "Design authentic student learning opportunities" and "Help students master complex content" all showed growth while also underscoring the survey variable with the most growth (3.0 to 5.0), "My colleagues support me in integrating Disciplinary Learning in my classroom." Incongruent with the growth shown in these Collective Efficacy variables and other Disciplinary Literacy-related variables such as an intention to include Disciplinary Literacy in their assessment and feedback approaches (3.50 to 4.40) and having all the resources needed to implement Disciplinary Literacy (3.50 to 4.40) was the decline in "I understand why Disciplinary Literacy was included in my subject area's Standards" which fell almost a point (5.17 to 4.25) and "I intend to implement Disciplinary Literacy in every lesson" which fell a quarter point (4.67 to 4.40).

Individual teacher responses to Disciplinary Literacy and the DLPD

An individual analysis of each teacher may explain the discrepancy among these seemingly-related survey variables as well as changes in their individual IC Maps. Qualitative data provides the bulk of support for my analysis and understanding. I also utilize elements of the theoretical framework in my analysis.

Art teacher: "a different kind of Picasso."

Due to a mid-year employment change in the high school Fine Arts department, the Art teacher joined the DLPD after it started. By that time, the teachers' focus was on the co-creation of the transdisciplinary project and not on professional readings or Disciplinary Literacy strategies. With her background in the International Baccalaureate, she quickly assimilated into the interdisciplinary discussions using the lens and language

of art. By the end of the DLPD, her comments about the students indicated an appreciation for the transdisciplinary nature of the project: "they know how to express themselves, and they know about describing the work of art using elements, the principles of art and design, and adding meaning. I love that." She even praised one student, stating that his comments led her to believe, "maybe he'll become a different kind of Picasso."

English teacher: beyond generic research papers.

The English teacher's pre- and -post DLPD IC Map indicated growth in her understanding of Inquiring and Questioning as well as Conversing, with a drop in Investigation. The four-point growth in Inquiring and Questioning could be attributed to discussions between the English department and I during the previous year which removed writing "research papers" in English classes. Because the new standards sets in the other subject areas (CCSS Math, NGSS for Science, NCAS for Fine Arts, and the C3 Framework for Social Studies) included reading and writing in the disciplines, we concluded that writing research papers might best happen in those classes under the guidance of the subject-area experts rather than in English classes. In this way, teachers using the newly adopted communicative practice standards would teach writing in the discipline-specific format and style of the subject areas rather than a generic style.

Math teacher: "doing those kinds of…assessments throughout."

The Math teacher's experience during the DLPD is perhaps the best example of Ajzen's Theory of Planned Behavior (1985), specifically the determinants of behavior that affect a person's willingness to change and most precisely the external limitations and factors that impact behavior. The Math teacher's hesitation and frustration centered

around her department's reticence to adopt new standards-based reporting categories in the three domains of Concepts and Procedures, Communicating Reasoning, and Problem Solving and Modeling which align to the communicative practice standards of both Common Core Math Standards and Advanced Placement math courses (Appendix E). Concurrently with the DLPD, she engaged in departmental professional learning with an external math consultant and additional sessions with me in my role as Director of Learning. These professional learning sessions focused on understanding the intent of the new communicative standards while redesigning existing assessments and creating new assessments aligned with these standards and categories. The Math department was the only subject area in the high school that had not adopted standards-based reporting categories as a transition to standards-based grading and reporting, relying on task-based grading categories (e.g. tests, quizzes, homework) and one numeric grade per assignment until absolutely forced to change.

Her pre- and post-DLPD IC Map indicated a two-point rise in both Reading and Metacognition, with all other components remaining unchanged. For Reading, she noted on her initial IC Map, "I have no text(book) to draw from and no time to find them [supplementary readings for the students]." In response to her comment, I shared articles and exemplars specifically concerning Reading and the ways in which she could integrate model texts that exemplify disciplinary discourse and ways of knowing. Her change in practice concerning reading and metacognition in the discipline is best illustrated by the way in which she prepared her students for the Expert Panel. To initiate the class, she shared an article about the mathematics of predicting the course of the coronavirus (Rogers & Molteni, 2020) and asked them to reflect on where they had encountered math

outside of the classroom and share any questions they may have about the myriad statistics on the Internet.

The Math teacher also demonstrated a willingness to adjust practice and share learning with those outside her grade level team. During one of the DLPD sessions, she volunteered, "that's something that I talked about (with Math colleagues) – assessments. Getting in that communication piece anyways. If I want evidence for the last unit, then I should be doing those kinds of little assessments throughout because I can't do the traditional." The necessity for change became most pronounced after the shift to remote learning, when math teachers became tired of "policing" traditional tests online and distrusting the validity of the results due to possible parental assistance. The Math teacher and Geometry colleague adapted a "build your own robot" project as a summative assessment rather than their long-standing unit test. The Math teacher volunteered the assessment for my review, and we collaboratively added the standards being assessed and the new reporting categories (Appendix E) to which they could align. After my initial feedback, the teachers also added the requirement for students to "write a narrative (minimum 3 paragraphs) explaining the purpose of their robot, justifying their choices in shapes based on the function/purpose, and explaining their thinking concerning their calculations of surface area and volume," a communicative practices element not present in their previous assessments. At the end of this iterative refining process, I praised their dedication to integrating the new communicative practice standards while optimizing student motivation, increasing student agency through master-oriented feedback, and integrating elements of Disciplinary Literacy by asking students to justify and explain thinking using the lens and language of mathematics.

Science teacher: literacy-content dualism.

The Science teacher was most vocal with his hesitancy to implement Disciplinary Literacy, focusing a great deal on the logistics of the project. His reluctance to engage deeply in conversations concerning Disciplinary Literacy displayed a strong allegiance to antecedent attitudes and pre-existing beliefs (Ajzen, 1985), particularly in regard to teaching the language of science and drawing distinctions between content literacy and Disciplinary Literacy. During the second DLPD session, he proclaimed, "I don't see the point of the article [Gillis, 2014]...even the overall point of this work...are you now telling me that I am now supposed to explicitly teach vocabulary even though I've been taught that that approach is old school?" I reminded him that two months earlier, during a professional learning session with the high school science team, NGSS consultant Paul Andersen confirmed the practice of teaching science-specific language: "Direct instruction, mini-lessons, must happen in all four of the practices. Without definitions, it's really hard to do reasoning" (December 2019).

In a private communication following the aforementioned DLPD session, the Science teacher further reflected on the Gillis article and Andersen's comment about science vocabulary:

> In the article, it seems that they are trying to get the students to learn, where the goal of our escape room is for the students from different disciplinary literacy strengths to come together and solve problems. I was helping [Grade 11 Social Studies teacher] with an article on genetics for his AP seminar class. It was a great chance to see the difference between core literacy and disciplinary literacy. The core literacy took a lot more in-depth knowledge of the science behind genetics, while the disciplinary literacy looked at mainly the abstract in conclusion and what could actually come out of the paper.

Reading this reflection and coding his comment about preparing students for the Expert Panel with a review "more on, like, just…scientific knowledge," I understood that his apprehension and dismissal stemmed from a general misunderstanding of Disciplinary Literacy. In this case, the Science teacher appeared to have an inherent "literacy-content dualism which suggests that teachers must decide whether to provide literacy or content instruction, which is a false dualism and adherence to it is detrimental to student participation in content-area reasoning, learning, and communicating" (Draper et al., 2005, p.12). Final discussions among his peers resulted in an appreciation for the interdisciplinary possibilities of Disciplinary Literacy based on his observation of the student responses in other subject areas: "all the differences they came up with, and then the amount of overlap." His pre- and -post DLPD IC Maps indicated a one point drop from 5.0 to 4.0 in Investigation, Argumentation, and Justification; while a drop may seem negative, this could indicate a realization that current practice may not be sufficient to meet new communicative practice standards. Perhaps at the very end, his colleagues helped him re-envision the ways in which he approaches opportunities for students to plan and conduct original research using discipline-specific strategies through the lens of Disciplinary Literacy and its relation to the NGSS standards – a step toward transformed practice.

Social Studies teacher: "old dog, new tricks!".

Based on both the qualitative and quantitative data, the Social Studies teacher exhibited the most overall growth in all aspects of the second research question concerning the ways in which the professional learning about Disciplinary Literacy equipped teachers to address the pedagogical changes of adopting and reporting to

communicative practice standards in their subject areas. Specifically, her transformation is noted in her pre- and post-IC Maps which indicated a two-point shift from 3.0 to 5.0 in three components (Investigating etc., Inquiring etc., and Metacognition) and a one-point shift from 3.0 to 4.0 in the remaining two components (Conversing and Reading). Qualitative data from conversations and workshops transcripts corroborate this growth, particularly a dedication to understanding the communicative practice standards, fostering student engagement, and reinventing her approach to individual assessment rubrics and whole course assessment design. Therefore, the Social Studies teachers' growth in both the theory and practice of Disciplinary Literacy during the Innovation affirms several aspects of the study's theoretical framework concerning the andragogical need for work-specific, immediately-applicable knowledge (Mezirow, 1997) and one's ability to transform practice through individual, critical reflection on one's own assumptions that have been framed from long-developed habits of mind and points of view (Ajzen, 1985; Mezirow, 2001).

Communicative practice standards.

When first introduced to the idea of Disciplinary Literacy and the new communicative practice standards in subject-area professional learning sessions, the Social Studies teacher and her department peers all demonstrated aspects of literacy-content dualism (Draper et al., 2005) and a curse of expertise (Fisher & Keil, 2016), unable to separate the skills and practices of history from the content. After observing the Social Studies teachers' different approaches to their existing standards and their uncertainty about the new C3 Framework, I selected resources from Moje, Wineburg, and other prominent social studies educational theorists to build a bridge of

understanding. The Social Studies teacher was exuberant when the shift in thinking finally happened:

> I'm using the posters, everything. I use the terminology, they're looking at two different sources on something, you know, do they corroborate with each other or are they different? Or source credible? Then I thought, you gave us those Stanford ones, we have the C3, and we have our AERO things – it's all the same thing! It's just how the nomenclature differs or how they use it in some way. Verbally, how they express it is different but it's the same thing over and over again so we can actually embed the Disciplinary Literacy language in our standards when we're using it with the students. So, this standard is maybe this, but we can call it...I don't know 'identification' or 'corroboration' or we don't have to keep them separate because they're really all the same things, it's just different people using different terms. That's what I thought of yesterday.

Assessment and rubric design.

As the Social Studies teacher's understanding of the communicative practice standards deepened through conversations with both vertical and horizontal teams, she shifted her focus to assessments and grading. At the beginning of the DLPD, the Social Studies team adopted new reporting categories that aligned with the new standards (Appendix E) and began redesigning assessments around the new categories. As she was

> grading [an] assessment, my brain started to sort the work into the standards. I can see it now! The brain shift has occurred! So it takes a semester to convert to the new grading and the standards, and now I can adapt old assessments into the four [reporting] categories. This is cool – old dog, new tricks!

After a few weeks revising assessments, she commented, "[I'm] still working on the rubric, probably just [assessing] Communication and Content...they already have Research and Analysis marks. For next year, I need to tweak it for pedagogical soundness. I was getting bored so I figured they were also."

Most of the Social Studies teacher's comments revolved around student learning and engaging her students in the new practices. She even brought students into the rubric design process:

> The students and I did the criteria for this assessment based on the [school's] proficiency criteria and standards, and we decided on what that would look like for this unit assessment based on our learning targets and activities. It was a great exercise; I did it with all three sections [of the class]. They got to see how teachers think and understand the need to be specific – 'I went above and beyond,' well what does that mean? And what does that look like for this unit? They came up with most of the criteria using the generic proficiency criteria as a guide. They set the grades, so I think we are OK. It was great for me, too. I asked them if next time they wanted me to just set them; a quarter said yes, and three-quarters said they liked the joint model.

When students are involved in determining the pedagogical approach to their learning, "grading fairness was predicted best by exposure to the teaching practices rather than the scoring practices" (Gordon and Faye, 2010, p. 93).

