DUGGAN, ARREN. Ph.D. Creating a Pacing Resource Linked to New Mathematics Standards: Collective Sensemaking by Multiple Stakeholder Groups. (2021)
Directed by Dr. Victoria Jacobs and Dr. Holt Wilson. 94 pp.

This dissertation showcases collective sensemaking in action. The study was situated in a larger North Carolina project, in which educators took a systems approach to update the state's instructional guidance infrastructure during content standards reform. Specifically, I investigated how K–5 educators from multiple stakeholder groups—teachers, instructional coaches, district leaders, and higher-education faculty members—worked together collaboratively to create an enhanced version of a statewide pacing guide, renamed an instructional framework that was designed to support the implementation of new state mathematics standards.

Similar to most pacing guides, the instructional framework included suggested sequencing and duration of mathematics standards. However, in contrast to most pacing guides, the instructional framework also included (a) clusters of standards to emphasize mathematical connections and foster a coherent understanding of mathematics for students, (b) ranges of suggested durations to provide flexibility in meeting students' learning needs, (c) links to standards of mathematical practice, and (d) educative information for educators about the mathematics, student learning progressions, and possible models of teaching.

My study focused on a single case—the design of the third-grade instructional framework by a 9-member writing team that included 4 stakeholder groups. Data included 10 hours of audio recordings of conversations among the writing team members as they designed the instructional framework across three meetings. The analysis involved using the constant comparative method to understand the writers' collective sensemaking during conversations and then the use of frequencies to detect overall patterns and patterns by stakeholder groups.

I identified three categories of debatable topics that emerged during the conversations: topics that focused on the whole framework, a single cluster, and multiple clusters. I also identified five categories of discussion points introduced to resolve the topics or move the conversations forward. The discussion-point categories included consideration of mathematical content—a typical consideration for traditional pacing guides—as well as four additional considerations: students' understandings, pedagogical connections, institutional obligations, and framework organization. Also of interest were the differential priorities for each stakeholder group as captured by the variability in the frequencies of discussion-point categories each group introduced. Findings indicated that each stakeholder group brought different priorities to the design process based on each group's most prevalent discussion-point category, some omissions in discussion-point categories, and their perspectives within certain discussion-point categories.

This study is an existence proof that collective sensemaking during the collaborative design of a resource is possible during reform efforts that use a systems approach. Findings also offer three insights related to the design of pacing resources during content standards reform, which could be of interest to district and state leaders and policymakers. First, the collective sensemaking opportunities that occurred during the creation of the framework led to the identification of four additional considerations—beyond the typical consideration of mathematical content—that writers of pacing resources should consider during the design process. Second, this study offers empirical evidence for the importance of involving multiple stakeholder groups in the design of resources. Based on their professional responsibilities, the stakeholder groups brought various experiences, expertise, and knowledge to the design process. This variation was particularly visible when comparing the frequencies of discussion-point categories for each stakeholder group. Each group had a different discussion-point category that

they used most often, and one group never used a discussion-point category. Therefore, if all stakeholder groups were not involved in the design process, some discussion-point categories may never have been introduced (or addressed) during the creation of the third-grade framework. Finally, this study offers evidence of how taking a systems approach and including multiple stakeholder groups in the design process can help address three typical implementation challenges for content standards reform—misalignment with existing resources, lack of buy-in, and lack of collective sensemaking opportunities.

CREATING A PACING RESOURCE LINKED TO NEW MATHEMATICS STANDARDS: COLLECTIVE SENSEMAKING BY MULTIPLE STAKEHOLDER GROUPS

by

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DEDICATION

To my family—thank you for your constant support, encouragement, and love. Thank you for always believing in me and being my personal cheerleaders! I could not have done this without all of you.

APPROVAL PAGE

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CHAPTER I: INTRODUCTION

Education is in a constant state of reform in that content standards typically change every 5-7 years (North Carolina Department of Instruction, n.d.). These changes are generally not incremental improvements but large-scale reforms (Fullan, 2009; Spillane et al., 2002). Reforms can be enacted for a variety of reasons. Some are enacted to prepare students for a new vision of society, such as a society with a 21st-century global workforce and economy (Ferrini-Mundy, 2017; Johnson, 2001; Jorgenson, 2006) or a society in which today's youth are innovators who can compete with international students (Barbaro, 2019; Ferrini-Mundy, 2017). Other reforms are reactions to federal mandates (e.g., No Child Left Behind [2001] and Every Student Succeeds Act [2015]) or to the poor performance by U.S. students on international assessments, such as the Programme for International Student Assessment or the Trends in International Mathematics and Science Study (Klien, 2015; OECD, 2019; Provasnik et al., 2019). Even the 2010 national effort to develop K–12 *Common Core State Standards* in mathematics and language arts did not disrupt this cycle of constant reform because calls for local control—and thus local versions of the national standards—as well as challenges with national assessments, resulting in states abandoning the *Common Core State Standards* in favor of local reforms. Specifically, the *Common Core State Standards* were originally adopted by 41 states, the District of Columbia, and four U.S. territories in August 2010, and currently, only 23 states are still using them (DeNisco, 2017; Goldstein, 2019).

One of the main drawbacks of this constant reform is that K–12 educators (e.g., teachers, instructional coaches, and district leaders) rarely have sufficient support to effectively implement the recommendations, even though resources are often crafted to complement the new content standards to help with implementation. These implementation resources come in a variety of

forms such as instructional materials to use with students (e.g., tasks, activities, lessons, and textbooks), pacing guides, standards unpacking documents, personnel (e.g., instructional coaches), professional development (e.g., learning opportunities that include suggestions for instructional strategies and instructional materials), and formative assessments (e.g., benchmark assessments).

Common across the reform efforts is that implementation is generally not a smooth process, and three challenges are prominent. First, new content standards and corresponding implementation resources are often misaligned with existing instructional materials and accountability measures making it difficult for educators to coordinate all parts of their work (Penuel et al., 2011).

Second, new content standards and implementation resources may lack buy-in by educators who are expected to use the standards and resources because the design process often excludes the voices and needs of those educators, including potential roadblocks they may encounter during implementation. As such, buy-in may be limited because the authors—often a small group—may be viewed as unqualified because of their distance from education or the educators' specific instructional contexts (Roschelle et al., 2006; Spillane, 2000; Tan, 2014; Voogt et al., 2011). Furthermore, buy-in may be limited because the resources may be hard to interpret or conflict with the educators' other professional obligations (Remillard, 2005; Remillard & Heck, 2014; Spillane, 2000).

Third, new content standards and corresponding implementation resources lack opportunities for collective sensemaking because stakeholder groups (e.g., teachers, instructional coaches, district leaders, and higher-education faculty members) are usually not included in the design process or the turnaround time from adoption to implementation is short, and educators

are not given sufficient time to make sense of the new standards and resources (Maitlis & Christianson, 2014).

This dissertation was situated in a North Carolina mathematics reform effort that has addressed these three implementation challenges by involving mathematics educators from multiple stakeholder groups in a project that produced high-quality implementation resources aligned with instructional materials and statewide accountability measures (Duggan et al., 2018). In the context of this reform effort, I investigated the creation of one implementation resource—an enhanced version of a pacing guide called an instructional framework. Traditional pacing guides are grade-level curriculum maps that list what content standards to teach and when and how long to teach them (Bauml, 2013; Broome, 2020; David, 2008). In contrast, the instructional framework included not only suggested sequencing and duration of mathematics standards, but also (a) clusters of standards to emphasize mathematical connections and foster a coherent understanding of mathematics for students, (b) ranges of suggested durations to provide flexibility in meeting students' learning needs, (c) links to standards of mathematical practice, and (d) educative information for educators about the mathematics, student learning progressions, and possible models of teaching.

My goal was to identify the types of debatable topics that emerged during the conversations and the categories of discussion points introduced to resolve the topics or simply to move the conversations forward. Also of interest were the differential priorities for each stakeholder group as captured by the variability in the frequencies of categories of discussion points each group introduced. Mapping this landscape can inform other efforts to create implementation resources in response to educational reform that involves new content standards.

In the following sections, I first describe the case of North Carolina, which provides the context for my study, and then I will outline my study.

The Case of North Carolina

The work in North Carolina is an example of what happens when a status quo reform process is disrupted explicitly to address the challenges of past reform efforts. The most recent round of mathematics reform in North Carolina began in 2016 with the adoption of new high school mathematics standards and the creation of corresponding implementation resources, followed by the adoption of new K-8 mathematics standards and the creation of corresponding implementation resources the following year.

Background for the North Carolina Case

New high school mathematics standards were adopted in North Carolina during the spring of 2016 and were implemented in the 2016-2017 school year. To assist with the short timeline for implementation of the new mathematics standards, a group of mathematics educators from eight public state universities along with members of the North Carolina Department of Public Instruction and high-school mathematics educators (teachers, instructional coaches, and district leaders) from across the state formed a research-practice partnership (Coburn & Penuel, 2016), named the *North Carolina Collaborative for Mathematics Leaners* (NC2ML). When the new K–8 mathematics standards were adopted in the spring of 2017, the NC2ML group was extended to include K-8 educators, who were tasked with creating statewide pacing guides to support the implementation of these standards, which were implemented in the 2018-2019 academic year.

NC2ML re-envisioned North Carolina's process for supporting the implementation of new content standards. Specifically, they sought to disrupt typical patterns of inequitable

supports for teachers and other educators during reform efforts by developing implementation resources (e.g., research briefs, lessons, online professional development modules, and instructional frameworks) that could be used with the new content standards. Historically, because North Carolina is a local control state, each of the 115 school districts has created their own pacing guides and other implementation resources to use with newly adopted content standards (The Glossary of Education Reform, 2014). However, when individual districts create their own implementation resources, small or low-income districts are often at a disadvantage because they cannot procure the same personnel or financial resources as large, well-funded districts. Therefore, NC2ML recognized the need to create a statewide pacing guide accessible to all 115 school districts and not contingent on the district resources available to create it. Furthermore, NC2ML recognized not only the power of traditional pacing guides but also their challenges, and they worked to address these challenges as they re-envisioned pacing guides.

Traditionally, school districts have used pacing guides to help educators know what content standards to teach and when and how long to teach them (Bauml, 2013; Broome, 2020; David, 2008; Remillard & Heck, 2014). Unfortunately, pacing guides often outline unrealistic, strict timelines for instruction, thus expecting students to reach mastery of concepts according to inflexible timeframes that may not match students' understandings (Bauml, 2013; Broome, 2020; David, 2008). These unrealistic timelines can cause teachers to feel pressure to use prescriptive instructional practices that emphasize test preparation instead of research-based practices. They may also choose to only focus their instruction on tested concepts (Bauml, 2013; Broome, 2020; David, 2008; Witzel & Riccomini, 2007). Overall, the unrealistic timelines may not allow teachers to address the learning needs of all their students (Bauml, 2013; Broome, 2020; David, 2008; Witzel & Riccomini, 2007).

In response, NC2ML recognized the need to create pacing guides that emphasized curriculum guidance, not prescriptive pacing, to teach the standards. This guidance included offering flexible ranges of suggested durations to teach the standards instead of unrealistic timelines (Bauml, 2013; Broome, 2020; David, 2008; Witzel & Riccomini, 2007). Furthermore, NC2ML wanted to design a pacing guide that would be helpful for all educators across all levels of the education system. To accomplish this goal, they included multiple stakeholder groups connected to mathematics in the design process. This re-envisioning of pacing guides led to the birth of the K-8 Instructional Frameworks Project to help teachers and other educators implement the new K-8 mathematics standards in North Carolina.

The K–8 Instructional Frameworks Project in North Carolina

The K–8 Instructional Frameworks project began in June 2017 and focused on designing statewide pacing guides, later renamed instructional frameworks, for the new K–8 mathematics standards. It took 13 months to collaboratively craft the nine instructional frameworks—one for each grade level—and Table 1 summarizes the design tasks and timeline. The following sections then describe the authors of the frameworks, the design process for the frameworks, the efforts to align the frameworks with other implementation resources, and the structure of the final versions of the frameworks.

Table 1. Design Tasks and Timeline for the Development of the K–8 Instructional Frameworks

Date	Tasks
June 2017	• Writing teams met to develop Draft 1. • NC2ML team leaders introduced Design Principles for re-envisioning pacing guides, and writers helped refine them.

Date	Tasks
July 2017	• Writing teams met to develop Draft 2. • Writing teams presented drafts to a convenience sample of K-8 educators for informal feedback.
August 2017	• NC2ML team leaders shared Draft 2 with the Tools for Teachers group for informal feedback.
September 2017	• Writing teams met to develop Draft 3 based on informal feedback from the Tools for Teachers group (individuals tasked with creating complementary instructional resources).
October 2017	• Subsets of writing teams met to format and polish Draft 3.
November 2017	• NC2ML team leaders shared Draft 3 at the state mathematics conference. • NC2ML team leaders released Draft 3 statewide to more than 1000 K-8 educators to gather formal feedback using an online survey.
January 2018	• Writing teams met to review statewide feedback and make revisions to develop Draft 4.
February 2018	• NC2ML team leaders released Draft 4 to K-8 educators to gather informal feedback as they explored the draft of the frameworks. • NC2ML team leaders incorporated informal feedback in an ongoing fashion until official implementation in Summer 2018.
April 2018	• Subsets of writers and NC2ML team leaders attended a meeting about North Carolina formative benchmark assessments (*NC Check-ins)* to stress the importance of aligning these assessments to the instructional frameworks.
April/May 2018	• NC2ML sponsored three regional rollout meetings for district leaders to increase visibility and understanding of the instructional frameworks.
July/August 2018	• NC2ML team leaders finalized the instructional frameworks. • North Carolina K-8 Instructional Frameworks were officially released. • Implementation of the North Carolina K-8 mathematics standards and instructional frameworks officially started.