Conclusions regarding Research Question Two

While the DLPD did not create five new Disciplinary Literacy disciples, there was some level of growth in understanding for each participant. One teacher wrestled with an existing personal paradigm about language teaching and needed expert validation to open thinking. Another teacher struggled with the external limitations placed upon her transformation by subject-area colleagues who resisted adopting new standards and reporting categories. Yet another teacher was pressured by organizational structures that stretched her across numerous grade-levels and left little time for engagement. One teacher truly transformed practice and shifted her paradigm concerning integrating and

assessing the new communicative practice standards by focusing on what works best for student learning.

Summary of Findings

By collaborating on the shared goal of creating the inquiry-based transdisciplinary project focused on hope and the future, participants came to value their colleagues' dedication to student-centered learning. This mutual engagement, which "draws on what we do and what we know, as well as on [...] the contributions and knowledge of others" (Wenger, 1998, p. 76), fostered a contextual collaboration but did not result in fully realizing Bandura's collective efficacy. As defined by Bandura (1997), "people's beliefs in their collective efficacy influence the type of futures they seek to achieve…[and] their staying power when collective efforts fail to produce quick results or meet forcible opposition" (p. 764). Because of the disparate ways in which each individual teacher embraced the theory and implementation of Disciplinary Literacy, the constant influx of new school- and division-wide initiatives, the revolving membership of the grade-level team, and the onset of the coronavirus pandemic, there is little evidence from this study to suggest that the Grade Nine Team developed collective efficacy as a result of the collaborative professional learning. As Larsen (2018) and Cansoy and Parlar (2017) found, however, there is evidence that long-standing teams who are given adequate collaborative planning time to focus on one or two specific goals can develop collective efficacy once self-efficacy and collegial relationships are established.

Individual teachers' dedication to transforming personal professional practice through the adoption of Disciplinary Literacy as a way to implement new communicative practice standards and migrate to standards-based grading and reporting was mixed. One

participant exhibited personal reluctance throughout the DLPD, another's time for professional learning was impacted due to multiple assignments, and a third's progress was hindered due to external pressures from department colleagues to maintain the status quo. Despite these determinants of behavior (Ajzen, 1985, 1991), all three of these participants experienced varying degrees of growth in understanding the ways in which Disciplinary Literacy can equip them to address pedagogical change. One participant experienced a lasting transformation in practice as evidenced by her constant self-reflection on pre-existing assumptions about teaching and grading, experimentation with new assessment approaches based on reading and discussions with me, integration of students into the design of grading and feedback systems, and collective discourse with her vertical subject-area team about her learning and shifts in practice (Mezirow, 1997, 2001).

In the next chapter, I posit possible conclusions based on these findings including the limitations of this study and the lessons learned. From these conclusions, I examine the implications for both practice and research for teams engaged in collaborative professional learning. Finally, I respond to the same provocation posed to the students – "from your discipline's perspective, what do you see about the future that brings you hope?" – and propose ways in which administrators can strive for systems coherence and educators can innovate curriculum by applying the potential social justice aspects of Disciplinary Literacy to concept-based transdisciplinary courses using the lessons learned from this study.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

> *Change...has a split personality: its nonlinear messiness gets us into trouble; but the experience of this messiness is necessary in order to discover the hidden benefits – creative ideas and novel solutions are often generated when the* status quo *is disrupted...you don't have to become Dr. Strangelove to realize that living on the edge means simultaneously letting go and reining in.*
>
> *– Michael Fullan (2001, p. 107)*

Through this study, I investigated two main lines of inquiry: is there a possible correlation between collaborative professional learning and collective efficacy for a high school grade-level team experiencing systemic pedagogical change; and is the theory and practice of Disciplinary Literacy as a means for teaching and assessing discipline-specific language, discourse, and ways of knowing during a shift to standards-based grading and reporting? The study, grounded in a theoretical framework devised from Mezirow's Transformative Learning Theory (1997, 2001), Bandura's Collective Efficacy Theory (1997), and Moje's Four Lenses of Disciplinary Literacy (2007), was a mixed-methods action research design (Ivankova, 2015; Mertler, 2016) to address the following research questions:

1) what role does collaborative professional learning have on teachers' collective efficacy when confronted with pedagogical change?; and,

2) in what ways does an understanding of Disciplinary Literacy equip teachers to address the pedagogical changes of adopting and reporting to communicative practice standards in their subject areas?

The original Innovation, or Disciplinary Literacy Professional Development (DLPD), included eight face-to-face workshops during which participants engaged in reflective discussions concerning their experiences with Disciplinary Literacy implementation in lesson design and assessment coupled with the co-creation of an inquiry-based transdisciplinary project for students. Two measurement tools comprised the quantitative data set including pre- and post-surveys that targeted the three subconstructs of the research questions – Collective Efficacy, Collaborative Professional Learning, and Disciplinary Literacy – as well as pre- and post-Innovation Configuration Maps (Appendix A) that were complemented by a corresponding crosswalk (Appendix B) to align communicative practice standards with components of the Innovation Configuration Map. During the DLPD, I recorded participant discussions during the workshops and transcribed them as part of a larger qualitative data set that included private communications with the teachers, teacher-volunteered artifacts. Both data sets were triangulated with my Account of Practice.

The onset of the coronavirus pandemic necessitated the shift to remote learning, yet teachers voluntarily asked to continue the DLPD sessions and reconceived the student project for online delivery. Throughout the DLPD sessions, teachers showed a dedication to student-focused learning and integrating the lens and languages of the various disciplines that equipped students to engage in a collegial debate concerning a future after the pandemic at the conclusion of the study.

Analysis of the quantitative data set included descriptive statistics and paired sample t-tests for the survey variables in all three subconstructs. I analyzed the qualitative data using a grounded theory approach (Strauss and Corbin, 1998) beginning

with a concept-driven *a priori* coding framework based on the subconstructs of the research questions. Through a multi-iterative First Cycle including Elemental and Affective Methods in a double-coding process (Saldaña, 2016), I transitioned to Second Cycle axial coding using a Code Charting approach (Saldaña, 2016) that identified the primary codes associated with each participant (Table 6). Axial coding resulted in emergent themes that informed the findings and conclusions of the study (Figure 5). Qualitative and quantitative data analysis results were then merged through qualitative-dominant mixed analysis (Onwuegbuzie & Combs, 2011), with the three subconstructs of the quantitative data aligning to the themes of the qualitative analysis (Figure 7).

Review of Findings

Notably, this study's findings addressed teachers' experiences with a pedagogical paradigm shift prompted by the study site's adoption of a new standards-aligned approach to teaching, learning, grading, and reporting – the initial "disorienting dilemma" (Mezirow, 2011, p. 19) that informed the research questions – while they also faced with the additional dilemma of a shift to remote learning caused by the coronavirus pandemic. Data analysis and findings detailed in Chapters Three and Four proved inconclusive for the first research question and mixed for the second. Different determinants of behavior (Ajzen, 1985, 1991) impacted each participant, ranging from external constraints imposed by their department teams and multiple initiatives to internal constraints of predisposed understandings of effective pedagogy. These constraints concerning a personal dedication to transformative learning impacted the collective efficacy of the team and individuals' growth in understanding and implementing Disciplinary Literacy.

In regard to Research Question One, the participants of the study demonstrated collegial co-construction of an inquiry-based transdisciplinary provocation for student discussion. Still, they did not fully meet Bandura's definition of collective efficacy regarding "a group's shared belief in its conjoint capability to organize and execute the courses of action required to produce given levels of attainment" (Bandura, 1997, p. 477) that would continue beyond the scope of this study. Only one teacher fully achieved self-efficacy concerning her understanding and implementation of communicative practice standards, an antecedent to collective efficacy (Bandura, 1997). The team as a whole did not achieve a collective understanding of the communicative practice standards and the ways in which they can present in one's lesson design and assessment planning or how they can be a starting point for collaboration.

As for the second research question, each participant experienced growth in at least one indicator of their understanding of Disciplinary Literacy. Additionally, one participant experienced Mezirow's paradigmatic transformation concerning the assimilation of communicative practice standards into their assessment, grading, and reporting design. Participants displayed varying levels of dedication to understanding the theory and practice of Disciplinary Literacy, behavior fitting both Mezirow's and Ajzen's theory of adult learning and transforming practice.

Overall, a deeper analysis of the findings of the study resulted in two main conclusions. First, schools would likely benefit from policies and organizational structures that ensure systems coherence across and among initiatives, especially as they link to teacher workload and professional learning concerning new initiatives and shifts in pedagogy. Second, student-focused, authentic curricula that innovates Moje's Four

Lenses of Disciplinary Literacy can enhance systems coherence and infuse curricula with culturally-relevant pedagogy and issues addressing social justice while addressing content standards .

Limitations of the study

I identified three predominant limitations within this study that may have impacted the results and findings including elements of the original study design, organizational factors of the study site, and the onset of the coronavirus pandemic. Limiting elements of the original study design stemmed from the small sample size, participant reluctance to engage in the professional reading and journaling, and survey variables that addressed the entire school's professional learning and not the participants' unique grade-level experience in the DLPD. Organizational factors of the study site that potentially limited the study included a lack of administrative understanding concerning Disciplinary Literacy and no standardized practices concerning grading and reporting expectations. Limitations caused by the coronavirus included the inability to meet for professional learning and collaborative planning in person exacerbated by the dubious nature of the immediate shift to remote learning.

Study design

The first limitation concerning the study design was the small sample size. With five participants representing all subject areas across one grade level, the availability of a range of data for inferential statistics is low, and therefore I was unable to generalize to other populations (Marshall & Jonker, 2010). One could argue, however, that the demographics of the sample represented teachers who were all working within the same culture with similar external constraints, lowering the within-group variability of results

(Gabrenya, 2003). Future studies could consider having all teachers, not simply one grade-level team, engaged in the same DLPD in order to compare across either disciplines or grade levels (e.g. Grade Nine Team, Grade Ten Team...or Social Studies Team, Math Team, Science Team…). Yet, to enlarge the sample size, the school would need to show commitment to the study by offering scheduling and resources support.

My failure to include participants in the original study design was the second limitation. From the onset, participants chose not to read the professional articles supplied in the workshops' agendas in order to engage in reflection on personal practice[6]. Although reflective journals contribute to self-efficacy as a member of a profession and in personal practice while also supporting elements of the overall educational program (Moon, 2019), participants stated they did not have time to engage in the reading and journaling. As a result of their concerns, I adapted the design so that the underlying intent of the journals as a data collection tool for participants' reflections on implementing Disciplinary Literacy and the theoretical framework of Mezirow's Transformative Learning Theory (1997, 2001) was not compromised. Instead of journals, I recorded and transcribed the DLPD sessions which provided the data needed to respond to Research Questions One and Two. Had I invited participants to contribute to the original design, I would have identified their reluctance to engage in the professional reading and journaling in order to design a different methodological approach.

[6] Other researchers have also indicated teacher reluctance to engage in readings and journaling outside of the dedicated professional learning sessions (Fong, 2018; Powell, 2019).

A third limitation was my failure to adapt certain survey variables concerning the subconstruct addressing collaborative professional learning to grade-level teams. The original questions, adopted with permission from Learning Forward's *Standards Assessment Inventory*, addressed professional learning for the entire school rather than the grade-level team involved in the study. This resulted in an inconsistency in question formulation across the three variables because variables for Collective Efficacy and Disciplinary Literacy addressed the grade-level team specifically while the phrasing for the variables concerning Collaborative Professional Learning assessed the entire school. These inconsistencies may have resulted in teachers' varied and disparate responses to the variables concerning Collaborative Professional Learning, answering some through the lens of the grade-level team and some through the lens of the school as discussed in the findings for Research Question One detailed in Chapter Four.

Finally, the co-creation of the project often overshadowed collaborative learning about Disciplinary Literacy. Although individual dedication to understanding Disciplinary Literacy was evident to varying degrees based on the content of the participants' remarks during collaborative discussions, only one workshop was able to focus on the theory and practice of Disciplinary Literacy based on conflicting priorities and time constraints. Participants cited a lack of collaborative team time in order for them to create an engaging and informative inquiry-based transdisciplinary project for the students. I failed to account for the time needed to accomplish both Disciplinary Literacy learning and project planning, given the limited number of sessions available in the study site's dedicated professional development time. Future action researchers may wish to petition for a dedicated semester of learning during all available professional learning

time, allocating three or four hour-long sessions for a background in Disciplinary Literacy, some "team time" within subject areas depending on where the subject areas are in the adoption process, and at least four hour-long sessions for developing a grade-level, transdisciplinary unit.

Organizational factors of the study site

From the very first DLPD, teachers expressed a sense of being overwhelmed by other initiatives and obligations, given limited time in the schedule for individual planning. Although administration cancelled only one of the DLPD sessions, the redesign of the study methodology accounted for any missed information. In addition to all of the associated learning and logistics of migrating to standards-based grading and reporting in one school year, teachers also supervised advisory groups for which they designed learning in addition to their regular course load, supervised clubs or activities, monitored passing periods and breaks, and prepared for an accreditation visit in the spring. There were also several content-area consultants who visited during the academic year for professional development in the new standards that impacted teachers' time. After the shift into remote learning, an entire barrage of new and unprecedented pressures emerged.

Administrative understandings

An organizational limitation to the study as inferred by the participants and expressed directly in my Account of Practice was the administration's insouciant attitude concerning Disciplinary Literacy. The impetus for the study dated to January 2019 when the former principal mandated interdisciplinary lessons among grade-level teachers. The Grade Nine Team leader approached me for help in guiding them through the process,

and I immediately identified the intersection between their task and the advent of the shift to standards-based grading and reporting. After discussing this connection with the principal following my first meeting with the team, she allocated several additional Tuesday morning Common Collaborative Time (CCT) meetings to the work. This time allowed for the previous cycles of action research that led to this dissertation study.

During the academic year of the study, a new interim principal exhibited a more emergent approach to the CCT sessions with single-topic, generalist sessions and an overall lack of backward design in calendaring professional learning around school events and teachers' myriad obligations. In email and video teleconference communications after the shift to remote learning, the interim principal remained impressed by the team's dedication but could not confirm a date for the student project and wondered if the dedication stemmed from their professional learning or a personal dedication to me. Despite my efforts to provide background on Disciplinary Literacy and connect the learning to other school-wide initiatives over the months preceding the DLPD, his comments during multiple conversations indicated a willful unawareness of the tenets of Disciplinary Literacy and the ways in which the complementary nature of communicative practice standards across subject areas could support the transition to standards-based grading. Despite the change in administration and one cancelled DLPD session, the participants remained dedicated to the study and the creation of an inquiry-based, transdisciplinary student project.

No standardized practices for grading

The problem of practice framing this study was the teachers' anxiety with regard to a shift away from traditional grading practices toward standards-based grading and

reporting. While the study site's strategic plan governed the multi-year curriculum adoption schedule for introducing the new standards, there was neither a Board-approved Assessment Policy nor socialized standardized grading practices. The school's three different divisions reported student progress in ways that were not vertically integrated, causing a tension between the elementary and middle schools that had adapted a standards-based grading approach and the high school which maintained a traditional grading system. Although the previous high school principal instituted aspects of O'Connor's (2017) healthy grading practices, there were no systems in place to ensure cohesion of expectations.

At the start of the study, teachers were still uncertain about the expectations for grading, specifically the ways in which the Student Information System grading platform would calculate student progress and final grades. Although many of the teachers were redesigning assessments based on the new reporting categories (Appendix E), the grades remained a single-digit number that corresponded to an A-F scale that calculated GPAs. Most frustrated was the Math teacher whose colleagues expressed reluctance to shift practice before knowing how the software would calculate grades in the new system. She lamented during a discussion about whether the student project would be graded: "I wouldn't need to do this because we aren't using these [new] reporting categories this year…and not working to find different ways."

Despite the lack of a division-wide framework for grading practices, the participants worked within their subject-area teams to create their own agreements. They also shared ideas within their grade-level team concerning ways to adapt individual

assessments to account for the shift to reporting to standards. Overall, the lack of an administrative mandate proved troublesome but did not adversely affect study findings.

Coronavirus pandemic

By far the most unpredictable and uncontrollable limitation of the study was the onset of the coronavirus pandemic. The pandemic forced schools worldwide into delivering content via online learning, referring to the switch with multiple names including virtual school, remote teaching, and distance learning. Distance learning pedagogy and delivery is fundamentally different from face-to-face teaching and learning (Hodges, Moore, Lockee, Trust, and Bond, 2020), and teachers responded admirably to the challenges. A Gowan Group survey (2020) of independent schools at the start of the pandemic indicated that almost half of the 500 schools surveyed had no experience with online learning. Private schools like the study site transitioned to online learning quickly based on an existing learning management system, yet there was still an undercurrent of angst and frustration among all members of the community compounded by parental stress of becoming co-teachers at home with the teachers in the classroom.

While the coronavirus pandemic affected the ways in which teachers delivered instruction and conducted assessments, it may have positively impacted the overall results of the study. In an effort to successfully adjust their teaching to an entirely online environment, some participants sought assistance concerning ways in which they could shift practice to be more student-centered and less about policing behavior and cheating. By forcing teachers to reevaluate their pedagogical approach to eliminate teacher-centered pedagogy and points-based assessments, the pandemic may have made them

more amenable to transforming their existing lessons and assessment to be more focused on providing evidence of growth toward standards.

Lessons learned

Based on the review of findings and reflection on the limitations, the lessons learned from this study include incorporating participants into the study design, educating administrators on the greater value of the study's professional learning as well as the need for a comprehensive assessment policy and socialized grading practices, and ensuring the coherence of the Innovation's professional learning across initiatives to reduce participant fatigue and clarify the connection between and among the initiatives. The last two lessons unveiled an overall need for systems coherence during times of pedagogical change.

Participants as designers

Although the study's research questions and methodology derived directly from the observed and expressed needs of the teachers' problem of practice combined with a careful examination of andragogical theory and best practices in professional development, participants did not comply with the initial design of professional reading and reflective journaling. Because action research is "systematic inquiry into one's own practice" (Mertler, 2016, p. 4), more and more fields of inquiry are involving participants in study design (Sacristan et al., 2016). Because "each teacher will have her own learning practice — just as she has her own teaching practice" (Fahey & Ippolito, 2014, p. 32), involving participants in aspects of the study's design regarding their goals and obligations is critical for self-efficacy, study compliance, and safeguarding the sufficient applicability of a data set that responds to the research questions (Thibodeau,

2008). Further, integrating participants into the methodological design "ensure(s) the stakeholders' interests are represented [and] increase(s) the likelihood that targeted communities will accept and use the research findings" (Ivankova, 2015, p. 33). Therefore, in retrospect, I would have included the participants in designing the ways in which they demonstrated their transformative learning journey.

Educating administrators concerning efficacy and systems coherence of study

Between the initial cycles of inquiry and the study itself, the high school administration at the study site changed when a long-standing principal left the school and was replaced by an interim principal coming out of retirement. For schools undergoing a shift to standards-based grading and reporting, an administration who understands the "various elements and actors across systems…[provides] balance and coherence" among subject-area standards, curricula, assessment, and faculty professional development (Looney, 2011, p. 3). Rittel and Webber (1973) term the interplay of complex elements and problems within a system as a consociation of "wicked problems" (p. 155). They posit that changes in one area of an organization impact all other areas, presenting precisely at the "juncture where goal-formulation, problem-definition, and equity issues meet" (p. 156).

Administrators play a critical role in supporting teachers during times of pedagogical change such as that examined in this study as part of an overall goal of systems coherence. Discussions with the interim principal indicated a discordant understanding about the role Disciplinary Literacy could play in providing coherence across the various wicked elements of a standards-aligned learning system. Because "instructional leadership ha(s) a significant, direct, and positive impact on collective

teacher efficacy" (Çalik et al., 2012, p. 2498), a disconnected administration has the potential to negatively impact teachers' professional learning and their transformative journey (Cansoy & Parlar, 2018).

Further, the study site did not have a Board-approved Assessment Policy and socialized grading expectations grounded in the policy. While schools may have grading *practices* that dictate such things as the number of grades per quarter and when grades are due, having assessment *policies* is critical to underscore the philosophy of the school concerning student learning and feedback for growth. Assessment policies are "more than assessment practices...assessment policies describe the approaches that are used by an organisation in its assessment practices [and] outline how the processes of assessment will be managed" (SAQA, 2001, p. 28). Although the administration empowered departments to design their own reporting categories grounded in the new standards (Appendix E), they often addressed teachers' questions regarding expected grading practices with a general statement about using professional judgment in gathering and reporting evidence of learning. Many teachers deemed this response insufficient. For instance, as detailed in Chapter Four, the Math teacher and her department expressed that the lack of a cohesive philosophical approach or even grading practice guidelines outlining the transition from traditional to standards-based impacted their practice. Other study participants echoed the Math department's concerns during the DLPD sessions when they discussed grading and reporting. This was particularly poignant as related to student engagement and the ways in which the professional learning would impact practice in designing and grading assessments in the absence of a guiding policy.

Overall, the administration's lack of understanding concerning the ways in which Disciplinary Literacy can support systems coherence during a shift to a standards-aligned learning system and the lack of a socialized grading policy frustrated the study participants but did not conclusively sway the results of the study. In retrospect, I could have postponed the study until after an Assessment Policy had been drafted and approved by the Board which would have also postponed teacher readiness to implement the shift to standards-based grading.

Seeking systems coherence

This study explored ways in which professional learning impacts teachers' collective efficacy when faced with paradigmatic change. In so doing, there were numerous ways in which the study exposed the need for coherence among all elements of systemic change including grading policies aligned with the mission and values of the community, socialized connections between and among all initiatives that are tied to the strategic plan, and professional learning that connects the initiatives through the demands of the teaching and learning process. As schools seek relevance in an increasingly standardized and complex educational market, they tend to adopt multiple, simultaneous initiatives in order to be inclusive of the cognitive needs of a spectrum of learners, artistic and physical needs of differently-abled learners, social-emotional needs of all learners and faculty, and the requirements or whims of stakeholders and governing boards. Often, schools become subject to a "chronicle of fads" (Kliebard, 1988, p. 144) and react to the perceived needs of the moment rather than long-range, cohesive plans. Project-based learning, design thinking, technology integration, visible thinking, service learning, diversity and equity, information and digital literacy…"the Law of Initiative Fatigue

states that when the number of initiatives increases while time, resources, and emotional energy are constant, then each new initiative — no matter how well conceived or well intentioned — will receive fewer minutes, dollars, and ounces of emotional energy than its predecessors" (Reeves, 2010, p. 27).

Even if a shift to standard-based learning is the only initiative in which a school endeavored, the overwhelming amount of systemic elements involved in such a shift would require an intentional and realistic timeline across multiple school years (Peters and Buckmiller, 2014). Multiple, related initiatives should not be a deterrent, however, as the complementary nature of the initiatives allows schools to meet the needs of most learners. Mounting multiple initiatives is therefore not the problem, rather "the main problem is not the absence of innovations but the presence of too many disconnected, episodic, piecemeal, superficially adorned projects" (Fullan, 2001, p. 109).

Schools engaged in paradigmatic, systemic change require strategic plans that understand, plan for, and communicate systems coherence across the initiatives, particularly in regard to the professional development needs of the teachers. Systems coherence, also known as systems thinking, is "grounded in equitable ways of thinking and working, the components of the system are logically connected, and the people within the system share a unified focus and purpose" (Education First, 2020, para 4). Coherent alignment across curriculum, instruction, and assessment is the backbone of a school's systems coherence and includes a balance between knowing and doing, performance and feedback, and theory and practice that is underscored by teachers who are aware of the connections between and among elements (Erickson, 1998).

Schools endeavoring paradigmatic change to a standards-aligned learning system using Disciplinary Literacy as the unifying approach may wish to create a graphic of all the wicked problems (Rittle & Weber, 1973) that impact teaching and learning, with specific reference to how Disciplinary Literacy responds to those various elements. Beginning with the communicative practice standards, the graphic would connect each standard with aspects of the Innovation Configuration Map and Moje's Four Lenses of Disciplinary Literacy with every element of the teaching and learning process from curriculum mapping to report cards. In this way, the professional learning and transdisciplinary student project would be explicitly linked to the strategic plan, transition process, and teachers' professional learning.

Next steps

Based on the lessons learned, the study site may seek to integrate Disciplinary Literacy as a unifying pedagogical approach across subject areas and grade levels to synergize the individual efforts of teachers into a unified whole (Moje, 2008). Next steps might include extending the communicative practice standards crosswalk (Appendix B) to include all standards sets, examining all subject areas' existing scope and sequence through the lens of these communicative practice standards for vertical integration within each discipline as well as for interdisciplinary collaboration, and institutionalizing the end-of-year student activity to create a longitudinal data set of cohort growth in communicative practice standards.