Authors of the Frameworks

Two mathematics education researchers from the NC2ML group (referred to as *NC2ML team leaders*) led the K-8 Instructional Frameworks project, and a total of 61 educators participated in the design of these statewide instructional frameworks. The writers included individuals from multiple stakeholder groups—19 teachers, eight instructional coaches, 18 district leaders, and 16 higher-education faculty members (which included the two NC2ML team leaders). Writers were invited to participate in the project by NC2ML team leaders, and they were purposefully identified from 19 diverse school districts across the state. The set of districts represented small, medium, and large-sized districts; rural, urban, and suburban settings; and all three regions of the state (West, Central, and East). Writers worked in nine teams, and each addressed implementation of one grade's mathematics standards.

Design Process for the Frameworks

The bulk of the creation of the frameworks occurred during three face-to-face writing meetings in June, July, and September 2017. In each of these meetings, the writers were split into grade-level writing teams to craft their grade-level instructional framework, and opportunities for informal feedback from other writers and K-8 educators were provided. Throughout the creation of the frameworks, writers engaged in rich conversations that involved a variety of perspectives stemming from the multiple stakeholder groups who were collaborating; these conversations are the focus of my dissertation.

At the start of the writing project (in the June meeting), NC2ML team leaders shared a list of possible design principles to guide the development of the frameworks. These design principles were based on the reading of David (2008), which described the benefits and challenges of using pacing guides. The K-8 writers discussed, refined, and adopted the design

principles that were then displayed throughout each of the writing meetings for the writers to reference as they engaged in conversations (see Table 2 for the adopted version of the design principles).

Table 2. Design Principles for the Development of the K–8 Instructional Frameworks

Design Principle 1	Emphasize curriculum guidance, not prescriptive pacing.
Design Principle 2	Focus on central mathematical ideas, with links to exemplary curriculum materials, lessons, and instructional strategies.
Design Principle 3	Allow for flexibility and unpredictability based on differences in teachers, students, and contexts.
Design Principle 4	Address development of student reasoning and how to build upon it (i.e., learning progressions/trajectories).
Design Principle 5	Adjust the frameworks frequently based on feedback from North Carolina educators.

After the main writing meetings in June, July, and September, subsets of the writing teams met in October 2017 to polish and format the draft from the September meeting. The goal was to prepare for the release of the frameworks for formal feedback from K-8 North Carolina educators. In November 2017, the frameworks were released for statewide feedback at the annual state mathematics conference. More than 1,000 K-8 educators (teachers, instructional coaches, and district leaders) were invited to give feedback and suggestions about the frameworks through an online survey. At the end of the survey window, small groups of writers met to unpack and discuss the feedback responses from the survey (n = 464). Using this feedback, they made revisions until February 2018, when the frameworks were released for educators to voluntarily explore in their classrooms and professional learning communities (PLCs) and offer informal feedback. In response, small groups of writers made additional

revisions to the frameworks until July 2018. Both the content standards and frameworks were officially implemented in the 2018-2019 school year.

Alignment Efforts

One of the main goals of the K-8 Instructional Frameworks project was to avoid misalignment issues that educators often experience with content standards reform. The frameworks themselves were designed from the new mathematics standards, and the project explicitly addressed alignment in two ways. First, the Tools for Teachers group—a partner group to the framework writers—was formed to create instructional materials that aligned to the K-8 instructional frameworks and could be used by teachers, district leaders, and parents during the implementation of the K-8 mathematics standards (for more information, see http://tools4ncteachers.com/). Examples of the types of materials created include lessons; instructional and assessment tasks; games; mathematics routines (e.g., warm-ups and number talks); PowerPoint presentations for professional development; and English/Spanish parent letters explaining the mathematics, instructional strategies, and games that parents could use at home to review mathematical concepts with their children.

Second, NC2ML team leaders, in collaboration with some of the K-8 framework writers and other educators across the state, participated in discussions with state leaders to stress the importance of aligning the quarterly, statewide formative benchmark assessments (known as the *N.C. Check-ins*) with the frameworks. As a result of their efforts, for the first time in state history, the state mathematics standards, pacing guides, and formative benchmark assessments were aligned, which is one of the reasons why over 50% of districts in the state are using the instructional frameworks (Wilson, 2018).

Structure of the Instructional Frameworks

The structure of the instructional frameworks evolved throughout the design process, and the final versions of the K-5 and 6-8 frameworks had slight variations. Because the focus of my study was on K-5, I only describe the final structure of the K-5 instructional frameworks in this section. Specifically, the K-5 frameworks consist of 7–9 *clusters* of mathematics standards grouped by similar mathematics concepts. These clusters are sequenced for the school year, with some mathematics concepts appearing in more than one cluster. Earlier clusters typically focus on conceptual understanding, and later clusters add more depth and procedural fluency. Furthermore, the first cluster includes support for teachers in building their mathematical community at the beginning of the year.

Each cluster is structured in five sections. First, *sets of mathematics content standards* are grouped to emphasize mathematical connections and foster a coherent understanding of mathematics for students. Second, there is a *suggested range of durations* for how long to teach the cluster. Because the standards are grouped into clusters, the suggested durations give teachers flexibility in determining the timeline for teaching concepts to meet the learning needs of their students. Third, each cluster lists specific *Standards for Mathematical Practice* that link well to the cluster's mathematics content standards. These mathematical practice standards differ from the mathematics content standards in that they describe the mathematical habits of mind or dispositions that apply to engaging with all mathematical content. The mathematical practice standards that North Carolina adopted were designed as part of the *Common Core State Standards for Mathematics* (Common Core, 2010) and drew on prior work from the National Council of Teachers of Mathematics and the National Research Council's report *Adding It Up* (National Research Council, 2001; TeacherStep, 2018). Specifically, the eight Standards for

Mathematical Practice include: (a) making sense of problems and persevering in solving them, (b) reasoning abstractly, (c) constructing viable arguments, (d) modeling with mathematics, (e) using appropriate tools, (f) attending to precision, (g) making use of structure, and (h) repeated reasoning (Common Core, 2010). Each cluster's fourth and fifth sections were designed to offer teachers and other educators additional information to understand and implement the cluster. Specifically, each cluster includes a *What is the Mathematics* section, which describes the mathematical concepts in that cluster that are essential for developing student understanding and connections among the concepts. Each cluster also includes an *Important Considerations* section that explains student learning progressions and possible teaching models. (See https://sites.google.com/dpi.nc.gov/k-12-mathematics/resources/k-5-mathematics for the North Carolina K–5 mathematics content standards and https://www.nc2ml.org/k-5-teachers/ for the K–5 instructional frameworks.)

Overview of Dissertation

In this dissertation, I explored what happened when a group of K–5 educators from multiple stakeholder groups came together to collaboratively create a statewide pacing resource to use with new mathematics standards. Specifically, I focused on the collective sensemaking that occurred during conversations among the third-grade writing team to identify the debatable topics that arose during the conversations and the discussion points introduced to address the debatable topics. I am defining *debatable topics* as times when a topic is shared or a question is posed during the writers' conversations, and more in-depth discussion is needed about the topic or question posed before the conversation can move forward. I am defining *discussion points* as the perspectives or rationales that are introduced to address the debatable topics.

I chose to study debatable topics and discussion points because there were a variety of stakeholder groups involved in the creation of the third-grade framework, and different stakeholder groups were likely to offer varying perspectives due to their varying experiences, expertise, and knowledge (Dooner et al., 2008; Severance et al., 2014). Research has shown that having various stakeholder groups work together to create some type of product or innovation can enhance the development of ideas and position the stakeholder groups as co-designers to help solve a problem (Penuel et al., 2011). However, these collaborations can also create tensions or require more in-depth discussions because of the differing perspectives from the stakeholder groups (Tan & Atencio, 2017). Thus, I was also interested in understanding the different contributions of each stakeholder group. The research questions I explored with this study were:

1. What categories of debatable topics surfaced during the development of an implementation resource for new state content standards?
2. What categories of discussion points were introduced to address the debatable topics?
3. What was the distribution across discussion-point categories for each stakeholder group, and how did that distribution compare across groups?

This study focused on the conversations of the third-grade writing team as they worked to create the third-grade instructional framework. The main data source consisted of audio recordings of the third-grade writing team's conversations in three meetings. I also consulted the framework draft from each meeting and the final version of the third-grade framework. Data analysis involved a constant comparative method (Merriam & Tisdell, 2016) to identify categories of debatable topics and discussion-point categories, and frequencies were used to

detect overall patterns and patterns by stakeholder groups. Additionally, I checked my findings with the members of the third-grade writing team by conducting four focus groups—one with each stakeholder group.

Significance of Dissertation

This study is an existence proof that collective sensemaking during the collaborative design of a resource is possible during reform efforts that use a systems approach. Furthermore, findings provide insights for district and state leaders and policymakers who may be interested in the design of pacing resources during content standards reform. Specifically, this study identifies possible debatable-topic and discussion-point categories that may arise during the creation of pacing resources. It also provides empirical evidence for the importance of involving multiple stakeholder groups in the design process.

CHAPTER II: LITERATURE REVIEW

All states have an instructional guidance infrastructure that includes the structures and resources that support and hold the K–12 education system accountable (Hopkins et al., 2013, Hopkins & Woulfin, 2015). The structures in an instructional guidance infrastructure reflect different levels of the system—classroom, school, district, and state—and each level has stakeholder groups that work within it (e.g., teachers, instructional coaches, district leaders, and state leaders). Examples of the resources found across the different levels include content standards, implementation resources (e.g., pacing guides and instructional resources such as lessons and tasks), and accountability measures (e.g., state benchmark assessments and standardized tests).

The structures and resources of the state's instructional guidance infrastructure help shape education policies and the professional responsibilities of the stakeholder groups, and they can also influence instructional practices used in classrooms to support student learning (Hopkins et al., 2013). Therefore, it is important that the entirety of a state's instructional guidance infrastructure is considered during reform efforts, such as updating new mathematics content standards and creating corresponding implementation resources. However, this approach to reform is not the norm. The more typical approach is piecemeal, and the lack of consideration of the entire instructional guidance system often results in multiple challenges during implementation. The following sections describe what researchers have learned about these challenges, and I conclude with the conceptual framework guiding my study.

Reform Efforts and Instructional Guidance Infrastructures

Reform efforts in education are common and generally occur every 5-7 years at the state level (North Carolina Department of Instruction, n.d.). Often the focus of most reform efforts is

on the development of new content standards, which describe concepts that students should know and understand at the end of each grade level (Darling-Hammond et al., 2014; McLaughlin & Tilstone, 1999). Although there is variation for why reform efforts occur in different content areas, a common reason is to prepare today's youth for a 21st-century global workforce and economy (Ferrini-Mundy, 2017; Johnson, 2001; Jorgenson, 2006).

Reform efforts in mathematics education also follow this pattern of frequent reform focused on developing new content standards. In most cases (and like in the North Carolina case), mathematics standards are designed to help students build an understanding of mathematical concepts (Hopkins et al., 2017; Lampert et al., 2010) and reach proficiency by the end of each school year, working toward the cumulative goal of ensuring that students are college and career ready by the end of high school (Darling-Hammond et al., 2014; North Carolina Department of Instruction, n.d.).

When new mathematics content standards are adopted at the state level, corresponding pieces of the infrastructure are typically updated. However, in local-control states like North Carolina, the approach to updating the infrastructure is not centralized. Hopkins and Woulfin (2015) have argued that typical infrastructure reforms tend to only cultivate change within "one component of the educational infrastructure, such as one set of actors (e.g., teachers or principals), one level of the educational system (e.g., state or district level) or one tool (e.g., standards, assessments)" (p. 372) instead of creating structures and resources that foster change across all education levels, stakeholder groups, and resources. The reasoning is that individuals and organizations closest to the students are best suited to make decisions on their behalf; therefore, decisions about updating pieces of the infrastructure are left to local district administrators or school boards (Fuhrman & Elmore, 1990; The Glossary of Education Reform,

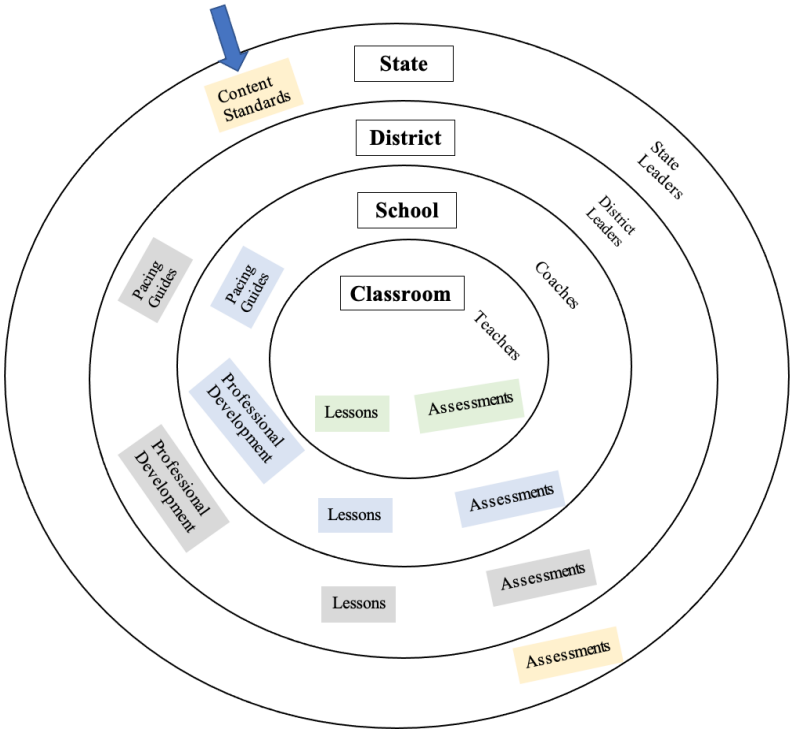
2014). Often, however, this piecemeal approach to updating has proven to be problematic during reform efforts.