Designed around the teaching assignments of the participating teachers, the Innovation for this study focused on the four core subject areas of English Language Arts, Math, Science, and Social Studies as well as Fine Arts. The study crosswalk

(Appendix B) constructed to assist teachers in aligning their respective discipline's communicative practice standards with the key components of Disciplinary Literacy included Common Core State Standards (CCSS) for English and Math, Next Generation Science Standards (NGSS), the C3 Framework for Social Studies, and the National Core Arts Standards (NCAS). Expanding the crosswalk to include the American Council on the Teaching of Foreign Languages (ACTFL) standards for world languages, Society of Health and Physical Educators (SHAPE) standards for physical education and health classes, and the International Society for Technology in Education (ISTE) standards for technology and design classes would provide additional integration of Disciplinary Literacy in all subject areas. An expanded crosswalk incorporating all of the subject areas can guide, "literacy experts, teachers, and those who work in the discipline...to collaborate [and] explicitly define a discipline's discourses and how students can show their understanding of content information" (Powell, 2019, p. vi).

This expanded crosswalk of communicative practice standards will also allow for a review of the vertical scope and sequence of these skills within the subject areas as well as horizontally across grade levels. Scope and sequence of content and skills, and the ways in which learning is taught and assessed, is most often expressed through curriculum mapping. According to instructional expert Heidi Hayes Jacobs, curriculum mapping is "a calendar-based process for collecting and maintaining an ongoing database of the operational and planned curriculum [that] is a focused, systemic effort [connecting] all aspects of the system" (Curriculum 21, 2009, para 1). Often accomplished by curriculum teams and teachers in professional learning communities, curriculum maps serve to align standards with the essential learning outcomes and assessment strategies

that measure students growth in, and attainment of, the standards (Wiggins and McTighe, 2005).

Because differences exist in the structure of knowledge between and among disciplines and the organization of the subject area standards themselves, approaches to curriculum mapping can also present challenging moments of understanding and collaboration between and among teachers in those subject areas (Rawle, Bowen, Murck, and Hong, 2017). As such, teams tasked with writing and reviewing curriculum maps using the crosswalk should come to the task with a common understanding of the theory and tenets of Disciplinary Literacy in order to find collaborative points of connection among the disciplines' various lenses, languages, and ways of knowing. In so doing, curriculum mapping of the communicative practice standards will lead to "a metadiscursive pedagogy [in which] teachers...develop courses of study that examine ideas from many different disciplinary and domain perspectives as a way of questioning the norms of their primary discipline of study" (Moje, 2008, p. 105).

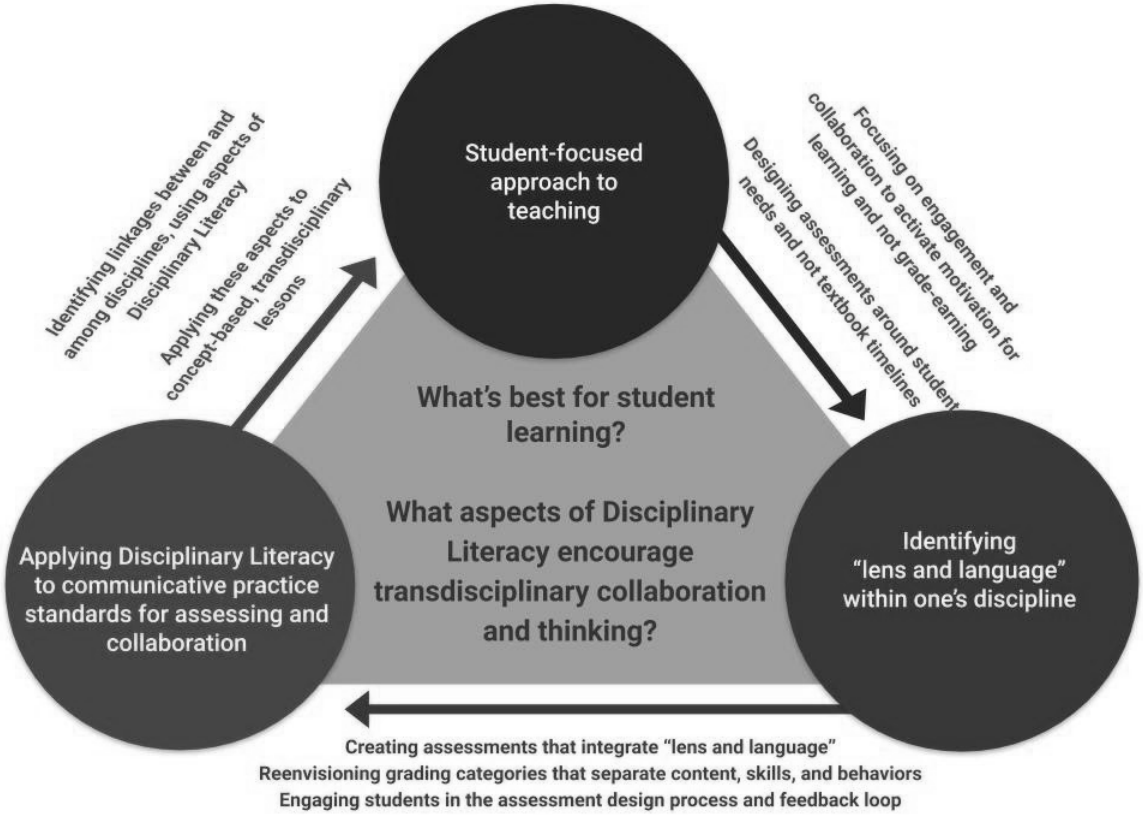
Although this study did not integrate the Student Exit Surveys or data from the student projects into the data set because they did not correlate with the research questions, the study site may consider institutionalizing the practice of year-end, transdisciplinary student projects similar to those discussed in the dissertation. In this way, they could gain longitudinal data concerning the implementation of the communicative practices standards through the lens of the learners. To use the students' own words, have we equipped them with the "right talk that adults want to hear" and have we adequately helped them understand why different people can see the same thing so differently and still be "right"?

Implications for practice

Three themes emerged from the combined quantitative and qualitative analysis that underscore the importance of systems coherence in schools and support the idea of Disciplinary Literacy as a unifying pedagogical approach: sharing a student-focused approach to teaching; identifying the "lens and language" within one's discipline; and applying Disciplinary Literacy to communicative practice standards for collaboration and assessment (Figure 8). An aggregate of the data analysis and findings, as presented in "a

Figure 8

Condition matrix of themes from combined qualitative and quantitative data analysis



condition matrix to map intersections of micro, meso, and macro conditions on actions and to outline connections between these levels of analysis" (Charmaz & Bryant, 2012, p.

3), provided insight into the ways in which this study can inform curriculum-related systems coherence through the implementation of Disciplinary Literacy. These themes underscore the importance of systems coherence for connecting teachers through common understandings and expectations that allow for professional learning communities to develop the skills of Disciplinary Literacy necessary for shifting the school to a standards-aligned learning system.

Two specific systems coherence elements that impacted the study included 1) a failure to connect multiple initiatives through complementary professional learning that informed collective practice across the initiatives and 2) a lack of established and socialized policies concerning assessment and grading to unify teachers around common understandings and expectations. While teachers in the DLPD effectively collaborated on the creation of an inquiry-based transdisciplinary project for the Grade Nine students, they failed to develop true and lasting collective efficacy due to time constraints imposed by multiple assignments, misunderstandings about the role of Disciplinary Literacy in helping enact the shift to standards-based grading and reporting, and confusion regarding the requirements of grading and reporting that consumed much of their thinking.

Systems coherence through a student-focused, standards-based, transdisciplinary curriculum

Findings from this study demonstrated that the participants held a collective value in student-focused learning and viewed the successful implementation of the transdisciplinary student project as an insight into practice. All teachers expressed pleasant surprise at students' level of engaging and connecting across disciplines concerning the provocation "from your discipline's perspective, what do you see about

the future that brings you hope?" The implication for practice resulting from these findings is that planning instruction and assessment through Moje's Four Lenses of Disciplinary Literacy and the associated Innovation Configuration Map (Appendix A) and complementary crosswalk of communicative practice standards (Appendix B) allows for the creation of standards-aligned learning experiences and assessments while also engaging and motivating student learning through culturally-significant, real-world problems rather than following a prescribed pacing guide focused solely on content.

Student-Focused approach to learning

In 2015, researchers at the Yale Center for Emotional Intelligence conducted a mixed-methods survey among 22,000 high school students in the United States asking them to express their current feelings in their own words. Results found that three-quarters of the students described their emotional state in negative ways (Moeller, Brackett, Ivcevic, and White, 2020), with most indicating they were tired, bored, or stressed. Most interestingly, there was no difference in emotions between males and females or those from disparate socio-economic or ethno-cultural backgrounds. Because feelings and emotions impact students' motivation to engage with their learning (Christenson, Reschly, and Wylie, 2012), it is critical for teachers to design meaningful learning experiences with which students can personally connect.

Disciplinary Literacy recognizes that "connections are required in order to engage students in relevant and purposeful activities, which lead to engagement and motivation in everyday life [and] foster deeper comprehension and better learning in all disciplines" (Johnston, Dibella, and Martelli, 2016, para 10). Noting that "purpose happens when students develop a meaningful connection to someone or something outside of

themselves" (Wehner, 2018, para 9), Disciplinary Literacy can serve as a bridge between the communicative practice standards of the subject areas and a student-focused transdisciplinary approach to teaching and learning as demonstrated in the three student projects discussed in this dissertation (Cullen, 2016; Jeder, 2014; McCrickerd, 2016; Moje and Hichman, 2004).

Identifying "lens and language" within one's discipline

Results from the Innovation Configuration Map data analysis in Chapter Four indicated that only the Social Studies teacher reported growth in both components of Metacognition and Inquiring and Questioning. Perhaps this disconnect is associated with the mean result for the survey's Disciplinary Literacy variable "I understand why Disciplinary Literacy was included in my subject area's Standards" which fell almost a point (5.17 to 4.25). While content is important in all of the subjects' standards sets, the discourse-related skills and practices of the disciplines are emphasized as a means for understanding the content. Given that none of the standards expressly include "metacognitive skills" or "epistemology," teacher professional learning about Disciplinary Literacy must explicitly draw connections between the ways of knowing in the disciplines and the associated communicative practice standards for that subject area. In this way, teachers can interpret their subject area standards through the "lens and language" of their discipline — specifically the five components of conversing, reading, investigation/argumentation/ justification, inquiring and questioning, and metacognition — in order to connect students with the purpose of learning their particular subject.

One critical aspect of Moje's Four Lenses of Disciplinary Literacy (2007) for teachers is an understanding that each discipline possesses unique epistemological

groundings that form the ways of knowing and sense-making within the discipline. This understanding also implies an appreciation for the inherent differences in metacognitive strategies and methods of inquiring about, and questioning, knowledge claims within each subject area. Through Disciplinary Literacy, teachers help students make deeper connections between the requisite content and skills within each discipline, foster connections across disciplines, and develop personal relevance of the subject matter for their own lives. From "the perspective of emotion and learning, the person building the skill must understand the purpose behind the skill and find the route to developing the means to accomplish that purpose" (McCrickerd, 2016, p. 551).

Teachers who understand the differences among the epistemological lenses of the disciplines and the contrasting ways in which experts in these disciplines communicate knowledge can instill meaning and purpose behind the text styles that students encounter as they move between classes. Because high school students study the disciplines in isolation and do not link learning with various styles of inquiry, "a natural consequence of the compartmentalization of subject areas is the invidious distinction made among them in terms values, priorities, and power" (O'Brien, Stewart, & Moje, 1995, p. 448). Designers of texts and curriculum resources write from the lens of their disciplines, highlighting the values of language and relationships within a discipline. For example:

> what if the following sentence were encountered in a chemistry textbook: 'The despondent chemist tenuously grasped the test tube and lifted it feebly over the dancing blue flame of the Bunsen burner, fluttering the cylinder back and forth like a tiny flag signaling his surrender to the very science he was studying.' Why is this funny? Because it reflects a clear violation of Disciplinary communication style associated with chemistry. This same feeling of awkwardness can happen when someone tries to use a strategy that supports comprehension in one

discipline but not in another (Cullen, 2016, p. 9).