A piecemeal approach to updating pieces of an infrastructure can amplify the inequities among districts, especially for smaller school districts who may only be able to create or update one or two implementation resources that align to the new content standards due to a lack of available personnel or financial resources. During content standards reform, this typical process for updating an instructional guidance infrastructure often leads to three implementation challenges that are well-documented in the literature: (a) misalignment between the new mathematical content standards and other pieces of the infrastructure (b) lack of buy-in by educators who will implement the standards, and (c) lack of opportunity for educators to engage in collective sensemaking both during the design and implementation of new content standards and corresponding implementation resources (Maitlis & Christianson, 2014, Weick, 1995).

Misalignment With Other Pieces in the Existing Infrastructure

The first challenge is that new content standards and corresponding implementation resources are often misaligned with other pieces of the existing infrastructure that have not been updated. Consider the Figure 1 depiction of a state instructional guidance infrastructure for K–12 education. The concentric circles represent the four levels of the system. Each level includes sample stakeholder groups and resources. The same type of resource is often included at multiple levels; thus, the resources are in boxes that are color-coded by level. When new state content standards are adopted in local control states, it is up to each education level to update their pieces of the infrastructure. Sometimes these updates occur, and sometimes they do not, and misalignment is often the result. This misalignment can make implementing new content standards challenging for both educators and students.

Figure 1. State Instructional Guidance Infrastructure for K-12 Education



For example, when mathematical content standards are updated at the state level, pacing guides at the district and school levels should be updated to reflect the new content standards. If changes are only made to a pacing guide at the district level, then implementation challenges will likely occur at the school and classroom levels due to a misalignment between new and existing pieces of the infrastructure. Similarly, other resources—assessments, professional development, and lessons—need to be updated at each level to align with the new content standards. In other words, when one piece of the infrastructure, such as content standards, is adjusted, adjustment to other resources and adjustment to the same resource at other levels needs to be considered, or misalignment may occur. This idea was echoed by Hopkins et al. (2013), who argued that each time content standards and corresponding resources are updated, it is important to consider how realignment to existing pieces of infrastructure can occur to ensure that there is both horizontal and vertical alignment with all levels of the system.

Lack of Buy-In

The second challenge is that new content standards and corresponding implementation resources often lack buy-in from the educators who will use the standards or resources because these users are typically not included in the design process. This exclusion of their voices and needs can lead to a lack of buy-in in three ways.

First, a lack of buy-in may occur because the educators who will implement the resources may not only feel that their voices were excluded but also that the writers of the resources—often a small group—lack the needed qualifications or experiences to write them (Roschelle et al., 2006; Spillane, 2000; Tan, 2014; Voogt et al., 2011). In response, Hopkins and Spillane (2015) have argued that the users of the resources should be included in creating the resources. Reform efforts and corresponding resources that reflect educators' understandings, teaching practices, and beliefs are more likely to be implemented as intended (Spillane et al., 2002). However, educators' perspectives will likely only be represented if multiple stakeholder groups are included in the design process.

Second, a lack of buy-in can occur when the intentions of the writers of the resources are unclear to educators who will use them (Spillane, 2000). In response, researchers have argued that creating *educative resources*—resources that include learning opportunities for educators—can not only increase buy-in but also improve educators' content knowledge and impact their pedagogical practices in ways that can support student learning (Ball & Cohen, 1999; Camburn & Han, 2015; Drake et al., 2014; Krajcik & Delen, 2017). In short, increased buy-in that occurs by making resources educative can make it easier for educators to interpret the writers' intentions when creating the resources, which in turn can potentially facilitate implementation (Cohen, 2011; Johnson et al., 2016; Spillane, 2000; Spillane et al., 2002).

Third, a lack of buy-in can occur when potential roadblocks that educators may encounter during implementation are not addressed. Roadblocks are conflicts between what educators are expected to do when implementing new resources and other expectations as part of their professional responsibilities. Echoing this concern, Hopkins and Spillane (2015) argued that the design of new pieces of infrastructure needs to consider how resources may interact with educators' daily professional responsibilities.

Lack of Opportunities for Collective Sensemaking

The third challenge is that each time new content standards and corresponding implementation resources are adopted, educators are not collectively given sufficient time to make sense of the standards. This lack of collective sensemaking opportunities can make it challenging for educators to design high-quality resources and implement them (Allen & Penuel, 2015; Maitlis & Christianson, 2014; Spillane et al., 2002; Weick, 1995). Researchers have argued that to ensure successful implementation of content standards and corresponding resources, educators need time collectively to interpret the meaning of standards and corresponding resources and how they connect with their existing instructional practices and with other pieces of the infrastructure within the education system in which they work (Allen & Penuel, 2015; Coburn 2001; Ball & Cohen, 1999; Hopkins et al., 2013; Spillane et al., 2002; Weick, 1995).

In response to these challenges that often arise in the traditional approach to updating instructional guidance infrastructures, researchers have suggested a different approach that focuses on the system rather than only pieces of that system. Penuel (2019) describes this systems approach as "infrastructuring"; it serves as the core of my conceptual framework. The

following section explores this systems approach in-depth as it was the approach taken in the North Carolina case, which is the context for this study.

Conceptual Framework

The conceptual framework for my study focuses on "infrastructuring" (Penuel, 2019) or taking a systems approach. Taking a *systems approach* means that all levels of the instructional guidance infrastructure, all stakeholder groups that work in each level, and all resources that exist in each level are considered during a modification of pieces of that infrastructure. Furthermore, flexibility and responsiveness at the local level are expected and encouraged (Hopkins et al., 2013; Hopkins & Spillane, 2015; Penuel, 2019). The following sections describe the benefits of using a systems approach to updating an instructional guidance infrastructure and the power of one of the key components of this approach, collaboration among multiple stakeholder groups.

Benefits of a Systems Approach to Updating an Instructional Guidance Infrastructure

Researchers have found that using a systems approach when updating pieces of the instructional guidance infrastructure during content standards reform efforts can be beneficial to educators (Hopkins et al., 2013; Hopkins & Spillane, 2015; Penuel, 2019; Shirrell et al., 2019). Updating existing pieces of infrastructure by involving all levels capitalizes on innovations and ideas stemming from both top-down and bottom-up approaches to reform (Hopkins & Woulfin, 2015). This range of ideas is possible because a systems approach involves collaboration among multiple stakeholder groups, which ensures that voices of educators throughout the system and the voices of relevant stakeholder groups outside the system (e.g., higher-education faculty members, community members, etc.) are included in the process (Camburn & Han, 2015; Spillane, 2000; Spillane et al., 2002).

A systems approach can also address the misalignment challenge that often occurs during content standards reform. For example, Hopkins and Spillane (2015) examined how adopting the *Common Core State Standards* in K-12 mathematics in Georgia resulted in a misalignment between new and existing pieces of the infrastructure at the local level. They compared two school districts—one district opted to create new infrastructure resources (i.e., pacing guides, textbook series, and benchmark assessments) that aligned with the then newly adopted *Common Core State Standards*, whereas the other district opted to continue using existing resources. Findings revealed that the school district that aligned its resources with the state's new content standards resulted in a smoother implementation of the new standards. Thus, taking a systems approach to reform allowed this district to address one of the three main challenges mentioned above—misalignment.

In this same study, researchers identified an additional benefit of taking a systems approach: identifying holes in the infrastructure. Specifically, in the district taking a systems approach, educators examined the existing infrastructure and identified holes in the support structures for teacher learning. In response, instructional coaches were hired to work in that district and in the district that continued to use existing resources. The coaches supported teacher learning by co-teaching with teachers, modeling lessons, and helping teachers make sense of new standards. Findings indicated that introducing coaches as teacher support structures was linked to increased teacher learning during the implementation of the new standards in both school districts (Shirrell et al., 2019). Camburn and Han (2015) found similar results in their study of the implementation of new literacy standards. They also identified holes in an existing infrastructure in terms of the support structures for teacher learning. In response, they also introduced instructional coaches and other on-the-job learning opportunities (e.g., lesson study).

Similar to Shirrell et al. (2019), they found enhanced teacher learning and understanding of the new content standards when these teacher support structures were introduced.

In summary, taking a systems approach to reform can generate a wide range of ideas based on including multiple voices, addressing misalignment challenges with other pieces of the infrastructure, and identifying and remedying holes in an existing infrastructure. In the following section, I explore a core component of taking a systems approach—the collaboration among multiple stakeholder groups in updating pieces of infrastructure.

Power of Collaboration Among Multiple Stakeholder Groups

Integral to taking a systems approach to updating pieces of an instructional guidance infrastructure is collaboration among multiple stakeholder groups who work both within and outside the K–12 educational system. Collaborative work that results in a new product can benefit the people involved in the work and the product's end-users. Furthermore, involving multiple stakeholder groups in updating an infrastructure can address two of the main challenges identified above—lack of buy-in and lack of collect sensemaking opportunities.

First, including the voices of educators who will use the resources in the design process can lead to increased buy-in from teachers and other stakeholder groups because they know that educator voices were involved in the creation process, which increases their trust in the product (Roschelle et al., 2006; Tan, 2014; Voogt et al., 2011). Thus, the approach of providing opportunities for educators to collaborate during the creation of implementation resources can influence other educators' interpretations of the resources as well as how educators implement and adapt the resources, thereby making new policy resources easier to implement (Ball & Cohen, 1999; Coburn, 2001; Spillane, 2000). Furthermore, including multiple stakeholder groups in the design process can help address potential roadblocks that may occur during the

implementation process, thereby increasing the likelihood of buy-in (Remillard, 2005; Remillard & Heck, 2014).

Second, collaboration among multiple stakeholder groups that requires collective sensemaking has been shown to have multiple benefits. *Collective sensemaking* is a social process in which individuals work collaboratively to create meaning for new or confusing ideas so that they can move forward to author documents or engage in further conversation (Allen & Penuel, 2015; Coburn, 2001; Maitlis & Christianson, 2014; März & Kelchtermans, 2013). Specifically, the sensemaking process is triggered when confusing or ambiguous messages are presented in conversations or events that disrupt the understandings of individuals in the group, thereby requiring them to draw on their personal experiences, expertise, and prior knowledge to collectively negotiate meaning to resolve the ambiguity and make the ideas discussed in the conversations or events more coherent (Allen & Penuel, 2015; Coburn, 2001; Maitlis, 2005; Maitlis & Christianson, 2014; März & Kelchtermans, 2013). When multiple stakeholder groups are involved during content standards reform, diversity of experiences, expertise, and knowledge are brought by individuals who draw from their work at different levels of the education system.

Research has shown that the diversity of ideas generated by collective sensemaking can lead to the creation of higher-quality resources (Maitlis & Christianson, 2014; Weick, 1995). Furthermore, research has also identified benefits for the individuals who participate in collective sensemaking. For example, the exchange of ideas and the opportunity to collectively make sense of information can lead to an increase in content knowledge and other professional growth for participants (Camburn & Han, 2015; Voogt et al., 2011).

My Study

This study occurred in the context of a reform project that took a systems approach to updating the state's instructional guidance infrastructure for mathematics. This broader project accomplished the alignment of state mathematics content standards, pacing guides (instructional frameworks), and formative benchmark assessments for the first time in North Carolina's history (Wilson, 2018). My study focused on the collaborative work of multiple stakeholder groups. Specifically, I investigated the collective sensemaking that occurred during the rich conversations that led to the creation of the third-grade instructional framework. I focused on identifying the debatable topics generated during this collective sensemaking—when ideas were shared during conversations and ambiguity or uncertainty resulted, thereby triggering sensemaking. Furthermore, I investigated the discussion points introduced during the conversations (and which stakeholder groups introduced those discussion points) as the writers of the third-grade framework attempted to collectively make sense of the ambiguity that occurred to move their conversations forward. The research questions I explored with this study were:

1. What categories of debatable topics surfaced during the development of an implementation resource for new state content standards?
2. What categories of discussion points were introduced to address the debatable topics?
3. What was the distribution across discussion-point categories for each stakeholder group, and how did that distribution compare across groups?

CHAPTER III: METHODS

This case study is connected with the North Carolina K–8 Instructional Frameworks project that focused on updating an existing instructional guidance infrastructure by creating instructional frameworks—"pacing guides"—for new K–8 state mathematics standards. My goal was to examine the conversations of a group of writers who worked collaboratively to create the third-grade framework during three writing meetings. Specifically, I analyzed the writers' conversations to identify categories of debatable topics that arose during the creation of the framework, categories of discussion points introduced to address these debatable topics, and frequency patterns of these discussion-point categories by stakeholder group. I chose a case study methodology because it allowed for an in-depth investigation of a bounded system, which in this study was the group of writers who worked together to create the third-grade framework (Merriam & Tisdell, 2016; Yin, 2017). In this chapter, I share information about the participants, writing team activities, data sources, data analysis, and my positionality.

Participants

I focused on the conversations of the third-grade writing team, which included two teachers, four instructional coaches, two district leaders, and one higher-education faculty member. All of the third-grade writers were experienced educators. I chose to focus on the third-grade writing team for several reasons. First, third-grade was in the middle of the K–5 grade span. Second, across three meetings, revisions of the previous meeting's drafts of the framework were more extensive at third-grade than at other grade levels, suggesting that more debatable topics may have arisen during the conversations. Finally, individuals from multiple stakeholder groups participated in all the writing teams, but not all team members participated in every meeting. Therefore, only a subset of stakeholder groups was represented at each meeting. The

only exception was the third-grade writing team that had one meeting where all stakeholder groups were present. Because I hypothesized that more diverse voices present in conversations could lead to more debatable topics and discussion points to examine, focusing on the third-grade writing team provided a unique opportunity to explore the contributions of all stakeholder groups at one time.

Writing Team Activities

The nine-member writing team collaboratively created the third-grade framework. The majority of the team's work occurred in 5 months (June 2017–October 2017) and consisted of three face-to-face meetings in June, July, and September. Although there was variation in the number of writers present at each meeting, members from at least two stakeholder groups attended each meeting. There was also an NC2ML team leader who was present at all three meetings. (See Table 3 for a summary of the participation of the writing team members.)