Teachers who purposefully infuse Disciplinary Literacy into their teaching and assessment practice deepen students' understanding of the socially-constructed ways in which texts represent not only the knowledge of the subject area's content but also the way the knowledge was created. This "access to knowledge and language conventions of different [scholarly] communities [empowers] youth [to] successfully navigate across those communities" (Moje and Hinchman, 2004, p. 324) which leads to metadiscursive young adults "who know how and why they engage" in the world (Moje, 2008, p. 103). Therefore, implementing a Disciplinary Literacy pedagogical approach with fidelity across all the disciplines underscores systems coherence by reinforcing both the unique and complementary skills from each discipline needed to bring purpose to "real-world" learning while also facilitating a common language among teachers that enables collaborative practices in teaching and assessment. As the participants discovered during their observations of students during the transdisciplinary discussion concerning hope after the pandemic, students who understand the epistemological lenses of the various disciplines and are equipped with the language of the subject areas can make connections between and among concepts in authentic ways.

Applying Disciplinary Literacy for collaboration and assessment

The final theme emerging from the combined quantitative and qualitative analysis that supports the role of Disciplinary Literacy as a unifying pedagogical approach and essential element of systems coherence in schools experiencing pedagogical change concerns collaboration and assessment. During this study, teachers collaboratively created an inquiry-based, transdisciplinary student project around a common prompt

about hope in a post-pandemic world. Previous cycles of inquiry related to this study involved students working as a team of experts in respective disciplines to discuss their subject areas' interpretation of a phenomenon such as a Chinese performance artist who makes bricks from particulate matter vacuumed from the air or taking an investigative walk through the local neighborhood and seeing the environment from the perspective of subject-area professionals. By using the crosswalk among discipline-specific communicative practices (Appendix B) as a framework for collaboration, teachers could extend this same approach from a one-time session by identifying concepts that transcend one discipline in order to formulate parallel lessons, interdisciplinary units, transdisciplinary courses, or entire integrated programs to facilitate systems coherence (Jacobs, 2014; Moje, 2008).

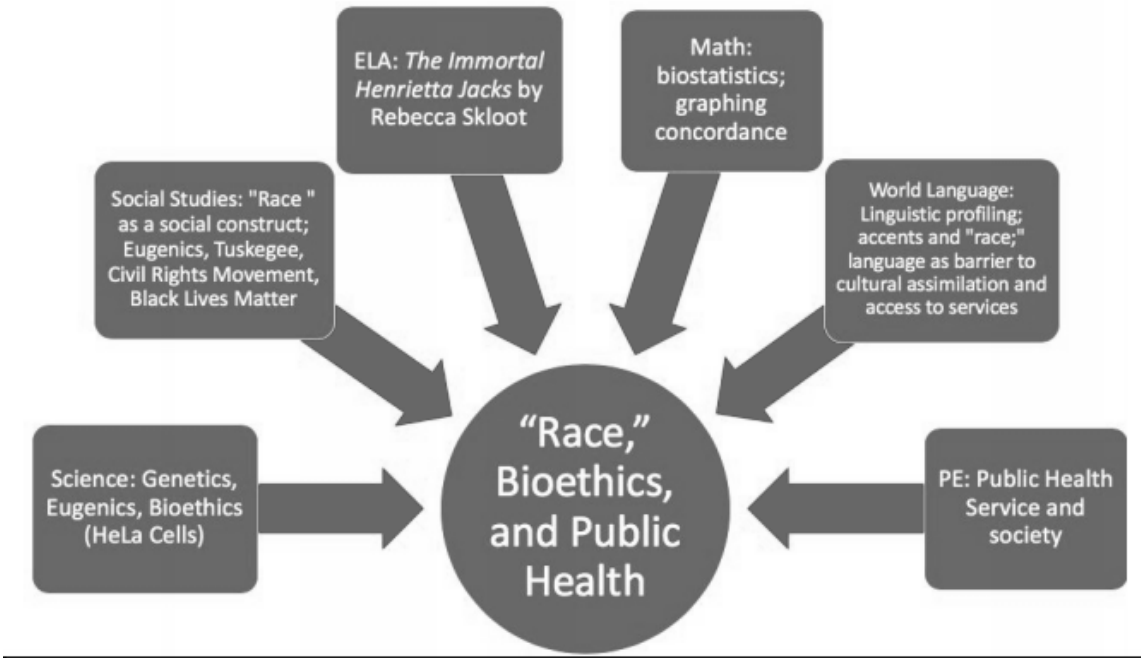
Teacher collaboration through Disciplinary Literacy.

Student engagement in learning to think collaboratively about authentic concepts, situations, and problems across disciples begins when teachers collaborate through the framework of Disciplinary Literacy. Maintaining "compartmentalized inquiry, with the use of widely differing orientations, methods, and languages of the separate disciplines results in unintegrated and incomplete knowledge and characterization of what education is as a whole system" (Banathy, 1995, p. 54). When students engage in inquiry across disciplines concerning topics and concepts that ignite their passions and emotions because of its relevance to their lives, they are "identifying how a body of understanding fits together [which] can be more useful than understanding the boundaries between disciplines" (Weise, 2017, para 10).

Exploring the contextual concepts affecting students' daily life is one approach to creating culturally-relevant, personalized, meaningful, emotional learning anchored in transdisciplinary course development (Johnston, Dibella, and Martelli, 2016; Jeder, 2014; McCrickerd, 2016; Wehner, 2018). While the teachers in this study focused on a single prompt during one class session due to its methodological design, that same prompt could be used as the introduction to a concept-based unit or course that addresses the authentic concerns of the students concerning the pandemic and the development and distribution of a vaccine. Following is an example of a topical, concept-based transdisciplinary course (Figure 9) that is of particular relevance to current reports concerning the disproportionate number of minorities who contract the virus and their reticence to take

Figure 9

Example of a concept-based transdisciplinary lesson or unit



the vaccine. The course focuses on the social construct of "race," specifically in regard to bioethics and public health. Inspired by a *New York Times* article "Bad medicine: the harm that comes from mistrust" concerning Black Americans' distrust of the healthcare system (Frakt, 2020), the podcast "Seeing White" (Biewen, 2016-present), and the museum exhibit "RACE: Are we really that different?" (American Anthropological Association, 2012), I constructed a framework around the concept of "'Race,' Bioethics, and Public Health" incorporating content standards from each course.

Collaborative assessment through Disciplinary Literacy.

The seminal disorienting dilemma stemming from the problem of practice centered on the "disorienting dilemma" (Mezirow, 2011, p. 19) of pedagogical change, specifically the adoption of new communicative practice standards and the shift to standards-based grading. One of the findings from the study indicated that teachers struggled with transforming their assessment practices because there was neither a Board-approved Assessment Policy nor socialized grading expectations. Concept-based, transdisciplinary teaching derived from the communicative practice standards also provides a consolidating assessment and grading approach for teachers to provide personalized feedback toward students' mastery of investigating, thinking, and communicating within and across the disciplines.

Using the proposed concept-based transdisciplinary unit in Figure 9, assessment and grading could be unified across the subject areas through a mastery-based, standards-aligned reporting system based on an expanded standards-aligned crosswalk of the

communicative practice standards[7] and/or the four global competence themes of Investigate the World, Recognize Perspectives, Communicate Ideas, and Take Action (CCSSO/Asia Society, 2011, p. 12). For example, a student report card for this course might include the specific subject area content standards with a focus on the communicative practice standards as they align to the global competencies. Investigating the World and Communicate Ideas calls for students to read, investigate, argue, and justify their responses with evidentiary support in a conversant and critical manner, components found in the standards crosswalk used in this study (Appendix B). Recognizing Perspectives requires students to understand the epistemological lenses of the disciplines to form inquiry, ask questions, and metacognate through various lenses, components of Moje's Four Lenses of Disciplinary Literacy also included in the standards crosswalk. The concept explored in this specific transdisciplinary unit, "'Race,' Bioethics, and Public Health," also provides contextual relevance for students to learn social-emotional skills and "helps them make personally relevant meaning of the racial and ethnic diversity and identity issues they encounter in their daily lives" (Immordino-Yang, 2015, p. 18).

While the topic of assessment and grading consumes volumes of research, this is still perhaps the most contentious element of shifting to a standards-aligned learning system for parents, students, and teachers (Burkhardt, 2020; Frankin, Buckmiller, and Kruse, 2016; Wheeler, 2017). Most of the angst stems from anxiety regarding university admissions not about student learning, yet schools can answer stakeholder concerns and

[7] See Appendix B for crosswalk used in this study as well as pages 167-168 for ways to create an expanded crosswalk of communicative practice standards inclusive of all subject areas.

report standards-based learning with a mastery transcript that "goes beyond a one-dimensional grade as an indicator of a student's academic progress over time [by including] an expanded set of competencies...students can transfer or apply...to other disciplines and situations" (Barker, 2020, para 6). Through a mastery-based reporting system and associated transcript, a student's final achievement in academic content areas as well as growth in transferable skills, global citizen, and communicative practice standards (i.e. Disciplinary Literacy) is complemented by a portfolio of evidence curated by the student. Over three-hundred public and private schools worldwide have adopted a standardized mastery transcript template (Mastery Transcript Consortium, 2020) with thousands more issuing their own proficiency-based or competency-based[8] transcripts.

Summary of implications for practice

This study's findings underscore the need for a unified approach to teacher professional learning and curriculum design resulting from a systemic, pedagogical change to a standards-aligned learning system. Themes that emerged from the qualitative and quantitative data analysis suggest that Disciplinary Literacy provides the pedagogical approach by which teachers can place students at the center of learning, understand the communicative practice standards of their own disciplines for coherence across subject areas, and collaboratively design and assess concept-based, transdisciplinary units and/or courses grounded in the standards (Figure 8). Adhering to a program of study grounded in Disciplinary Literacy also allows for students to be engaged emotionally in their

[8] While closely related to standards-based grading which reports student progress and proficiency toward content and skills standards, competency-based grading often involves students learning at their own pace rather than in age-based cohorts and demonstrating application of standards to unknown contexts (Townsley, 2014).

learning, finding relevance and meaning in the concepts chosen for investigation. By means of the collective study and implementation of Disciplinary Literacy, teachers provide coherence across the entire learning system based on their collaborative application of the standards through a cohesive, common lens.

Implications for research

Based on my findings, I am keen to understand why two study participants were eager to share their learning about Disciplinary Literacy with subject area colleagues not involved in the DLPD while others engaged in the same professional learning and co-creation of the transdisciplinary project did not. I also pondered why a positive correlation existed between Collective Efficacy and Collaborative Professional Learning despite the team not meeting Bandura's definition of collective efficacy. Finally, I wondered how a graduate of a school dedicated to Disciplinary Literacy might operate in the world beyond high school. A review of literature as I wrestled with the data analysis provided some insight, yet I also believe these are possible avenues of future inquiry.

Case studies to see wider impact of the DLPD

Both the Social Studies teacher and Math teacher shared their learning concerning Disciplinary Literacy and its impact on adopting communicative practice standards with their subject area colleagues. Specifically, these two teachers were interested in the impact of Disciplinary Literacy in helping create reporting categories (Appendix E) and redesign rubrics for existing assessments in light of the new standards. For example, the Social Studies teacher – whose experience in the DLPD resulted in qualitative and quantitative data that corroborated her own assertion of a "brain shift...old dog, new tricks" – enthusiastically shared her learning with other middle and high school social

studies teachers as they discussed the impact of the new C3 standards on teaching and learning. The Math teacher worked with her co-teacher to redesign a summative assessment by incorporating the communicative practice standards for argumentation and justification.

Findings from the study are informative for developing complementary case studies that examine the "scaling out" impact of the DLPD workshops beyond the scope of the original participants to the teachers' vertical subject area teams (Reed, 2018, p. 296). Often when individuals engage in isolated professional development, they have trouble translating that learning into their workplace because others do not share in the vision or pedagogical understanding (Wenger-Trayer, Fenton-O'Creevy, Hutchinson, Kubiak, & Wenger-Trayner, 2014). Emails between and among subject-area teachers, shared Google docs, Google Classroom lessons, assessments and their accompanying rubrics, curriculum maps, and meeting agendas would comprise the bulk of the evidence needed to address the study question "to what extent did participants in the DLPD impact other subject-area teachers concerning Disciplinary Literacy?"