Table 3. Third-Grade Writing Team Members' Participation in Meetings

	Writing Meetings		
Writing Team Members	June 2017	July 2017	September 2017
Teacher 1		X	X
Teacher 2		X	X
Instructional Coach 1		X	X
Instructional Coach 2		X	
Instructional Coach 3			X
Instructional Coach 4			X
District Leader 1	X		X
District Leader 2		X	
Higher-Education Faculty Member	X		X

Note. One NC2ML team leader (who was also a Higher-Education Faculty Member) was present at all three meetings and participated in the writing-team discussions on an as-needed basis.

For each of the three meetings, the goal was to create or refine a draft of the third-grade framework. Each meeting began with the third-grade writing team talking briefly with the other grade-level writing teams to review the design principles for the instructional frameworks (see Table 2) and the specific goals for that meeting, but then they spent a substantial amount of time as an independent writing team engaged in rich conversations. Sometimes the conversations were straightforward, and decisions were made quickly. Other times more discussion was needed because multiple debatable topics arose in the conversations. Topics raised in the conversation were considered *debatable topics* when a topic was shared, or a question related to the topic was posed, and more in-depth discussion was needed before the conversation could move forward. When debatable topics arose during conversations, the writers would introduce *discussion points*, which were perspectives or rationales put forth to address the debatable topics

Table 4 summarizes the work completed by the third-grade writing team in each meeting, and this work included six types of tasks. First, the writing team collectively unpacked and made sense of the new mathematics standards, discussing which standards could be clustered together based on key mathematical concepts present in each standard. Clustering standards for the first cluster of the framework had an additional goal, as the writers also needed to select standards that could be used to help build a mathematical classroom community at the beginning of the school year. Second, once the standards were clustered, the writing team wrote rationales to explain why certain standards were clustered together. Third, the writing team sequenced the clustered standards. Fourth, they identified suggested durations for the sequenced clusters, noting that each suggested duration was just an approximation, thereby giving teachers the autonomy to set the learning pace based on the learning needs of their students. Fifth, the writing team wrote an *Important Considerations* section for each cluster in which they highlighted student learning

progressions underlying the standards in that cluster and other helpful information for implementation. Sixth, they identified key Standards for Mathematical Practice (Common Core, 2010) for each cluster. Specifically, they considered the eight Standards for Mathematical Practice and identified the key standards that linked best with the mathematical content in each cluster.

Table 4. Instructional Framework Development Tasks

	June 2017 *Draft 1*	**July 2017** *Draft 2*	**September 2017** *Draft 3*
Clustered third-grade mathematics standards	Created six clusters	Significantly revised the six clusters from Draft 1 and created four new clusters	Significantly revised the 10 clusters from Draft 2[a]
Wrote rationales for clusters[b]	Wrote rationales for three clusters	Wrote rationales for three of the four new clusters	Revised the three rationales from Draft 2 and wrote seven new rationales
Sequenced clusters	Sequenced six clusters	Revised the sequencing of the six clusters from Draft 1, integrating the four new clusters	Revised the sequencing of the 10 clusters from Draft 2
Suggested durations for clusters	NA	Suggested durations for all 10 clusters	Revised the suggested durations for all 10 clusters from Draft 2
Wrote *Important Considerations* sections for clusters	NA	Wrote *Important Considerations* for eight clusters	Significantly revised the *Important Considerations* for eight clusters from Draft 2 and wrote new *Important Considerations* for the two remaining clusters
Identified Key Standards for Mathematical Practice for clusters	NA	Identified key Standards for Mathematical Practice for each of the 10 clusters	Revised the key Standards for Mathematical Practice that were identified for each of the 10 clusters from Draft 2

[a] In the final version, in the third-grade framework, there were only nine clusters. The extra cluster was removed after the September 2017 meeting.

[b] In the final version of the third-grade framework, the rationale sections were deleted. After the September 2017 meeting, some of the information was integrated into the *Important Considerations* sections, and some formed the basis for a new section, *What is the Mathematics.*

June Meeting

During this 3-day meeting, the third-grade writing team worked together for 2 hours to create the first draft of the framework. At this meeting, the writing team consisted of one district leader and one higher-education faculty member. This team worked together to (a) cluster standards, (b) write rationales for standards, and (c) sequence standards. The writers were purposeful in how they clustered and sequenced the standards so that they could build in "brain breaks" for students (and teachers) in between the core concepts that students learn in third-grade (e.g., multiplication, fractions, etc.). They also responded to informal feedback from other grade-level writing groups at the broader meeting, particularly about sequencing clusters. By the end of the meeting, the writing team had completed Draft 1 of the third-grade framework.

July Meeting

During this 2-day meeting, the third-grade writing team worked together for 3 hours. At this meeting, the writing team consisted of five writers who were all new—two teachers, two instructional coaches, and one district leader. The team members were all new because of scheduling conflicts for the original writers and because of the purposeful decision by the NC2ML team leaders to include increasingly more voices in the design process. This team worked together to: (a) make sense of and revise the Draft 1 clusters, rationales, and sequencing, (b) suggest durations for the clusters, (c) write *Important Considerations* sections for the clusters, and (d) identify and link key Standards for Mathematical Practices to individual clusters. They also responded to informal feedback from other educators attending professional development at the meeting site. By the end of the meeting, the writing team had completed Draft 2 of the third-grade framework with notable revisions to Draft 1.

September Meeting

During this one-day meeting, the third-grade writing team worked together for 5 hours. At this meeting, the writing team consisted of eight writers, and they included all of the writers at the June meeting, all but one of the writers at the July meeting, and two new writers. The two new writers, instructional coaches, were drawn from the Tools for Teachers group—a different group tasked with designing instructional resources for teachers that aligned with the instructional frameworks. (Note that there was some overlap in the group membership in that the district leader from the June writing team was also a member of the Tools for Teachers group.)

Before the meeting, the Tools for Teachers group had generated feedback on Draft 2 of the framework in the form of written suggestions and questions. Thus, the main goal for the meeting was to provide a space to discuss the written feedback, with additional explanations from the three writers who were also members of the Tools for Teachers group. The writing team collectively used the feedback to guide revisions to Draft 2. During the meeting, the writing team worked together to (a) use the Draft 2 feedback from the Tools for Teachers group to revise the Draft 2 clusters, rationales, sequencing, durations, *Important Considerations* sections, and key Standards for Mathematical Practices linked to each cluster, and (b) write the remaining rationales and *Important Considerations* sections for the clusters.

By the end of the meeting, the writing team had completed Draft 3 of the third-grade framework with notable revisions to Draft 2. Note that additional revisions occurred after the September 2017 meeting and continued through July 2018, which was right before all of the K–8 instructional frameworks were released for implementation during the 2018–2019 school year.

Data Sources

For this study, I used existing data collected from the North Carolina K–8 Instructional Frameworks project. Specifically, I focused on audio recordings of the third-grade writing team's conversations during the June, July, and September meetings. I also consulted the final version of the third-grade framework and the three earlier drafts produced at each of the three writing meetings.

Audio Recordings

Each of the meetings of the third-grade writing team was audio-recorded and transcribed. There were approximately 10 hours of audio recordings—2 hours from the June meeting, 3 hours from the July meeting, and 5 hours from the September meeting. Throughout my analysis, I listened to the audio recordings as I read through the transcripts to help me make sense of the debatable topics and discussion points that emerged during the writers' conversations.

Instructional Frameworks

I examined a total of four versions of the third-grade instructional framework—Drafts 1-3 from the writing meetings and the final version released for implementation for the 2018-2019 school year. The main use of the drafts of the instructional framework was to provide context for the audio-recorded conversations.

Data Analysis

The data analysis for this study consisted of six phases: (a) preparing data for analysis, (b) identifying conversation segments, (c) categorizing debatable topics and discussion points, (d) identifying frequencies for categories of debatable topics and discussion points, (e) connecting stakeholder groups to categories of discussion points, and (f) member checking with

focus groups. Although most of the phases were completed in chronological order, there were times when I needed to re-visit earlier phases to revise my analysis in certain sections.

Phase 1: Preparing Data for Analysis

I began the data analysis of my study by transcribing all third-grade audio recordings using an online software program. Once the transcripts were created, I read through the transcripts while listening to the audio recordings to check for errors and made adjustments as needed. Most of the adjustments consisted of identifying the speakers, correcting words or phrases, or adding any missing text that the software could not transcribe because the speaker spoke in a low voice or several people spoke at once. Note that I used the audio recordings and the transcripts to ensure that I was accurately capturing the meaning in the writers' words throughout my analysis.

Phase 2: Identifying Conversation Segments

Identifying conversation segments laid the foundation for the rest of my analysis. I began this phase by reading through the transcripts, looking for debatable topics that emerged during the conversations. Debatable topics were generally identified by noting when a writer presented a topic or question, and more in-depth discussion about the topic was needed before the conversation could move forward. However, sometimes in-depth discussion occurred about a topic not explicitly framed as a topic or question. In this case, the debatable topic was inferred from the conversation. Once a debatable topic was identified, I wrote "start" on the transcript the beginning of the conversation related to the debatable topic and "end" at the conclusion when the conversation moved to another topic. The conversation between the start and end points became my conversation segments. Each conversation segment included a debatable topic voiced by a writer or inferred from the conversation. Additionally, there needed to be discussion points

voiced by at least two writers because my goal was to explore collective sensemaking, which involves more than one person.

Phase 3: Categorizing Debatable Topics and Discussion Points

The goal of this phase of my analysis was to identify and then categorize both debatable topics and discussion points, and this process consisted of five parts. First, I read through each conversation segment and identified the debatable topic present in each segment. In other words, the unit of analysis for a debatable topic was a conversation segment. Each debatable topic was written in the form of a question, and a comprehensive list of all of the debatable topics present in the conversations was created for further analysis.

Second, I reviewed the comprehensive list of debatable topics and categorized them based on similarities among the topics. I used open coding as I read through the list of debatable topics and created descriptive codes for the debatable topic categories (Merriam & Tisdell, 2016). This process was iterative as I worked on grouping debatable topics into meaningful categories.

Third, for each debatable topic, I identified the discussion points introduced in the conversation segment. The unit of analysis for a discussion point was an idea unit, not a talk turn. In other words, the idea could have been introduced by a writer in a single comment or in multiple comments that may or may not have been successive. I then characterized the discussion points using open coding to create descriptive codes (Merriam & Tisdell, 2016).

Fourth, I reviewed the list of characterized discussion points and categorized them based on similarities among the ideas. This process was iterative as I worked on grouping discussion points into meaningful categories.

Finally, I created a comprehensive list of all the discussion points present for each debatable topic and noted which writer introduced each discussion point. This information was needed so that later analysis could consider the role of the stakeholder groups.

Phase 4: Identifying Frequencies for Categories of Debatable Topics and Discussion Points

The goal for this phase of my analysis was to identify the frequencies of debatable-topics and discussion-points categories; this process consisted of three parts. First, to determine the frequency of each debatable-topic category, I computed the percentage of debatable topics that fell within each of the three debatable-topic categories. Second, to determine the frequency of each discussion-point category, I computed the percentage of discussion points that fell within each discussion-point category. Third, to determine the frequency of discussion points in each debatable-topic category, I computed the percentage of discussion points that were linked to each debatable-topic category.

Phase 5: Connecting Stakeholder Groups to Categories of Discussion Points

The goal of this phase of the analysis was to understand how stakeholder-group membership might be linked to the discussion-point categories. To determine the frequencies of discussion-point categories for each stakeholder group, I worked separately with the data for each stakeholder group and computed the percentage of discussion points that fell within each discussion-point category. I then compared the frequency distributions across stakeholder groups, looking for similarities and differences. In particular, I compared the most prevalent discussion-point category for each stakeholder group and then looked for other patterns that stood out.

Phase 6: Member Checking with Focus Groups

I conducted four focus groups with the third-grade writing team—one for each of the four stakeholder groups—to confirm my findings and refine my interpretations of the findings. Two of the instructional coaches were unable to attend. The focus groups were designed to last no more than one hour, and they were conducted and recorded using the online video conference platform Zoom.

I selected a focus group format rather than individual interviews because it had been over two years since the third-grade writing team last met together to work on the frameworks. The focus group format provided a space for writers to hear views, opinions, and recollections from each other, which may have helped to activate their memories and increase participation in the conversations (Merriam & Tisdell, 2016). The writers were grouped by their stakeholder groups for the focus group sessions because I wanted to know if my findings resonated with each of the various stakeholder groups. Furthermore, I thought the writers would be more comfortable sharing their thoughts with peers in similar roles.

During the focus groups, I chose to use semi-structured questions to follow ideas raised in the conversation. The focus group questions invited exploration of the findings from each of my research questions—debatable topics, discussion points, and the frequency patterns for stakeholder groups. (See Appendix A for the list of questions posed during the focus groups.)

I used the focus groups as a type of member-check to solicit feedback from the writers and improve the credibility and trustworthiness of my study (Merriam & Tisdell, 2016). Specifically, I shared my findings related to the debatable-topics categories, the discussion-point categories, and the frequencies of discussion-point categories introduced by each stakeholder group. I then began my questioning by asking each stakeholder group to share their initial

reactions or comment on the data. Next, I followed up with more specific questions about the findings. The writers from all stakeholder groups shared that the findings resonated with them, and several of the conversations helped me think more deeply about some of the findings. Furthermore, each stakeholder group was excited to hear about the data analysis and expressed their continued commitment to the K–8 Instructional Frameworks project.

Positionality Statement

As a member of the NC2ML group, I worked closely with the NC2ML team leaders to design and implement the K-8 Instructional Frameworks project. I attended the July and September writing meetings and sat with writing groups to listen to some of their conversations in the moment, but I was not a participant in the writing teams' conversations. As a member of the NC2ML team, I am aware of the project's goals, know the writers of the frameworks, and attended meetings outside of the three meetings analyzed for this study. This insider knowledge helped me interpret participants' comments and appreciate the context in which the work occurred. However, because of my unique role in the project, I also had to check my biases throughout the analysis to ensure that my interpretations were data-based and not based on my insider knowledge or my stake in the project's success.

CHAPTER IV: FINDINGS

This study focuses on the conversations of writers from multiple stakeholder groups as they collaboratively worked to create the third-grade instructional framework. Specifically, I am studying the types of debatable topics that emerged during the conversations and the types of discussion points introduced by the writers to address the topics. I am also interested in which categories of discussion points are introduced by each stakeholder group. This chapter is organized by the research questions I explored for this study, which were:

1. What categories of debatable topics surfaced during the development of an implementation resource for new state content standards?
2. What categories of discussion points were introduced to address the debatable topics?
3. What was the distribution across discussion-point categories for each stakeholder group, and how did that distribution compare across groups?

Research Question 1: Categories of Debatable Topics

A total of 47 debatable topics surfaced during the third-grade writers' conversations as they worked collaboratively to create the instructional framework. The debatable topics were compiled into a comprehensive list for analysis and were categorized based on similar ideas present in each topic. Three categories of debatable topics emerged from the analysis—whole framework, single cluster, and multiple clusters.

When the writers focused on the *whole framework*, they discussed topics that cut across the instructional framework, such as how to communicate important information about particular standards (e.g., whether a standard should be taught in a single cluster or ongoing throughout the

year) or other implementation information that could be helpful to educators who would be using the framework. They also focused on the overall process for creating the framework and, in particular, how to get started (e.g., how to start clustering standards). In contrast, when the writers focused on a *single cluster*, they focused on only a part of the instructional framework. These conversations addressed the mathematical ideas in a single cluster, connections between mathematical ideas in that cluster, and when the cluster would be taught in the school year. Similarly, conversations focused on *multiple clusters* addressed a part of the instructional framework, but the scope was larger. These conversations focused on the connections between mathematical ideas in two or more clusters and when clusters would be taught in relation to each other.

The writers' discussions were overwhelmingly focused on debatable topics within a single cluster—almost two-thirds (64%) of the debatable topics were linked to the single-cluster category. The remaining discussions split almost evenly between the other two debatable-topic categories—whole framework and multiple clusters. (See Table 5 for the debatable-topic categories, frequencies, and examples.)

Table 5. Debatable-Topic Categories, Frequencies, and Examples

Debatable-Topic Categories	**Debatable-Topic Frequencies (*N* = 47)**		**Debatable-Topic Examples**
	n	**%**	
Whole Framework	9	19%	• How are we going to start grouping the standards? • How do we notate ongoing standards that relate to multiple clusters?*

Debatable-Topic Categories	Debatable-Topic Frequencies (N = 47)		Debatable-Topic Examples
	n	%	
Single Cluster	30	64%	• What standards should we include in Cluster One?* • What are the big ideas in each fraction standard? • What are the connecting mathematical ideas between the standards in this cluster? • When should fractions be taught in third grade?
Multiple Clusters	8	17%	• Which other clusters should we connect to the time cluster?* • What are the connections between the fraction cluster and measurement cluster? • Do we need to teach a cluster about shapes before we teach the fraction cluster?

Note. * Reoccurring debatable topics

Reoccurring Debatable Topics

Although most of the debatable topics were standalone topics that were only addressed in one conversation segment, three debatable topics surfaced in multiple conversation segments and at least two writing meetings. In these cases, the debatable topic was discussed but not resolved and thus revisited for further discussion either later in the meeting or at a future writing meeting.

The first reoccurring debatable topic focused on how to notate or communicate which standards would be *ongoing*, which means that they would be taught in multiple clusters throughout the school year. This topic was discussed in four conversation segments—two segments in the June meeting and two segments in the July meeting. During the conversations, writers suggested ideas such as listing the ongoing standards in each cluster in which they would be taught or listing all the ongoing standards at the beginning of the framework. Ultimately, the writers decided to list the ongoing standards in each cluster in which they would be taught and

include a note about which standards were ongoing standards in the *What is the Mathematics* section of the framework for that cluster.

The second reoccurring debatable topic focused on the time standard and whether the mathematical concepts in the standard connected to any other clusters in the framework or if it needed to be viewed as a standalone standard. This topic was discussed in two conversation segments—one segment in the June meeting and one segment in the September meeting. During the conversations, writers suggested standards that they thought could connect mathematically to the time concepts, such as adding and subtracting two-step word problems or addition and subtraction in general, but they ultimately decided to make time an independent cluster to be taught at the end of the school year.

The last reoccurring debatable topic focused on what content standards would be taught in Cluster One. This cluster was slightly different than all other clusters because teachers needed to address standards that would also support them in building a mathematics classroom community at the beginning of the school year. This topic was discussed in four conversation segments—two segments in the July meeting and two segments in the September meeting. Writers suggested many ideas for focal standards for Cluster One—such as data collection (e.g., collect and interpret data) combined with addition and subtraction, data collection only, addition and subtraction only, or multiplication. Ultimately, the writers decided to focus on only a subset of the multiplication standards for Cluster One. Conversations around this reoccurring standard will serve as the main context for illustrating the categories of discussion points in the next section and thus will be described in more depth below.

Research Question 2: Categories of Discussion Points

The third-grade writers introduced a total of 252 discussion points to address the debatable topics that emerged during the writers' conversations—sometimes these discussion points resolved the debatable topics, and other times, they simply moved the conversation forward. For my analysis of discussion points, I focused on when discussion points were *introduced* in a conversation, rather than attending to the reiteration or extension of discussion points already raised. I chose this more limited focus because it captured what was foregrounded for individuals as they were the ones who introduced the idea into the conversation. The majority (74%) of the 252 discussion points addressed debatable topics focused on a single cluster, whereas 19% focused on multiple clusters and 7% on the whole framework.

The discussion points were compiled into a comprehensive list for analysis and were categorized based on similar ideas. Five major categories emerged from the analysis. One of the categories—mathematical content—reflected the typical considerations for pacing guides that focus solely on the mathematical content of standards and when to teach them. However, the other four categories combined issues of mathematical content with additional considerations that were unique to the framework design process—students' understanding, pedagogical connections, institutional obligations, and framework organization. During the beginning stages of the K-8 Instructional Frameworks project, NC2ML team leaders and writers spent time discussing and refining their vision for what the instructional framework would include. They were adamant that the framework would be different from a traditional pacing guide. They wanted to create a resource that could be easily accessed and used by teachers and other educators across the system; thus, the writers' discussions were broader than what one might expect when designing a traditional pacing guide, as evidenced by the four categories of

additional considerations. About three fourths of the discussion points focused on these additional considerations, and only one fourth focused solely on mathematical content considerations. (See Table 6 for a summary of the discussion point categories and their frequencies.)

In the following sections, I further describe and illustrate each discussion-point category and its subcategories. Examples are mostly drawn from the series of discussions around the reoccurring debatable topic of designing Cluster One, and a summary of these discussions is provided in the next section. Finally, necessary background information for any additional examples is provided with the examples.

Table 6. Discussion-Point Categories and Frequencies

	Discussion-Point Frequencies (*N* = 252)	
Discussion-Point Categories	***n***	**%**
Typical Considerations for Pacing Guides		
Mathematical Content	**64**	**25%**
Additional Considerations for the Framework		
Students' Understanding	**31**	**12%**
Pedagogical Connections	**59**	**23%**
Historical Activities and Timing	41	7%
Possible Activities and Timing		17%
Institutional Obligations	**30**	**12%**
Assessment Requirements	15	6%
School Calendar Deadlines	15	6%
Framework Organization	**60**	**24%**
Miscellaneous	**8**	**3%**

Note. Not all percentages sum to their totals due to rounding.

Summary of the Discussions Related to Cluster One

Identifying the mathematical focus and corresponding standards for Cluster One was one of three reoccurring debatable topics discussed in the writers' conversations. The discussions occurred during four conversation segments—two segments in July and two segments in September—and will be the context for most of the upcoming illustrations of the five discussion-point categories. Designing Cluster One was complicated because teachers needed to build a mathematical classroom community at the beginning of the school year in addition to addressing mathematical content. Therefore, the mathematical focus selected for Cluster One needed to provide teachers with opportunities to establish an effective and safe mathematics learning community. Ultimately, they decided to focus Cluster One on understanding equal groups (a subset of the multiplication standards) because this focus built on students' prior learning from second grade and could help build a conceptual understanding of multiplication. They also included a list of teaching practices that teachers should consider when developing their mathematics classroom community, such as creating opportunities for students to share their thinking and learn from each other and their mistakes; developing norms and procedures for classroom discussions; and helping students develop problem-solving skills and strategies.

In each of the four conversation segments, the writers discussed what they wanted the mathematical focus to be for Cluster One. I share the path to determine the focus of Cluster One in an extended form not only to provide background information for the upcoming examples but also to provide a sense of how conversations around a debatable topic evolved. This set of conversations began in the July meeting after the writers read through Draft 1 of the framework created during the June meeting. Draft 1 listed data collection combined with addition and

subtraction as the focus for Cluster One, and the June writers had specifically highlighted comparison problems (e.g., how many more and how many less).

During the first conversation segment in the July meeting, the writers felt that this focus, combined with trying to develop a mathematical community, would make the cluster too big to teach because they felt there were too many goals for the teachers to keep track of and teach at the same time. Furthermore, the mathematical concepts in each of the targeted standards did not easily connect with each other. Thus, they talked about removing data collection from Cluster One and instead focused solely on addition and subtraction. They also discussed narrowing the content focus further by focusing on a subset of addition and subtraction. The grade 3 standards include addition and subtraction up to and including 1,000, but the writers talked about restricting their focus to exclude any four-digit numbers, thereby focusing only on adding and subtracting two- or three-digit numbers and making sure that any sums were less than 1,000. The writers felt that this narrower focus would be an appropriate starting point for students because it built on what students had previously learned in second grade, and they wanted to spend some time at the beginning of the school year reviewing concepts that students had learned in the previous grade.

The focus of Cluster One was revisited in a second conversation segment later on in the day when the writers' discussion transitioned back to beginning Cluster One with data collection combined with addition and subtraction. This focus was similar to the focus for Draft 1, but this time, the writers suggested teaching only the subset of the addition and subtraction standards that involved two- and three-digit numbers based on what students had learned in the previous grade level. The shift back to data collection occurred because the writers recognized that activities in which students could collect data about their peers and their classroom could not only help to

build an understanding of the data collection concepts but also help to build a classroom community. Ultimately when Draft 2 was completed, the writers decided to make data collection the focus of Cluster One, with a subset of the addition and subtraction standard—two- and three-digit numbers only—as a supporting standard for this cluster.

During the September writing meeting, the writers once again discussed the mathematical focus for Cluster One during two conversation segments. The discussions in the first conversation segment addressed feedback from the Tools for Teachers group. This group raised a concern that multiplication was an embedded, unfamiliar mathematical concept in the data collection standard, and students would not be ready to learn multiplication concepts at the beginning of third grade. Therefore, the writers began to discuss what the focus should be for Cluster One. First, the writers discussed what they liked about data collection combined with addition and subtraction as the focus for Cluster One. They felt teaching the two standards together would help build a mathematical classroom community since the standards would allow students to collect data about each other and provide opportunities for students to get to know each other while incorporating some addition and subtraction problems based on the data collected. Specifically, they noted that addition and subtraction strategies could be used to help analyze the data collected but would not actually help students learn the addition and subtraction standards. They also considered elevating multiplication and making it the focus of Cluster One but only teaching a small subset of the standard (i.e., single-digit multiplication and skip counting). However, they still were concerned that students were not ready to learn multiplication at the beginning of the school year. The conversations stalled, and writers moved to discuss other debatable topics before revisiting the focus of Cluster One later in the day.

During the second September conversation segment, the writers once again discussed the mathematical focus of Cluster One, and they considered changing the focus of Cluster One from data collection combined with addition and subtraction to addition and subtraction only. The writers still expressed concerns that addition and subtraction should not be the focus of Cluster One because they felt expecting students to add and subtract numbers up to into the thousands was too much for beginning-of-the-year third-grade students. Instead, the writers thought only teaching a subset of the standard (e.g., working with two-and three-digit numbers with sums less than 1,000) might be a better option since it built on students' prior learning in second grade and would be more appropriate for the beginning of the school year. They also expressed concerns that students were supposed to start using number-based strategies in the third grade, but beginning to use these types of strategies at the beginning of the year was a huge leap from the picture-based strategies that were the norm in second grade.

Writers then transitioned to talking about using multiplication as the focus of Cluster One, but again concerns were voiced by the writers that students were not ready to understand multiplication at the beginning of the year. The writers introduced discussion points that further explained what students had likely learned in second grade, this time in reference to multiplication (vs. addition and subtraction). They also discussed how the cluster's focus should build on what students had learned in prior grades, understanding equal groups, and not focus on new mathematical ideas at the beginning of the year, such as solving multiplication problems with equations. This goal was especially important because teachers had many different assessment requirements they had to complete at the beginning of the year and thus needed students to be able to work independently at times. Ultimately, the writers decided to focus

Cluster One on multiplication but with only a subset of the standard—understanding equal groups, which built on what students had learned in the second grade.

Throughout each of the four conversation segments, the writers shared discussion points that explained the mathematical concepts present in the standards and reiterated what students had learned in prior grades to determine if students were ready to learn the mathematical ideas found in the standards. Further, they suggested ways the standards could be taught, including activities to help develop a mathematical community, and they shared their thoughts and concerns about the standards suggested for Cluster One. These conversations segments and discussion points will be used in the upcoming sections to help illustrate the five discussion-point categories.

Discussion-Point Category 1: Mathematical Content

The first category of discussion points focused on the mathematical ideas present in the standards and reflected typical considerations for a pacing guide. Specifically, this discussion-point category focused on explaining or clarifying the mathematical concepts present in each standard or identifying the mathematical focus for a cluster of standards. However, the discussion points that were introduced did more than just identify the mathematical content of the standard or cluster of standards—the discussion points also provided a time for the writers to collectively make sense of the mathematics themselves by drawing on their own mathematical understandings and teaching experiences (Maitlis & Christianson, 2014). This sense-making process helped them decide how the standards should be clustered and how to make the information supporting the implementation of the standards as clear as possible for users to understand. As a result, the discussion points in this category accounted for 25% of the total number of discussion points.