Collective efficacy or effective team?

Data analysis concerning the study's first research question, "what role did collaborative professional learning have on teachers' collective efficacy when confronted with pedagogical change?," proved inconclusive despite a probability value of 0.021 between Collective Efficacy and Collaborative Professional Learning after the Innovation. Several studies concerning sports teams and musical ensembles (Leo, González-Ponce, Sánchez-Miguel, Ivarsson, & García-Calvo, 2015; Matthews, 2007) have investigated the relationship between group cohesion, collective efficacy, and goal

performance, while other education-related studies investigated the relationship between collective efficacy with goal attainment, school leadership, or student performance (Bandura, 1993; Donohoo, 2018; Eells, 2011; Goddard, Goddard, Kim, & Miller, 2015; Greenless, Graydon, & Maynard, 2000; Kurz & Knight, 2004). However, there are only a few studies (Larsen, 2018; Loughland & Ryan, 2020) that explore the antecedents of collective efficacy to address the differences between collectively efficacious teams and teams who simply collaborate well on short-term projects. A possible guiding question for this research might be: "what factors differentiate collective efficacy from collaborative teams in high school teams, with a focus on comparing these factors between subject-area teams and grade-level teams?"

Impact of Disciplinary Literacy on advocacy and citizenship

Perhaps most exciting would be future research concerning the ability of students to translate their understandings of the lens and language of the disciplines and the transdisciplinary nature of solution-finding to service learning and advocacy within their communities. Referencing the interaction of various levels of literacy including Moje's Four Lenses of Disciplinary Literacy (2007) established in Figure 1 at the beginning of this dissertation, a longitudinal study of graduates from schools that infuse Disciplinary Literacy through a concept-based transdisciplinary curriculum complemented by global competencies might indicate a lasting impact for civic engagement. If now-twelve-year-old Amariyanna "Mari" Copeny participated in such a program throughout middle and high school, might she choose a career in environmental science and public health to simultaneously navigate the cultural peculiarities of politicians and chemists concerning healthy water and the Foundational Language of her Flint, Michigan neighborhood? As

the potential for transdisciplinary research among academics from various disciplines who ally with practitioners in the field gains credibility for answering humanity's more dire issues (Hansson & Polk, 2018; Polk, 2014; Wickson, Carew, & Russell, 2006), it would be prudent for future researchers to come from an educational grounding in which this transdisciplinary way of knowing about and communicating in a complex and diverse world is already internalized and practiced.

Concluding thoughts

Achieving collective efficacy during times of pedagogical change is a process, one that requires purposefully connected initiatives to build teacher's self-efficacy, foster the antecedents of collegial teams, and design coherence across an organizational system. Aware that "it is at [the] intersection of the technical and social where practitioners align efforts where change and improvement can occur" (Looney, 2011, p. 16), efficacious stakeholders acknowledge and account for wicked problems stemming from both systems-level logistics and personal emotions of paradigmatic change. As such, "it may be most productive to build disciplinary literacy instructional *programs*, rather than to merely encourage content teachers to employ literacy teaching practices and strategies" (Moje, 2008, p. 96) to truly achieve collective efficacy and systems coherence.

As an educator, the words of Labaree (2011) echoed during my reflections and wonderings about the provocation posed to the students – "from your discipline's perspective, what do you see about the future that brings you hope?":

> we ask schools to promote equality while preserving privilege,
> so we perpetuate a system that is too busy balancing opposites
> to promote student learning. We focus on making the system

> inclusive at one level and exclusive at the next, in order to make sure that it meets demands for both access and advantage (p. 394).

Simply adopting the label of another pedagogical framework is insufficient for true transformation at all levels – teacher, team, school, district, state, country, and world. By its very nature, Disciplinary Literacy equips students with the specialized lexicons, discursive methods, and epistemological lenses of the various disciplines in order to engage in discourse across knowledge areas which is inherently a tool of empowerment and global civic virtue for transformation (Gee, 1999; Moje, 2007; Moje & Hinchman, 2004). The majority of organizations in the twenty-first century need employees who can analyze and synthesize information to critically solve problems (United States Chamber of Commerce, 2011). Current political and social divisiveness indicate these skills are even more essential beyond the workplace. Educators can foster knowledge of the content and skills of the disciplines while simultaneously forming young adults who understand the moral imperative for social engagement and are empowered with the voice to act locally and globally (Daddow, 2015; Fullan, 2003; Jacobs, 2014; Jeder, 2014; Leonardo, 2004; Moje, 2007; Stoll and Giddings, 2012).

Further, educators who ground their practice in the theory and strategies of Disciplinary Literacy believe that "learners need access to the knowledge deemed valuable by the content domains, even as the knowledge they bring to their learning must not only be recognized but valued" (Moje, 2007, p. 1). Acknowledging students' membership in numerous communities – home, school, and social life both in person and online – and this "nexus of perspectives" they bring with them when engaging in these

communities means educators understand the "value of people whose multimembership allows them to be brokers across boundaries" (Wenger, 1998, p. 703).

Students themselves are a powerful linkage among educators who endeavor, through their own collaborative practice, to develop transdisciplinary learning experiences within their grade-level or subject-area teams. Building curricula that ties the subject-area standards to the lived experiences of the students through Disciplinary Literacy enables a cultural modeling framework "by drawing analogues between disciplinary constructs and modes of reasoning, on the one hand, and students' cultural funds of knowledge on the other" (Orellana & Eksner, 2006, p. 224). In so doing, Disciplinary Literacy is a powerful pedagogical approach by which educators can be more inclusive of all learners from various cognitive orientations, physical abilities, and cultural backgrounds by acknowledging the multimemberships of their students. Channeling students' interests and emotional engagement through concepts and topics relevant to their lives and the world around them allows for innovative ways to teach and assess the content and skills standards with meaning and authenticity. Students who learn through such an approach are poised to "critically intervene in a way that challenges and changes" (hooks, 1996, p. 12) as brokers of understanding across real and perceived boundaries because of their ability to build communicative bridges of empathy across numerous communities.

I began this research framed by the following research questions: 1) what role does collaborative professional learning have on teachers' collective efficacy when confronted with pedagogical change; and 2) in what ways does an understanding of Disciplinary Literacy equip teachers to address the pedagogical changes of adopting and

reporting to communicative practice standards in their subject areas? Through this study, I aimed to understand how teachers engaged in collaborative inquiry and cycles of reflection concerning the adoption of new standards and a shift to standards-based grading and reporting contributed to collective efficacy and individually transformed professional practice. My experiences throughout the study and analysis, however, led to a much deeper understandings of the important nuances between collective efficacy and collaborative teamwork, the processes by which collective efficacy is achieved, the significance of systems coherence during paradigmatic pedagogical shifts, and the potential role of Disciplinary Literacy as a tool for systems coherence when implementing standards-based learning through concept-based, transdisciplinary learning concerning issues of global competency and social justice.

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APPENDIX A

INNOVATION CONFIGURATION MAP

Component 1: Conversing				
Intentionally builds discipline-specific vocabulary and discourse strategies that enable students to share ideas and critique the ideas of others with credibility.	Includes intentional vocabulary and discourse strategies. Idea-sharing is limited to one or two modalities, and opportunities to critique are infrequent.	Includes vocabulary and discourse strategies incidentally and/or does not integrate opportunities for students to share or critique ideas.	Defines vocabulary only when students inquire and/or does not include discourse strategies.	Does not integrate vocabulary or discourse strategies.
Component 2: Reading				
Integrates model texts that exemplify disciplinary discourse and ways of knowing including unique text structures, specialized vocabulary, visual representations, and use of evidence to support claims.	Integrates a variety of model texts into the curriculum map that include a limited number of disciplinary discourse strategies.	Makes available discipline-specific texts and references them in teaching, but does not intentionally teach with them.	Limits reading comprehension instruction only to cognitive processes strategies (i.e. content-area literacy skills).	Does not use model texts. Students are not exposed to the writing of professionals in the discipline.
Component 3: Investigation, Argumentation, and Justification				
Provides multiple, scaffolded opportunities for students to plan and conduct original research using discipline-specific strategies. Research is supported by evidence and appropriate to task, purpose, problem, and audience.	Engages students in opportunities to conduct original research while scaffolding discipline-specific strategies. Uses evidence, but may not be aware of task, purpose, problem, and audience.	Scaffolds learning in the specific research strategies of the discipline and provides an opportunity to conduct original research.	Asks students to conduct research using general research skills.	Does not plan for original research or investigations or does so only once a year.
Component 4: Inquiring and Questioning				
Integrates explicit instruction in question formulation that enables students to engage in inquiry and questioning in the manner of their discipline.	Actively engages students in questioning with limited direct instruction.	Engages students in guided questioning of the materials with limited instruction in the thinking strategies unique to the discipline.	Uses worksheets without connecting them to inquiry or other strategies in the discipline.	Does not integrate any instructional tools or strategies.
Component 5: Metacognition				
Intentionally and regularly integrates visible thinking routines into the curriculum map (naming the expert practice, showing how to use it, and providing a discipline-specific reason for using it).	Intentionally and regularly integrates visible thinking routines into the curriculum map but does not always include all three elements.	Effectively uses "think alouds" but does not plan for them in the curriculum map.	Uses "think alouds" only when students ask for clarification or inquire why the teachers made an instructional decision.	Does not model expert practices or include visible thinking routines

APPENDIX B

STANDARDS CROSSWALK

RC = Reporting Category	CCSS ELA	CCSS Math	C3	NGSS	NCAS
Conversing Builds disciplinary-specific vocabulary and discourse strategies that enable students to share ideas and critique the ideas of others with credibility.	ELA-LITERACY. CCRA.W.9-10.4-6: Production and Distribution of Writing (RC: Writing) ELA-LITERACY. CCRA.SL.4-6: Presentation of Knowledge & Ideas (RC: Speaking & Listening)	College Board Mathematical Practice 4: Communication and notation (RC: Communicating Reasoning) CCSS Mathematical Practice 3: Construct viable arguments and critique the reasoning of others (RC: Communicating Reasoning) CCSS Mathematical Practice 6: Attend to precision (RC: Communicating Reasoning) CCSS Mathematical Practice 1: Make sense of problems and persevere in solving them (RC: Problem Solving & Modeling)	D4.3 Presenting (RC: Communication) D4.4 Critiquing Claims & Evidence in Arguments (RC: Communication) D4.5 Critiquing Reasoning in Explanations (RC: Communication)	NGSS Practice 2: Developing and Using Models (RC: Modeling Practices) NGSS Practice 8: Obtaining, Evaluating, and Communicating Information (RC: Communicating Practices) NGSS Practice 5: Using Mathematics and Computational Thinking (RC: Modeling Practices) NGSS Practice 4: Analyzing and Interpreting Data (RC: Modeling Practices)	VA:Cr3.1.1a : Use art vocabulary to describe choices while creating art. (RC: Creating) VA:Cr3.1.5a : Create artist statements using art vocabulary to describe personal choices in artmaking. (RC: Creating) VA:Re9.1.2a: Use learned art vocabulary to express preferences about artwork. (RC: Responding) VA:Re9.1.IIIa: Construct evaluations of a work of art or collection of works based on differing sets of criteria. (RC: Responding) VA:Pr4.1.Ia: Analyze, select, and curate artifacts and/or artworks for presentation and preservation. (RC: Presenting)

RC = Reporting Category	CCSS ELA	CCSS Math	C3	NGSS	NCAS
Reading Integrates model texts that exemplify disciplinary discourse and ways of knowing including unique text structures, specialized vocabulary, visual representations, and use of evidence to support claims.	ELA-LITERACY. CCRA.R.4-6: Craft & Structure (RC: Reading) ELA-LITERACY. CCRA.R.7-9: Integration of Knowledge & Ideas (RC: Reading)	CCSS Mathematical Practice 7: Look for and make use of structure (RC: Concepts & Procedures) College Board Practice 2: Connecting Representations (RC: Concepts & Procedures)	D1.5 Determining Sources for research and investigation (RC: Research & Investigation) D3.1 Gathering Sources (RC: Research & Investigation) D3.2 Evaluating Sources (RC: Research & Investigation)	"Any education in science and engineering needs to develop students' ability to read and produce domain-specific text. As such, every science or engineering lesson is in part a language lesson, particularly reading and producing the genres of texts that are intrinsic to science and engineering" (NRC Framework, 2012, p. 76).	VA:Re.7.2.Ia: Analyze how one's understanding of the world is affected by experiencing. (RC: Responding) VA:Re.7.1.Ia :Hypothesize ways in which art influences perception and understanding of human experiences. (RC: Responding) VA:Re8.1.IIIa: Analyze differing interpretations of an artwork or collection of works in order to select and defend a plausible critical analysis. (RC: Responding) VA:Re8.1.IIa: Identify types of contextual information useful in the process of constructing interpretations of an artwork or collection of works. (RC: Responding)