Discussion points in this category were prominent in the July and September conversation segments that explored the possible mathematical foci of Cluster One. Throughout the conversations, the writers talked about the mathematics present in the potential target standards. For instance, when addition and subtraction was suggested as the focal standard for Cluster One, the writers began to explore the underlining mathematical concepts in that standard. They noted that the emphasis in third grade for the addition and subtraction standard was on "bigger numbers," specifically adding and subtracting into the thousands. This "unpacking" of the mathematics was often the first step when writers considered a standard or a cluster of standards because this foundational understanding needed to be established before any additional considerations could be explored.

Discussion-Point Category 2: Students' Understanding

The second category of discussion points focused on the mathematical understanding that students brought to third grade, particularly whether students would be ready to learn specific mathematical concepts at the beginning of the school year. These discussion points were especially important for deciding how to cluster and sequence the standards. The discussion points in this category reflected one of the additional considerations for the framework that went beyond typical considerations for pacing guides, and they accounted for 12% of the total number of discussion points.

The discussion points in this category were prominent in the four conversations segments that focused on the mathematical content for Cluster One discussed in the July and September meetings. Throughout the conversations, the writers considered how students' prior learning would (or would not) connect with the proposed standards and implementation suggestions in the framework. Sometimes the conversations focused on specific curriculum topics that were

supposed to be addressed in prior grades, thereby assuming that students already understood those topics. Other times, the conversations focused more broadly on what third graders are typically prepared to learn. For instance, writers expressed concerns about students' readiness when Cluster One was focused on addition and subtraction. Some writers expressed concern that third graders would not be prepared to engage with numbers in the thousands at the beginning of the school year because they were only expected to go to three digits in second grade. For example, a district leader shared that working with four-digit numbers at the beginning of the year was not appropriate based on students' prior understandings: "It's not where I would start a third grader." As the conversation continued, a teacher shared a related concern about students' prior understandings related to the expectation that third graders were expected to shift from picture-based strategies for addition and subtraction—common in second grade—to strategies that relied more on number relationships. She expressed concern about expecting this shift too early: "the expectation is [that students] move away from pictorial models and [start] using relationships between numbers, right? So that's a huge expectation in the very beginning of the year."

Similar concerns surfaced about students' readiness when writers were discussing the feedback from the Tools for Teachers group during the September meeting. The feedback highlighted how the proposed focus of Cluster One in Draft 2—data collection combined with addition and subtraction—actually involved a lot of multiplication. Several writers expressed concern about whether beginning third graders would be sufficiently prepared to engage with multiplication. One district leader recognized that "students would not have had that experience of multiplication yet," and a teacher who had already tried beginning a school year with standards that had some type of multiplication focus was more emphatic with her concern: "We

do it that way, and they are not ready. Mine can't do multiplication first. They're coming to us not ready for what we are presenting. They're not ready." These examples illustrate how the writers raised issues related to readiness based on students' prior understandings.

Discussion-Point Category 3: Pedagogical Connections

The third category of discussion points focused on how and when the mathematics in a standard or cluster could be taught, and two subcategories were identified: (a) historical activities and timing and (b) possible activities and timing. The discussion points in this category reflected one of the additional considerations for the framework that went beyond typical considerations for pacing guides; they accounted for 23% of the total number of discussion points, with the majority focused on the possible activities and timing subcategory.

Historical Activities and Timing

The first subcategory of pedagogical connections focused on how things were historically taught. Writers often drew from either personal experience or school district expectations to recount activities they had personally used to teach the standards and when they had generally done so within the school year. For instance, when discussing the focus of Cluster One during the September meeting, one teacher shared that starting with addition and subtraction was how she usually started the school year in her school district; therefore, she thought it made sense for Cluster One to have that focus. Other times, writers referenced how and when standards had historically been taught, but in these cases, the focus was on how the activities or timing were problematic and should not be replicated in the framework. For example, during the July meeting, the writers had tentatively agreed to teach the addition and subtraction standards at the beginning of the year, and their conversation had shifted to how long to teach them. A teacher shared that her district typically started the school year teaching the addition and subtraction

standards, and they were typically taught for the entire first grading period. She did not like this plan because she felt that was too much time was spent reviewing what students had previously learned in the second grade. For her, if students were not learning new content knowledge, then that time should be saved to teach new concepts later in the year. Another teacher agreed and added that, overall, she found it problematic that they typically spent too much time reviewing concepts students learned in the second grade. Both teachers drew on how things were historically taught to explain why the framework should take a different approach.

Possible Activities and Timing

The second subcategory of pedagogical connections went beyond how and when standards had historically been taught to instead offer a range of possibilities based on the mathematics in the standard or cluster. During the conversations, the writers talked about new ways to teach the standards by suggesting specific lessons, tasks, or other activities (e.g., number talks or choral counts) that teachers could use to teach the standards, and they also identified any corresponding resources that would be needed. Possible timeframes for these activities were also discussed. For instance, when discussing the pedagogical advantages of using data collection combined with addition and subtraction as the mathematical focus of Cluster One, an instructional coach suggested possible ways to structure lessons with data collected from students. She suggested collecting data related to what transportation students use to go home or information shared in "get to know me" activities, and then possibly posing addition and subtraction questions about the data collected:

> You could do pictures and bar graphs and collect data by asking questions that yield data up to four categories, make a representation of the data and interpret data in a frequency

> table … [and] solve one and two-step [word problems with] how many more and how many less questions based on the data collected.

She proposed these beginning-of-the-year activities to argue that a mathematical focus on data collection combined with addition and subtraction could be a productive focus for Cluster One.

As the writers suggested ways to teach the clusters of standards, they also discussed the types of additional resources (e.g., lessons, tasks, etc.) that may be needed to teach the standards, and they expressed that teachers should be provided with the required resources rather than expecting teachers to find the resources on their own. For instance, when discussing splitting the multiplication standards across multiple clusters—understanding equal groups as the mathematical focus of Cluster One and the rest of the standards to be taught in other clusters later in the school year—a district leader expressed concern that teachers would not have the needed resources to teach multiplication at two different times in the school year. Her concern was that how the standards were split would not align with current resources (e.g., textbooks, previously written lessons, etc.) because most of the resources group all the multiplication standards together. Therefore, she felt it was important that tasks and lessons be provided to teachers if the framework split the standards in the ways being proposed:

> We can’t leave teachers somewhere in the middle. So if we’re telling them, we want you to integrate multiplication in a very finessed way throughout the year, we have got to provide the tools for them to do that. We can't say here's how we want you to teach it and now go find those [resources to teach it].

This idea was echoed by a teacher who strongly agreed, stating that resources needed to be provided because the school districts’ existing textbooks or curriculum programs most likely

would not align with the proposed framework because multiplication is not typically split and taught in multiple units.

Discussion-Point Category 4: Institutional Obligations

The fourth category of discussion points focused on how teaching mathematics in the proposed ways has to fit with teachers' other professional responsibilities so that using the framework does not introduce frustration that could ultimately lead to lack of use. These discussion points focused on institutional obligations—required activities that were determined outside of teachers' classrooms and that often had fixed timelines. I identified two subcategories of discussion points related to these institutional obligations: (a) assessment requirements, such as report cards, benchmark tests, and end-of-grade tests; and (b) school calendar deadlines that were planned (e.g., vacations or ends of grading periods) and unplanned (e.g., snow days). This category of discussion points reflected one of the additional considerations for the framework beyond the typical considerations for pacing guides, and they accounted for 12% of the total number of discussion points, split evenly across the two subcategories.

Assessment Requirements

The first subcategory of institutional obligations focused on assessment requirements such as benchmark testing, report card concerns, and end-of-grade tests. Some of the writers' conversations focused on how splitting the standards into small subsets could be troublesome in terms of alignment with benchmark tests. The writers were concerned that test creators would use test questions on the benchmark assessments that focused on the whole standard, not just the small subset currently being taught. This concern was voiced by one of the teachers: "the county is pulling a test problem [related to the whole standard], but we have not gotten the entire standard done." The writers wanted to make sure that it was clear to administrators and test creators that the

standards were being taught in subsets and that benchmark assessment data may be problematic if the assessments did not adhere to the subsets of standards that were taught.

Similar ideas were also voiced by writers related to report cards and grades. They were concerned that only teaching and grading a subset of the standards would confuse and potentially upset parents. For example, one district leader posed a hypothetical situation in which a parent might be confused about their child's report card grade for the standard focused on adding and subtracting numbers up to 1,000:

> So let's say they scored a three, but I was only working up to the hundreds, right? And then next quarter, we teach it, and they're [working with] thousand and … they get a two, which means they don't have [the concept] yet. As a parent, I need to have some clarity by the district about how they went from a three and [now] they're a two.

With this hypothetical situation in mind, the writers wanted to ensure that some type of clarification was given to parents to ensure they understood how the standards were taught—completely or in subsets—throughout the school year.

School Calendar Deadlines

The second subcategory of institutional obligations focused on school calendar deadlines—planned deadlines like the end of the grading period and student vacations, and unplanned deadlines such as school closures due to weather or other events that may unexpectedly occur throughout the school year. Discussion points related to school calendar deadlines occurred most often when writers talked about when to teach a cluster of standards and the need *not* to split any cluster across two grading periods. In other words, each cluster should be taught within a "nine-week quarter." The writers often checked school calendars to see when student vacations occurred and when grading periods ended as they sequenced the clusters of

standards or suggested durations for teaching clusters. Furthermore, the writers talked about how they needed to keep in mind how unplanned events, such as missing school due to weather, could impact school calendar deadlines, and they suggested building in extra teaching time to accommodate the unexpected.

Discussion-Point Category 5: Framework Organization

This final category of discussion points focused on how standards and supplemental information were structured and communicated differently in the framework compared to a traditional pacing guide. In most pacing guides, the standards are listed in a prescribed order, with specific amounts of time assigned to teach each standard. Most often, the standards are given equal emphasis, and they are taught in their entirety at only a single time during the school year. In other words, standards are expected to be addressed in almost a checklist type format, and any implementation supports (e.g., resources, mathematical explanations, organizational tips, important information for the users, etc.) need to be found outside of the pacing guide.

In contrast, the instructional framework had a unique organization that did not list the standards in a prescribed order with a strict timeline to teach them. Instead, the framework grouped standards into clusters based on mathematical ideas present in the standards, and in some cases, only subsets of the standards were taught at a time. Furthermore, the timing allotted for teaching the clusters was a suggested duration, and because there were only nine clusters within the third-grade framework, the suggested durations were longer than most traditional pacing guides. To help students continually build conceptual understanding, the framework also included standards taught ongoing throughout the school year, such as solving two-step addition, subtraction, and multiplication problems. Another unique aspect of the framework was how important information was communicated to educators who would use the framework. The

framework included supplemental information not typically found in traditional pacing guides such as the *What is the Mathematics* and *Important Considerations* sections.

The purpose of this category of discussion points was to make the unique framework organization clear for users, and below I share two examples. The discussion points in this category reflected one of the additional considerations that were not typical considerations for pacing guides, and they accounted for 24% of the total number of discussion points.

The first example occurred during the July meeting as writers discussed how to convey information about the framework organization concerning the clusters. During the conversations, the writers discussed how clusters help connect mathematics standards for users, but naming clusters then becomes challenging because multiple standards are involved. For instance, in the July meeting, a district leader indicated that the proposed name of Cluster One in Draft 1: "Addition and Subtraction and Data" was problematic because it conveyed that all the pieces of the mathematical content that students needed to learn were equally weighted and would therefore require the same amount of time to learn. In fact, the mathematics in each standard is multidimensional, and pieces are of different complexity, requiring different amounts of time to learn. Thus, the writers, along with the NC2ML team leader, discussed what criteria should be considered when naming clusters. The NC2ML team leader shared criteria that writing teams at other grade levels had used to name clusters, and the group ultimately decided to focus on the key mathematical ideas of the cluster for the naming criteria. This exchange of ideas is shared below in the conversation between a district leader and the NC2ML team leader.

> … maybe it's the title of the cluster name that bothers me because if it's addition and subtraction and data collection, it makes it feel like they are equal, and to me, that sends the message to teachers because the [standards] are not equal. (**District Leader**)

> Some grade levels put the actual big idea or understanding as the cluster name. So, for example, in first grade, there's a cluster called understanding equality, equality as "the same as." The lower grades have done that, and in the upper grades, their cluster names are "volume" and "multiplication." So that's a decision we may need to make. Is it a big idea? Is it a topic? Because you don't want the cluster name to be everything included in that cluster—[such as] subtracting, data, graphing, and linear metrics. (**NC2ML Team Leader**)
>
> **[Agreement by several teachers and instructional coaches]**
>
> So okay, so maybe I would propose, you guys tell me what you think about if we change the cluster name of the first cluster to "adding and subtracting" … if that's the major work, that's the big idea, then I would propose we change it. (**District Leader**)

The second example of this category of discussion points occurred when the writers discussed how to convey the framework organization concerning how the standards were purposefully organized in multiple ways. In traditional pacing guides, each standard is scheduled to be taught entirely at one point during the school year. In contrast, in the framework, the standards are taught in multiple ways. Sometimes the standards are taught in their entirety in a single cluster, such as the Time standard, in which students learn to tell time to the nearest minute and solve addition and subtraction problems within the hour. Other times the standards were taught in subsets in multiple clusters to give students opportunities to make sense of the mathematical ideas more slowly as they worked to develop proficiency throughout the year. For instance, the writers decided that subsets of the addition and subtraction standards would be addressed multiple times in different clusters. In the July meeting, they discussed this issue when considering the addition and subtraction standards as a possible focus for Cluster One. An

instructional coach shared that she thought that the standard adding and subtracting up to and including 1,000 (Standard: 3.NBT.2) should be taught throughout the year. She suggested first teaching it by working with the smaller two-digit numbers in Cluster One and then increasing the complexity and size of the numbers throughout the year—as shared in the following quote:

> So basically, what I was thinking is 3.NBT.2 needs to happen multiple times [throughout the year] and what's changing is the size of the numbers. Two-digit to start with, and then you move into three-digits, three-digits within 600 or something—you know, some way of chunking not necessarily working up to 1,000 right away.

The other writers agreed with her idea and then discussed how to convey this atypical splitting of standards to educators who would use the framework. The ideas shared in these discussions were included in the *What is the Mathematics* or *Important Consideration* sections.

Research Question 3: Frequencies of Discussion-Point Categories for Stakeholder Groups

One of the unique features of the K-8 Instructional Frameworks project was the intentional inclusion of multiple stakeholder groups in the design process. The third-grade writing team consisted of two teachers, four instructional coaches, two district leaders, and one higher-education faculty member. The NC2ML team leader was also a higher-education faculty member who occasionally participated in discussions. To create the third-grade instructional framework, each stakeholder group drew on their own knowledge of the educational system and their experiences and expertise. This collaboration ensured that the voices of educators with a variety of professional responsibilities were present throughout the framework design.

I was interested in how often each stakeholder group offered discussion points in the various categories. For this analysis, I again focused only on the 252 discussion points that

introduced new ideas into conversation versus those that reiterated or extended ideas already put forth. However, this time I tracked who voiced each new discussion point and then summarized the frequencies of discussion-point categories for each stakeholder group. See Table 7 for a profile of the frequencies for each stakeholder group—the percentages are column percentages, indicating the percentage of the total number of discussion points voiced by each stakeholder group for the discussion-point category listed.[1]

Table 7. Frequencies of Discussion-Point Categories for Each Stakeholder Group

Discussion-Point Categories	Teachers' Discussion Points (N = 58)	Instructional Coaches' Discussion Points (N = 53)	District Leaders' Discussion Points (N = 104)	Higher-Education Faculty Members' Discussion Points (N = 37)
Typical Considerations for Pacing Guides				
Mathematical Content	24%	25%	31%	14%
Additional Considerations for the Framework				
Students' Understanding	16%	8%	14%	11%
Pedagogical Connections	19%	30%	21%	29%
Historical Activities & Timing	*12%*	*4%*	*6%*	*8%*
Possible Activities & Timing	*7%*	*26%*	*15%*	*22%*
Institutional Obligations	25%	10%	11%	0%
Assessment Requirements	*11%*	*6%*	*6%*	*0%*
School Calendar Deadlines	*14%*	*4%*	*5%*	*0%*
Framework Organization	18%	25%	21%	41%
Miscellaneous	0%	4%	4%	5%

Note. Not all column percentages sum to their totals due to rounding.

[1] Row percentages would have allowed me to compare the relative frequency of stakeholder groups' contributions for each of the discussion-point categories. However, I chose not to explore row percentages because they would be misleading. Not all stakeholder groups had the same number of participants, and not all stakeholder groups were present at each of the three meetings. Therefore, stakeholder groups had unequal opportunities to introduce discussion points. Future research will need to address the relative frequency of contributions by stakeholder groups when all groups are more equally represented and present for the discussions.

Note that all stakeholder groups contributed to every discussion-point category, with one exception (institutional-obligations category), to be discussed below. However, the stakeholder groups seemed to have differential priorities, as reflected in their differential frequencies. In the following sections, I will share three areas that showcased these differences among stakeholder-group priorities: (a) the most prevalent discussion-point category, (b) attention to pedagogical connections, and (c) attention to institutional obligations—all of which emerged through collective sensemaking opportunities that occurred during the stakeholder groups' conversations (Maitlis & Christianson, 2014).

Differences in the Most Prevalent Discussion-Point Category by Stakeholder Groups

As one might expect, when multiple stakeholder groups are brought together to create innovations, such as the instructional framework, each stakeholder group will bring their own knowledge of the system in which they work and different experiences and expertise to the design process. During the creation of the framework, these differences influenced the discussion points that each stakeholder group introduced to help resolve or move debatable-topic conversations forward, which resulted in differences in the most prevalent discussion-point category for each stakeholder group: institutional obligations for teachers, pedagogical connections for instructional coaches, mathematical content for district leaders, and framework organization for higher-education faculty members. This variability is further elaborated below and reinforces the importance of the intentional inclusion of multiple stakeholder groups in creating the instructional framework.

Teachers

The teachers' most prevalent category of discussion points was institutional obligations (25%), although their second-most prevalent category (mathematical content) had a similar

frequency (24%). The teachers' focus on minimizing frustration from institutional obligations reflected their first-hand experience managing assessment requirements and deadlines driven by school calendars. Specifically, their daily responsibilities are often impacted by the school, district, and state assessments, and they know first-hand how challenging it can be if assessments do not align with what they are teaching. Teachers also have to deal with school calendar deadlines, such as the end of grading periods and other planned (and unplanned) events throughout the school year. Using resources that do not take into account these deadlines can be frustrating. However, attending to these types of institutional obligations upfront, in the framework design, could help ease challenges; thus, it was not surprising that this category of discussion points was the most prevalent for this stakeholder group.

The data also indicate that another category, mathematical content, was essentially equally as important to teachers. Emphasis on this discussion-point category was also not surprising because a strong focus on the mathematical content of standards is prevalent in traditional pacing guides; thus, teachers might have embraced this expectation and reflected it in the discussion points they introduced.

Instructional Coaches

The instructional coaches' most prevalent category of discussion points was pedagogical connections (30%). Sometimes their discussion points for this category focused on potential lessons or tasks that could be used to teach the cluster of standards and supplementary resources needed for the lessons or tasks. They also introduced discussion points that included examples of specific tasks, such as word problems, to help explain the mathematical content present in the standards. This focus on pedagogical connections seems to reflect the instructional coaches'

daily responsibilities—they are often commissioned to create or suggest lessons or tasks to help teachers provide instruction on the mathematics standards.

District Leaders

The district leaders' most prevalent category of discussion points was mathematical content (31%), which followed the same pattern as the previous stakeholder groups in terms of connecting to daily professional responsibilities. District leaders are expected to know and understand mathematical content standards as other educators in their district often ask them questions about what students are expected to learn and understand. Furthermore, district leaders spend an extensive amount of time thinking about the district's mathematical achievement and ways to increase it. Therefore, it makes sense that the most prevalent category for this stakeholder group is mathematical content.

Higher-Education Faculty Members

The higher-education faculty members' most prevalent category of discussion points was framework organization (41%), which was almost half of their discussion points. The discussion points in this category focused on how the standards and supplemental information were structured and communicated in the framework. Such an extensive focus on this category by the higher-education faculty members may reflect their strong vision for the benefits of the broader framework project—that innovative pacing resources are needed to meet students' learning needs and help educators as they implement new mathematics content standards.

Differences in Attention to Institutional Obligations by Stakeholder Groups

The institutional-obligations category constituted at least 10% of the discussion points for all K-12 stakeholder groups (teachers, instructional coaches, and district leaders), including a fourth of the discussion points for the teachers. The discussion points in this category focused on

how teaching the mathematics standards as proposed in the instructional framework needed to fit with users' other professional responsibilities. The higher-education faculty members did not introduce any discussion points in this category, perhaps because institutional obligations such as assessment requirements and school calendar deadlines are not components of their educational system. Note that even though higher-education faculty members did not *introduce* discussion points related to institutional obligations, they did value these considerations, as evidenced by other comments in the discussions. This variability across stakeholder groups again reinforces the importance of including multiple stakeholder groups in creating the instructional framework so that a wide range of issues are introduced.

Differences in Attention to Pedagogical Connections by Stakeholder Groups

All stakeholder groups introduced discussion points about pedagogical connections ranging from 19%-30% of each stakeholder group's total discussion points, but with different emphases in the subcategories. The teachers emphasized historical activities and timing, which meant they used personal experiences to think about activities to teach the standards or timing for when to teach the standards. Almost all the teachers' discussion points in this subcategory reflected hesitation to try new possibilities when what they had done before seemed to work well, perhaps reflecting a comfort level with their existing practices. However, teachers occasionally shared activities and timing that previously did not go well to ensure that what was done historically was not repeated in the framework.

In contrast, the other three stakeholder groups (instructional coaches, district leaders, and higher-education faculty members) focused on possible activities and timing by brainstorming a range of possibilities (e.g., lessons, tasks, when to teach the standards, etc.) based on the mathematics in the standards or cluster that were independent of what had historically been done.

This focus on the possible activities and timing suggests that the three stakeholder groups were not constrained by how mathematical concepts were historically taught. Perhaps their emphasis on brainstorming possibilities reflected some of the professional responsibilities of these stakeholder groups—instructional coaches, district leaders, and higher-education faculty members typically create professional development opportunities to share new ideas, resources, and instructional practices with teachers and other educators. Often this new information derives from reading research or from exposure to a wide variety of classrooms, both of which are experiences that are often limited for teachers who may spend most of their time working within their own classrooms and grade-level groups. Again, the variability across stakeholder groups reinforces the importance of including multiple stakeholder groups in creating the instructional framework so that both historical and new activities and timing are considered.

Summary

Examining the frequencies of discussion-point categories for stakeholder groups showcased the substantial overlap in discussion-point categories introduced by each group as well as, at times, their differential priorities. These stakeholder-group differences were often linked to each group's professional responsibilities and reinforced the importance of including multiple stakeholders in the design process. Also of significance was that all stakeholder groups seemed invested in this new vision of a pacing guide. Specifically, all stakeholder groups introduced a significant number of discussion points for the framework-organization category (18%-41%), which emphasized identifying and communicating how the framework differed from a traditional pacing guide. The next chapter elaborates on this collective recognition that the traditional way of creating pacing resources was not working, and a new approach was needed moving forward.

CHAPTER V: DISCUSSION

This case study is an example of collective sensemaking in action during the creation of a statewide implementation resource, known as an instructional framework, that was created in response to the adoption of new state mathematics standards. The instructional framework was created to be accessible to individuals at all levels of the state's instructional guidance infrastructure (Hopkins et al., 2013; Hopkins & Woulfin, 2015). This new approach to creating implementation resources, known as "infrastructuring" (Penuel, 2019), included the voices of four stakeholder groups—teachers, instructional coaches, district leaders, and higher-education faculty members from across the state—in the design process. For this case study, I analyzed the conversations of the third-grade writing team as they worked collaboratively to create the third-grade instructional framework, and I explored three research questions.

For the first research question, identifying categories of debatable topics, I explored the types of topics raised in the writers' conversations. I categorized the 47 debatable topics that emerged into three categories—whole framework, single cluster, and multiple clusters. Over 60% of the debatable topics fell into the single cluster category, which is not surprising because directions were given at the beginning of each writing meeting for the writers to focus on grouping standards into clusters of standards. When the debatable topics focused on a single cluster, the writers talked about the mathematical focus of each cluster, when to teach the cluster, and other information that educators may need to know when implementing the framework. Some of the ideas shared in the conversations identified information to include in the *What is the Mathematics* and *Important Considerations* sections for the cluster.

For the second research question, identifying categories of discussion points, I focused on the ideas that stakeholder groups introduced to help resolve or move forward the conversation for

the debatable topics. I categorized the 252 discussion points introduced by the third-grade writers into five categories. One category was a typical consideration for traditional pacing guides—mathematical content—and four categories linked mathematical content with additional considerations for the framework—students' understanding, pedagogical connections, institutional obligations, and framework organization. The discussion points were distributed relatively evenly across the categories, with the frequencies ranging from 12% to 25%.

For the third and final research question, frequencies of discussion-point categories by stakeholder groups, I focused on which stakeholder group introduced the discussion points and compared the stakeholder-group distributions across discussion-point categories. All stakeholder groups contributed to all discussion-point categories with one exception (i.e., institutional obligations), yet the frequency patterns revealed differential priorities for each stakeholder group, and these priorities often reflected the stakeholders' professional responsibilities. Stakeholder-group differences were found regarding the most prevalent discussion-point category, attention to pedagogical connections, and attention to institutional obligations. These differences underscore the importance of including multiple stakeholder groups in the design process.

Across my three research questions, the findings have both theoretical and practical implications, and both are described in the following sections. I conclude by identifying study limitations and providing suggestions for future research.

Theoretical Implications

Each time new state content standards are updated without considering the existing infrastructure for the whole education system, implementation challenges are likely to occur (Hopkins & Spillane, 2015). Such implementation challenges include misalignment of new

standards with other pieces of the existing infrastructure, lack of buy-in by educators who will implement the standards, and a lack of collective sensemaking opportunities during the design and implementation of resources. This study, and the broader K–8 Instructional Frameworks project in which it is situated, was motivated by the idea that each of three implementation challenges can be minimized if a systems approach is used. In the following sections, I address these implementation challenges individually, highlighting contributions from my study and related efforts in the K–8 Instructional Frameworks project.

Misalignment With Other Pieces in the Existing Infrastructure

The first implementation challenge, misalignment of new state content standards with other pieces in the existing infrastructure, was considered by the writers during the creation of the third-grade framework. As evident in many of their conversations, the writers were concerned that this misalignment could hinder implementation. For instance, the writers expressed concerns that the way the new mathematics standards were being clustered in the framework—grouped by similar mathematical concepts and sometimes only including a subset of a standard—would not align with most existing resources. Sometimes these concerns were expressed as pedagogical-connections discussion points that emphasized misalignment with lessons, tasks, and district curriculum materials. Other times the concerns were expressed as institutional-obligations discussion points that emphasized misalignment with district or statewide assessments. These concerns echoed misalignment concerns expressed in the literature (see, e.g., Hopkins & Woulfin, 2015), and my study contributes two insights related to the misalignment challenge. First, when multiple stakeholder groups work together, it is more likely that a range of misalignment concerns will be introduced into the conversation, thereby providing opportunities to address them. Second, misalignment with pedagogical resources and

assessment requirements are likely specific categories of misalignment that will be highlighted in conversations about implementing new content standards; thus, attention to these categories should be woven into the design process.