RC = Reporting Category	CCSS ELA	CCSS Math	C3	NGSS	NCAS
Investigation, Argumentation, and Justification Provides multiple, scaffolded opportunities for students to plan and conduct original research that is supported by evidence and appropriate to task, purpose, problem, and audience.	ELA-LITERACY.W.CCRA.9-10.8-9: Research to Build & Defend Knowledge (RC: Writing) ELA-LITERACY.W.CCRA.9-10.10: Range of Writing (RC: Writing)	College Board Mathematical Practice 3: Justification (RC: Communicating Reasoning) CCSS Mathematical Practice 5: Use appropriate tools strategically (RC: Problem Solving & Modeling) CCSS Mathematical Practice 2: Reason abstractly and quantitatively (RC: Problem Solving & Modeling) CCSS Mathematical Practice 4: Model with math (RC: Problem Solving & Modeling)	D3.3 Identifying Evidence to develop claims (RC: Research & Investigation) D3.4 Developing Claims (RC: Research & Investigation) D4.1 Constructing Argument (RC: Communication) D4.2 Constructing Explanations (RC: Communication)	NGSS Practice 3: Planning and Carrying-out Investigations (RC: Investigating) NGSS Practice 6: Constructing Explanations and Designing Solutions (RC: Communicating Practices) NGSS Practice 7: Engaging in Argument from Evidence (RC: Communicating Practices)	VA:Pr6.1.Ia: Analyze and describe the impact that an exhibition or collection has on personal awareness of social, cultural, or political beliefs and understandings. (RC: Presenting) VA:Re9.1.8a: Create a convincing and logical argument to support an evaluation of art. (RC: Responding) VA:Cr2.3.Ia: Collaboratively develop a proposal for an installation, artwork, or space design that transforms the perception and experience of a particular place. (RC: Creating) VA:Re8.1.Ia: Interpret an artwork or collection of works, supported by relevant and sufficient evidence found in the work and its various contexts. (RC: Responding)

RC = Reporting Category	CCSS ELA	CCSS Math	C3	NGSS	NCAS
Inquiring and Questioning Integrates explicit instruction in question formulation that enable students to engage in inquiry and questioning.	ELA-LITERACY.W. CCRA.9-10.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (RC: Writing)	College Board Practice 1: Implementing Mathematical Practice (RC: Concepts & Procedures) CCSS Mathematical Practice 2: Reason abstractly and quantitatively (RC: Problem Solving & Modeling)	D1.1 & 1.2 Compelling Questions (RC: Critical Thinking, Reasoning, & Analysis) D1.3 Supporting Questions (RC: Critical Thinking, Reasoning, & Analysis) D1.4 Connecting compelling and supporting questions (RC: Critical Thinking, Reasoning, & Analysis)	NGSS Practice 1: Asking Questions and Defining Problems (RC: Investigating)	VA:Cn10.1.IIa: Utilize inquiry methods of observation, research, and experimentation to explore unfamiliar subjects through artmaking. (RC: Connecting) VA:Cn10.1.Ia : Document the process of developing ideas from early stages to fully elaborated ideas (RC: Connecting)
Metacognition Shares expert practices with students through visible thinking routines including naming the practice, showing how to use it, and providing a discipline-specific reason for using it.	There are no prescribed standards specifically addressing “metacognition.”				

APPENDIX C

DATA COLLECTION TOOL FOR STUDENT OBSERVATIONS

As you observe the students, make a "tick mark" under the appropriate heading. If there are any student statements that might provide supporting qualitative data, please note these below.

Students used discipline-specific vocabulary correctly	Students described a concept but did not use discipline-specific language
Students explained the provocation using discourse methods appropriate for the discipline ("ways of thinking")	Students respond to the provocation from a perspective outside their expert group or non-academic perspective

What types of questions are the students asking of each other?

Content related Concept or skill in your subject area	Language related "I don't understand that word you just used – what does it mean?"	Ways of thinking "Why would you think that? I didn't see it that way?"

APPENDIX D

SAMPLE STUDENT EXIT SURVEY

This survey was administered through the school's G-suite account using Google Forms and school email addresses.

1) What was your group's subject area?

   English
   Fine arts
   Math
   Science
   Social studies

2) How comfortable would you be talking to an actual, real expert in your subject area about this [video/Perspective Walk/prompt] using their specialized vocabulary and ways of thinking?

   Very comfortable
   Comfortable
   Ok
   Uncomfortable
   Very uncomfortable

3) Based on your response to the previous question, what about this experience made you choose your response?

4) What surprised you about your discussions with other students representing different subject areas?

Note: the following question was added to the May 2020 survey

I feel I need to learn more about (check any/all boxes that apply):

	English	Fine Arts	Math	Science	Social Studies
Specialized language used by experts					
Ways of thinking/perspective of experts					

APPENDIX E

STANDARDS-ALIGNED REPORTING CATEGORIES

STANDARDS-ALIGNED REPORTING CATEGORIES GROUPED BY LEARNING DOMAIN			
SUBJECT	What will the student KNOW Content Knowledge	What will the student be able to DO Subject-area skills and practices	What will the student be able to TELL Communicating in the subject area
Math CCSS	Concepts & Procedures Student understand mathematical concepts and processes needed for engaging in mathematical and computational thinking. All CCSS Content Categories CCSS Mathematical Practice 7: Look for and make use of structure College Board Practice 1: Implementing Mathematical Practice College Board Practice 2: Connecting Representations	Problem Solving & Modeling Student applies mathematical thinking to solve problems. CCSS Mathematical Practice 1: Make sense of problems and persevere in solving them. CCSS Mathematical Practice 2: Reason abstractly and quantitatively. CCSS Mathematical Practice 4: Model with math. CCSS Mathematical Practice 5: Use appropriate tools strategically.	Communicating Reasoning Student evaluates, justifies, and communicates mathematical thinking using the language of mathematicians. College Board Mathematical Practice 3: Justification College Board Mathematical Practice 4: Communication and notation CCSS Mathematical Practice 3: Construct viable arguments and critique the reasoning of others. CCSS Mathematical Practice 6: Attend to precision.

Social Studies AERO & C3	Content, Ideas, & Concepts As a basis for understanding, inquiring, and investigating in the Social Sciences, the student is able to identify and explain the key figures, institutions, events, movements, and ideas from history, economics, geography, civics, sociology and psychology, and anthropology. AERO Standard 1: Time, Continuity and Change AERO Standard 2: Connections and Conflict: AERO Standard 3: Geography AERO Standard 4: Culture AERO Standard 5: Society and Identity AERO Standard 6: Government AERO Standard 7: Production, Distribution, and Consumption AERO Standard 8: Science, Technology, and Society	Research & Investigation Student identifies, evaluates, selects and integrates resources and data sources that provide evidentiary support for their original inquiry and argumentation. C3 D1.5 Determining Sources for research and investigation C3 D3.1 Gathering Sources C3 D3.2 Evaluating Sources C3 D3.3 Identifying Evidence to develop claims C3 D3.4 Developing Claims	Critical Thinking, Reasoning, and Analysis Student appreciates Social Scientists' unique ways of knowing about the world and applies the key strategies and skills of the discipline in their thinking. C3 D1.1 & 2 Compelling Questions C3 D1.3 Supporting Questions C3 D1.4 Connecting compelling and supporting questions C3 D2 Understanding Perspectives & Interpretations in History	Communicating in the Social Sciences Student understands and applies the specialized ways in which Social Scientists formulate claims and communicate their understanding. C3 D4.1 Constructing Arguments C3 D4.2 Constructing Explanations C3 D4.3 Presenting C3 D4.4 Critiquing Claims & Evidence in Arguments C3 D4.5 Critiquing Reasoning in Explanations

Science NGSS	Core Ideas and Concepts Student demonstrates understanding of core scientific ideas and cross-cutting concepts. Physical Science PS1 Matter and Its Interactions PS2 Motion and Stability: Forces and Interactions PS3 Energy PS4 Waves and their Applications in Technologies for Information Transfer Life Science LS1 From Molecules to Organisms: Structures & Processes LS2 Ecosystems: Interactions, Energy, and Dynamics LS3 Heredity: Inheritance and Variation of Traits LS4 Biological Evolution: Unity and Diversity Earth & Space Science ESS1 Earth's Place in the Universe ESS2 Earth's Systems ESS3 Earth & Human Activity Engineering, Technology & Applications of Science ETS1 Engineering Design	Investigating Practices Student develops and conducts investigations to examine scientific phenomena. NGSS Practice 1: Asking Questions and Defining Problems NGSS Practice 3: Planning and Carrying-out Investigations	Modeling Practices Students uses and develops scientific models to represent relationships. Student presents, interprets and analyzes data to evaluate the outcome of a scientific investigation. NGSS Practice 2: Developing and Using Models NGSS Practice 5: Using Mathematics and Computational Thinking NGSS Practice 4: Analyzing and Interpreting Data	Communicating Practices Student obtains, evaluates, and/or communicates information that demonstrates knowledge of the topic using the language of scientists. NGSS Practice 8: Obtaining, Evaluating, and Communicating Information NGSS Practice 6: Constructing Explanations and Designing Solutions NGSS Practice 7: Engaging in Argument from Evidence

STANDARDS-ALIGNED REPORTING CATEGORIES DIRECTLY ALIGNED TO STANDARDS			
English Language Arts: Common Core State Standards			
Reading Student reads to understand what a text says, both literally and inferentially; works to develop an understanding of the craft of writing, focusing on both figurative and connotative language, analyzes meaning, and provides strong textual evidence that supports their analysis of theme, character, setting and plot; determines what informational text says explicitly, makes logical inferences, cites evidence, and draws conclusions; reads closely to interpret, analyze, evaluate argument, and compare/contrast texts and other informational media.	Writing Student examines and conveys complex ideas clearly and accurately; develops and strengthens writing through appropriate writing processes; uses technology to enhance writing and collaborate; writes for a specific audience, purpose, style, and cites evidence, analyzes, and reflects.	Speaking and Listening Student participates effectively in a range of conversations, expressing ideas clearly and persuasively, integrates information from diverse media platforms in understanding and presentation; adapts presentation findings with appropriate style, organization, context, and development; evaluates and analyzes other speakers.	Language Student demonstrates command of conventions, grammar, vocabulary, and expression of the English language; applies knowledge of language functions in different contexts and makes effective choices for meaning or style to express and comprehend.
Fine Arts: National Core Arts Standards			
Creating Student conceptualizes, organizes, develops, and refines artistic work.	Presenting Student collaboratively prepares and presents selected theme-based artwork for display and formulates exhibition narratives for the viewer.	Responding Student interprets art by analyzing how the interaction of subject matter, characteristics of form and structure, use of media, art-making approaches, and relevant contextual information contributes to understanding messages or ideas and mood conveyed.	Connecting Student synthesizes and relates knowledge and personal experiences to make art. Student relates artistic ideas and works with societal, cultural, and historical context to deepen understanding.

Physical Education: Society of Health and Physical Educators			
Movement Competencies Student demonstrates competency in a variety of motor skills and movement patterns.	Knowledge & Tactics Student demonstrates the knowledge and skills to achieve and maintain a health-enhancing level of physical activity and fitness.	Responsible Personal and Social Behavior Student exhibits responsible personal and social behavior that respects self and others.	Recognizes the Value of Physical Activity Student recognizes the value of physical activity for health, enjoyment, challenge, self-expression and/or social interaction.
World Languages: American Council on the Teaching of Foreign Languages			
Interpretive Communication Student understands, interprets, and analyzes what is heard, read, or viewed on a variety of topics.	Interpersonal Communication Student interacts and negotiates meaning in spoken or written conversations to share information, reactions, feelings, and opinions.	Intercultural Communication Student uses the language and knowledge to investigate, explain, and reflect on the relationship between the practices or products and perspectives of cultures.	Presentational Communication Student presents information, concepts, and ideas to inform, explain, persuade, and narrate on a variety of topics using appropriate media and adapting to various audiences of listeners, readers, or viewers.

APPENDIX F

SURVEY

Dear Teachers,

Thank you for your participation in our professional learning concerning Collaborative Professional Learning, Collective Efficacy, and Disciplinary Literacy. I am currently completing my dissertation research study as a doctoral student in the Mary Lou Fulton Teachers College (MLFTC) at Arizona State University (ASU). Information that you submit will inform a response to the study's research questions: what role does collaborative professional learning have on teachers' collective efficacy when confronted with pedagogical change; and in what ways does Disciplinary Literacy equip teachers to address the pedagogical changes of adopting and reporting to communicative practice standards in their subject areas?

The following questionnaire has been adapted from several professional surveys concerning collective efficacy, professional learning, and planned behavior. Questions for the Professional Learning section used with permission of Learning Forward, www.learningforward.org. All rights reserved. There are a total of 37 questions. It is anticipated that the survey should take about 15 minutes to complete.

This survey is being administered to the Ninth Grade Faculty Team who are engaged in the Disciplinary Literacy Professional Development (DLPD) workshop series. Your participation in the survey is voluntary. You may choose not to answer any question or stop your participation at any time. Your information and answers will not be shared with anyone. Your responses will be known only to me. By clicking on the "next" button, you are agreeing to your voluntary consent in this study.

The benefit to participation is the opportunity for you to reflect on and think more about the implementation of Disciplinary Literacy in your classroom and any potential changes to the professional learning experience. Thus, there is potential to enhance your professional practice. There are no foreseeable risks or discomforts to your participation.

If you have any questions concerning the research study, please do not hesitate to contact me at afossum@domainnameomitted.edu or [phone number omitted]. Let's begin...

Collective Efficacy and Collaborative Professional Learning about Disciplinary Literacy							
Collective Efficacy "A group's shared belief in its conjoint capability to organize and execute the courses of action required to produce given levels of attainment" (Bandura, 1997, p. 477).							
Question	1 Strongly Disagree	2 Disagree	3 Slightly Disagree	4 Slightly Agree	5 Agree	6 Strongly Agree	0 Don't Know/ Unsure
Teachers in my grade level design authentic student learning opportunities.							
Teachers in my grade level help students believe they can do well in schoolwork.							
Teachers in my grade level create environments that facilitate learning.							
Teachers in my grade level help students master complex content.							
Teachers in my grade level help students develop the practices of their subject areas.							
Teachers in my grade level provide experiences for students to integrate knowledge and skills across subject areas.							
Teachers in my grade level promote deep							

understanding of academic concepts.							
Teachers in my grade level help students think critically.							
Teachers in my grade level foster student understanding of their subject area's ways of knowing.							
Collaborative Professional Learning In-school professional development designed specifically for teachers to learn with and from each other in cycles of inquiry and/or through new initiatives to improve student learning.							
Question	1 Strongly Disagree	2 Disagree	3 Slightly Disagree	4 Slightly Agree	5 Agree	6 Strongly Agree	0 Don't Know/ Unsure
My school's learning communities are structured for teachers to engage in the continuous improvement cycle (i.e. data analysis, planning, implementation, reflection, and evaluation).							
Most members of the learning communities in my school hold each other accountable to achieve the school's goals.							
In my school, learning community members demonstrate effective communication.							

In my school, learning communities have a high level of trust among members.							
Professional learning is available to me at various times during the school year and summer.							
Practicing and applying new skills with students are regarded as important learning experiences among my grade level team.							
Teachers in my school are involved with monitoring the effectiveness of the professional learning.							
In my school, teachers have an opportunity to evaluate each professional learning experience to determine its impact on student learning.							
A variety of data are used to assess the effectiveness of my school's professional learning.							
In my school, teachers use what is learned from professional learning to adjust and inform teaching practices.							

In my school, teachers have opportunities to observe each other as one type of job-embedded professional learning.							
Teachers in my school are responsible for selecting professional learning to enhance skills that improve student learning.							
Professional learning in my school includes various forms of support to apply new practices.							
A primary goal for professional learning in my school is to enhance teaching practices to improve student performance.							
Teachers in my school receive ongoing support to improve their teaching.							
My school's professional learning plan is aligned to school goals.							
In my school, teachers individually reflect about teaching practices and strategies.							
Professional learning at my school focuses on the curriculum and how students learn.							

In my school, professional learning supports teachers to develop new learning.							
In my school, professional learning supports teachers to expand and deepen their learning over time.							
Disciplinary Literacy For the purposes of this survey, Disciplinary Literacy is defined as the ability to engage in content area sense-making and knowledge creation based on an epistemological understanding of the discipline and the effective use of specialized vocabulary, text structures, and discourse of professionals in that field of study.							
Question	1 Strongly Disagree	2 Disagree	3 Slightly Disagree	4 Slightly Agree	5 Agree	6 Strongly Agree	0 Don't Know/ Unsure
I believe my students will improve their performance in my class if I integrate Disciplinary Literacy in my teaching practices.							
I intend to implement Disciplinary Literacy in every lesson.							
I intend to implement Disciplinary Literacy in my assessment and feedback design.							
Other teachers are eager to implement Disciplinary Literacy.							
My colleagues support me in integrating Disciplinary Learning in my classroom.							

I understand why Disciplinary Literacy was included in my subject area's Standards.							
I can control the ways in which I implement Disciplinary Literacy in my classroom.							
I have all the resources needed to implement Disciplinary Literacy in my classroom.							

Thank you for completing the questionnaire. Now that you have finished, if you have any questions concerning this survey or my research in general, please contact me at afossum@domainnameomitted.edu or [phone number omitted]. Thank you for your time and consideration of this survey request.

Sincerely,

Andrea H. Fossum, M.A., M.A. (LIS), M.Ed.

APPENDIX G

PERMISSION TO USE LEARNING FORWARD'S

STANDARDS ASSESSMENT INVENTORY

learningforward
THE PROFESSIONAL LEARNING ASSOCIATION

January 16, 2020

Andrea H. Fossum
Arizona State University
Mary Lou Fulton Teachers College
PO Box 37100
Phoenix, AZ 85069-7100

Dear Andrea,

Learning Forward grants you permission to use the Standards Assessment Inventory (SAI) in your Doctoral Program to research how collaborative professional learning impacts teachers' collective efficacy when confronted with pedagogical change.

Please ensure that this credit line appears in your work in reference to the SAI:

"Used with permission of Learning Forward, www.learningforward.org. All rights reserved."

Good luck in your research in pursuit of your doctorate.

Sincerely,

Tom Manning
Vice President of Consulting Management and Services, Learning Forward
17330 Preston Road, Suite 106-D
Dallas, Texas 75252
(972) 421-0888
tom.manning@learningforward.org

APPENDIX H

CURATED LIST OF ARTICLES FOR EXPERT PANEL

Email sent to study participants on April 30, 2020:

Subject: Resources of Interest

Hello, Team!

As I was working on another project (I'm "test driving" Univ. of Michigan's Disciplinary Literacy course), I came across some resources that may be of interest. I hope I captured each subject area and a couple transdisciplinary ones as well:

Allen, J. et al. (2020, March 20). How the world will look after the coronavirus pandemic. *Foreign Policy* online. Retrieved from https://foreignpolicy.com/2020/03/20/world-order-after-coroanvirus-pandemic/

Humphrey, J. (2020, March 25). Using collaborative language is essential in times of crisis. Fast Company. Retrieved from https://www.fastcompany.com/90481201/using-collaborative-language-is-essential-in-times-of-crisis

Martini, M., Gazzaniga, V., Bragazzi, N.L., & Barberis, I. (2019, March 29). The Spanish Influenza Pandemic: a lesson from history 100 years after 1918. *Journal of Preventative Medicine*, 60(1): E64–E67. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6477554/

Netter, L. (2020, April 1). The importance of art in the time of coronavirus. *The Conversation*. Retrieved from https://theconversation.com/the-importance-of-art-in-the-time-of-coronavirus-135225

Paton, B. (2020, April 9). Social change and linguistic change: the language of Covid-19. *OED blog*. Oxford University Press. Retrieved from https://public.oed.com/blog/the-language-of-covid-19/

Rogers, A. and Molteni, M. (2020, March 30). The mathematics of predicting the course of the coronavirus. *Wired* online. Retrieved from https://www.wired.com/story/the-mathematics-of-predicting-the-course-of-the-coronavirus/

Spinney, L. (2019, October 19). How pandemics shape social evolution. *Nature* 574: p. 3 324-326. Retrieved from https://www.nature.com/articles/d41586-019-03048-8

Xin, Y. (2020, March 30). What will the world look like after coronavirus? Four possible futures. *The Conversation*. Retrieved from https://theconversation.com/what-will-the-world-be-like-after-coronavirus-four-possible-futures-134085

APPENDIX I

IRB APPROVAL AND MODIFICATION

ASU Knowledge Enterprise Development

EXEMPTION GRANTED

Carrie Sampson
Division of Educational Leadership and Innovation - West Campus
-
csampso4@asu.edu

Dear Carrie Sampson:

On 2/6/2020 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	"Collaborative Professional Learning and Disciplinary Literacy: Building Collective Teacher Efficacy in Times of Pedagogical Change"
Investigator:	Carrie Sampson
IRB ID:	STUDY00011398
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• Fossum Dissertation IRB application v 2.docx, Category: IRB Protocol; • Fossum IRB Innovation Configuration Map.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Fossum IRB Participant Consent Letter v 2.pdf, Category: Consent Form; • Fossum IRB Procedures Involved.pdf, Category: Other; • Fossum IRB Site Permission.pdf, Category: Off-site authorizations (school permission, other IRB approvals, Tribal permission etc); • Fossum IRB Study Timeline and Procedure.pdf, Category: Other; • Fossum IRB Survey.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Fossum SAI Permission (1).pdf, Category:
	Measures (Survey questions/Interview questions /interview guides/focus group questions);

ASU Knowledge Enterprise Development

APPROVAL: MODIFICATION

Carrie Sampson
Division of Educational Leadership and Innovation - West Campus
-
csampso4@asu.edu

Dear Carrie Sampson:

On 2/2/2021 the ASU IRB reviewed the following protocol:

Type of Review:	Modification / Update
Title:	"Collaborative Professional Learning and Disciplinary Literacy: Building Collective Teacher Efficacy in Times of Pedagogical Change"
Investigator:	Carrie Sampson
IRB ID:	STUDY00011398
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• Addendum to Consent Form v 2, Category: Consent Form; • IRB application with addendum notice, Category: IRB Protocol;

The IRB approved the modification.

When consent is appropriate, you must use final, watermarked versions available under the "Documents" tab in ERA-IRB.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

BIOGRAPHICAL SKETCH

Andrea was born in Missouri and raised in Nebraska with childhood summers spent on her family's farms and ranches in Montana along the Saskatchewan border. Overeducated and in need of less expensive hobbies, she holds graduate degrees in History (University of West Florida), Library and Information Science (University of South Florida), and Educational Administration (American College of Education). Her Midwestern roots, cultivated by a Jesuit education, established her ethos as a servant leader. Since becoming an educator in 2007, Andrea has served school communities as a classroom teacher, librarian, principal, curriculum director, and professional learning facilitator in the United States, Pakistan, Mexico, and the Middle East. She will join her new team in China in Fall 2021. Named the Beginning Teacher of the Year at Suncoast High School (2008) and one of the Top Five Beginning Teachers of the Year in the School District of Palm Beach County, Florida (2008), her most cherished honors are being a two-time finalist for the student-nominated "My Teacher, My Hero" award (2008, 2009) and accidentally being called "mom" by her students. Prior to entering the classroom, Andrea was a maritime archaeology graduate intern, cultural educator, and museum administrator for ten years in the often-overlooked although historically-rich State of Florida. Living outside her country of original for over a decade, she came to appreciate the myriad ways in which language impacts understanding. She truly believes that empowering students and teachers as active partners in co-designing learning experiences that explore issues of social justice, cultural understanding, and historical appreciation will produce global advocates who fearlessly endeavor to define a hope-filled future.