Misalignment concerns were also considered by the NC2ML team leaders and other writing groups within the K–8 Instructional Frameworks project, and action beyond the creation of the frameworks was taken. Specifically, a group of NC2ML team leaders and some K–8 instructional framework writers worked with the testing and accountability department of the North Carolina Department of Public Instruction to align the state's quarterly benchmark assessments, known as the *NC Check-ins,* with the frameworks. This alignment was a huge accomplishment as alignment between content standards, pacing resources, and accountability (i.e., benchmark assessments) at the state level is rare. Furthermore, the Tools for Teachers group was created to develop high-quality instructional resources (e.g., lessons, tasks, etc.) aligned with the frameworks (Ball & Cohen 1999; Borko, 2004; Little 1993). Aligning the *NC Check-ins* and instructional resources with the frameworks reflected how the whole North Carolina educational system was considered during the design process, minimizing possible misalignment challenges during implementation.

Lack of Buy-In

The second implementation challenge, lack of buy-in by educators who will implement the standards, was visible in my study in three ways: writing-team composition, novel framework organization, and attention to potential roadblocks. First, the third-grade writing team, as part of the K–8 Instructional Frameworks project, was intentionally comprised of multiple stakeholder groups—teachers, instructional coaches, district leaders, and higher-education faculty members—and the individuals selected from these groups had strong

connections to mathematics as part of their professional responsibilities. Attention to the composition of design teams can enhance the likelihood of buy-in because research has shown that each time new implementation resources are created, a lack of buy-in may occur by educators who feel that their voices, or the voices of individuals with credentials they trust, were not included in the design process (Roblin & McKenney, 2019; Spillane, 2000; Tan, 2014; Voogt et al., 2011). My study was grounded in efforts to address these potential concerns by upfront attention to including stakeholder groups with relevant professional responsibilities.

Second, the framework—specifically the framework organization—was different from a traditional pacing guide that often only includes lists of content standards and strict timeframes that must be adhered to throughout the school year (Bauml, 2015; Broome, 2020; David, 2008). The cluster organization in the framework grouped and sequenced standards (or parts of standards) based on underlying mathematical connections. Also included were some standards that should be taught ongoing throughout the school year to help students deeply and incrementally build key mathematical understanding. Furthermore, the framework included supplemental information to support implementation in the *What is the Mathematics* and *Important Considerations* sections of each cluster. The writers were concerned that the framework's novel organization, which included non-traditional information, could easily be misinterpreted or viewed as confusing, leading to a lack of buy-in. Thus, they discussed how to include information to help educators make sense of this new organization and content, as seen in the framework-organization category of discussion points. In this way, the writers ensured that they transformed the framework from a pacing resource that just listed standards and suggested durations to an educative resource designed to help educators learn as they implemented the framework (Ball & Cohen, 1996; Davis et al., 2017; Drake et al., 2014; Krajcik & Delen, 2017).

Third, my study captured the writers' discussion of potential roadblocks that educators may encounter making it difficult for educators to buy in and use the framework as it is written. Attention to these roadblocks was most obvious in the institutional-obligations category of discussion points when the writers focused on assessment concerns or school-calendar deadlines. For instance, writers were concerned that educators might not want to use the framework if students were required to take benchmark assessments with test questions that focused on the whole standard when the framework recommended only teaching part of the standard at that given time. Unfortunately, in many cases, roadblocks that educators may encounter are often not considered when updating pieces of the infrastructure (Remillard, 2005; Remillard & Heck, 2014). However, my findings suggest that, if given a chance, writers from multiple stakeholder groups will identify these potential roadblocks beforehand and address them in the design of resources, thereby increasing the likelihood of educator buy-in. In sum, my findings suggest that including multiple stakeholder groups in the design process of implementation resources can create resources that support the users of the resources by addressing concerns or problems that may surface during implementation, thereby decreasing the likelihood of lack of buy-in.

The K–8 Instructional Frameworks project also addressed the lack of buy-in after the framework was created. When rolling out the framework, the NC2ML leaders held meetings across the state to support implementation. They specifically invited some of the writers (from multiple stakeholder groups) to lead sessions, share their experiences, and answer questions. They also encouraged the writers to be resources in their own (and neighboring) districts to answer questions and advocate for the framework to help increase buy-in. One of the writers in the teacher focus group articulated this important role:

> We had to be that advocate … Because we were hit with the same things that we discussed [in the writing meetings] … It was important that we had that voice. And it was important that we listened and understood every part of [the framework] … so that we can be an advocate for the framework and how it works.

Lack of Opportunities for Collective Sensemaking

The third implementation challenge, the lack of collective sensemaking opportunities during the design and implementation of resources, was relevant because a small group of people often create traditional pacing guides (Bauml, 2013; Broome, 2020; David, 2008; Remillard & Heck, 2014). Thus, involvement of multiple stakeholder groups with opportunities for collective sensemaking is unusual during the design of traditional pacing guides, yet it was central to the design of the framework, and research has shown that this approach can lead to higher-quality resources (Allen & Penuel, 2015; Coburn, 2001; Maitlis & Christianson, 2014; März & Kelchtermans, 2013).

During each of the third-grade writing meetings, collective sensemaking occurred in the conversations. Writers drew on their own experiences, expertise, and knowledge of the level of the system in which they worked to make sense of new and sometimes confusing information, and differences across stakeholder groups could be seen in the discussion-point categories they introduced. Specifically, although each stakeholder group introduced discussion points for all the categories (with one exception), different ideas were foregrounded by each group as shown in their most prevalent discussion-point categories—mathematical content for the district leaders, pedagogical connections for the instructional coaches, institutional obligations for the teachers, and framework organization for the higher-education faculty members. The most prevalent category often reflected links to that stakeholder groups' professional responsibilities. This

differentiation was important because it allowed each stakeholder group to introduce the writing team to ideas that were most relevant to them. In this way, the writers could collectively make sense of a range of ideas and think about addressing them in the framework.

Similarly, differences among the stakeholder groups were also found in the institutional-obligations discussion-point category and the subcategories of the pedagogical-connections discussions-point category (historical vs. possible activities and timing). Without the opportunity for all stakeholder groups to engage in collective sensemaking, many issues may not have surfaced and, therefore, would not have been addressed in the framework. The differences in the discussion-point categories introduced by the stakeholder groups speak to the richness of the writers' discussion and show how this process led to the creation of a third-grade framework that was designed for everyone across the education system.

The K–8 Instructional Frameworks project also included opportunities for the writing teams—across grade levels—to engage in collective sensemaking. Throughout each of the three writing meetings, the writers for all grade-level frameworks participated in whole-group discussions to determine the format of the framework, share ideas, ask questions, and share and discuss feedback related to each grade level's framework drafts. In these large discussions, the writers engaged in collective sensemaking and made important decisions that helped guide the creation of the grade-level frameworks.

Practical Implications

The findings from my study provide practical implications for district and state leaders and policymakers interested in taking a systems approach when creating resources for an existing instructional infrastructure. In the following sections, I will share recommendations for each group.

Implications for District and State Leaders

The findings from my study offer recommendations that may be useful for district and state leaders tasked with creating new resources. My recommendations focus on facilitating collective sensemaking in the design of new mathematics resources. I view these recommendations as complementary to the broader design principles that guided the K–8 Instructional Frameworks project (Table 2).

The first recommendation is to include multiple stakeholder groups in the writing process because the groups will bring diverse experiences, expertise, and knowledge of the level of the system in which they work—a diversity that is important to the collective-sensemaking process and the creation of high-quality resources. Additionally, the multiple stakeholders should have professional responsibilities that include a focus on mathematics to help them make sense of the mathematical concepts present in the standards and make connections to students' understanding and related pedagogy.

The second recommendation relates to the types of debatable topics that will emerge during the writing meetings. The directions provided to the writers will likely influence how the writers focus their conversations. In my study, the writers focused mostly on single clusters, as they were explicitly asked to do. Thus, leaders need to consider their instructions carefully. Furthermore, I encourage leaders to consider emphasizing conversations about the entire resource. These conversations about the whole framework did not naturally occur very often in my study, but as the teachers in their focus group suggested, more conversation about cross-cutting issues for the whole framework would have been beneficial.

The third recommendation is to encourage discussion beyond what is typically considered when designing a traditional pacing guide. Like with most traditional pacing guides,

the writers' conversations focused on the mathematical content present in the standards. However, the writers also shared discussion points in categories that focused on students' understanding, pedagogical connections, institutional obligations, and framework organization—all of which are additional considerations not typically considered in the design of traditional pacing guides. In particular, leaders may want to encourage discussion related to the institutional-obligations discussion-point category. By acknowledging and addressing possible frustrations that educators may encounter when implementing resources, buy-in can be increased, encouraging educators to actively support and use the resources as they were designed. Similarly, special attention should be paid to the framework-organization discussion-point category. Writers need to clearly communicate new ideas, organization, and other important information about the resource created—both for the direct users of the resources and other people who may link to the resources (e.g., test makers, curriculum designers, administrators, etc.).

Implications for Policymakers

My study provides existence of proof that multiple stakeholder groups from four levels of a state's instructional guidance infrastructure can productively work together to create a pacing resource that addresses three typical implementation challenges (i.e., misalignment, lack of buy-in, and lack of collective sensemaking). Thus, when engaging in reform efforts, policymakers should consider including multiple stakeholder groups from across the education system and provide ample time for the design process. This approach will increase the likelihood that voices similar to those who will use the resources are represented, priorities and important ideas that each stakeholder group brings to the design process are incorporated, and challenges that each

stakeholder group may face during implementation are acknowledged. This study shows what is possible and should be considered before initiating new reform efforts.

Limitations

I highlight four limitations to my study that should be considered when making sense of the findings. First, the sample for this study consisted of only one of nine writing teams from the broader framework project, given that there was a writing team for each grade level of the K–8 frameworks. Furthermore, the sample included representation for each of the four stakeholder groups, but the number of stakeholders in each group and their participation across the meetings varied greatly. This unequal representation is typical, especially for a short timeline project, but means that conclusions for individual stakeholder groups must be considered exploratory given the small sample sizes and inconsistent opportunities for participation.

Second, the writing group focused on developing a pacing resource, which is only one piece of the instructional guidance infrastructure (Hopkins et al., 2013; Hopkins & Woulfin, 2015). Studying the development of other pieces of the infrastructure, such as statewide assessments and curriculum materials, is needed to understand collective sensemaking more fully in reform efforts.

Third, I focused my analysis on which discussion points were *introduced* by writers. Although this analysis provided an initial map to the discussion-point categories and how the stakeholder groups prioritized them, I did not attend to how writers reiterated or extended discussion points of other writers. This limitation meant that I captured only the discussion-point categories that each stakeholder group foregrounded.

Finally, the relatively lower percentage of discussion points related to student understanding (12%) surprised me and made me wonder about my criteria for this category of

discussion points. Specifically, was the students' understanding simply of lesser interest to the writers, or was students' understanding somehow embedded in some of the other categories, thus needing further conceptualization?

Future Research

In this section, I share two suggestions for future research that build on my study findings. First, it would be interesting to explore the types of collaboration that occurred during the writers' conversations, specifically as they engaged in collective sensemaking. In my study, I explored categories of debatable topics and discussion points that emerged from the writers' conversations during the creation of the instructional framework, and I examined the discussion-point profiles for each of the stakeholder groups. Future research also needs to characterize the types of collaboration present in the conversations because I noticed that there were multiple ways that writers responded to each other when ideas were shared—for example, sometimes they agreed with each other, and other times they pushed back against the idea shared. Thus, I am particularly interested in characterizing the conversations in terms of the conversation routines that occurred during the discussions, such as whether the ideas shared were complementary or had competing goals (Allen & Penuel, 2015; Horn & Little, 2010; Roschelle et al., 2006). I am also interested in identifying power relationships that may be present in the writers' conversations and how these power relationships may have influenced the development of the framework (Cameron, 2005; Penuel, 2019; Maitlis & Christianson, 2014; Roschelle et al., 2006). A deeper exploration into the types of collaboration that occurred during the writers' conversations could be helpful for district and state leaders who may be interested in facilitating conversations that involve collective sensemaking.

Second, I think it would be interesting to explore how the educative features in the framework were taken up by teachers when using the third-grade framework. In this study, I explored collective sensemaking as the writers created the third-grade framework. One of the writers' goals was to create an educative pacing resource that could be used when implementing the new mathematical content standards. When analyzing the conversations, I noticed that many ideas were shared to make the framework educative, and I wondered how those ideas would be perceived by teachers and taken up in the classroom. Future research needs to explore how teachers interacted with the framework and whether the educative features within the framework worked as designed. Understanding how the educative features of the framework are taken up and used by teachers could be helpful to district and state leaders who may be interested in designing educative resources to impact teacher learning.

Final Thoughts

The third-grade instructional framework as it is written would not exist without including multiple stakeholder voices in the design process. By drawing from all levels of North Carolina's Instructional Guidance Infrastructure, the priorities that each stakeholder group viewed as important and the challenges that each stakeholder group was likely to experience during implementation were acknowledged and addressed during the creation of the framework. This worthwhile yet time-consuming project led to the creation of an educative resource that can be used by all stakeholder groups across the entire education system. My study serves as an example of collective sensemaking in action when taking a systems approach to creating new resources during reform efforts.

Also noteworthy is that the creation of the framework was a worthwhile experience for the writers involved in the design process. During the focus group sessions, the writers—across

stakeholder groups—expressed their commitment to the project, which they also found meaningful to their own learning and understanding. Furthermore, they were excited to be an integral part of creating an educative resource that could help make the implementation of new state content standards more effective.

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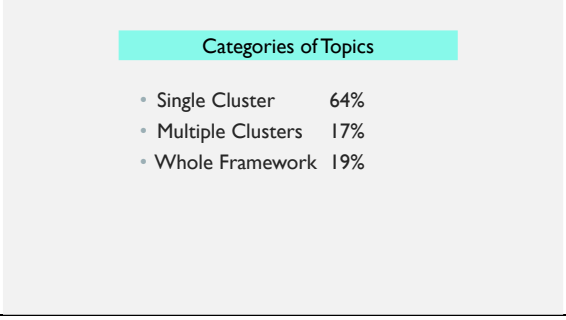
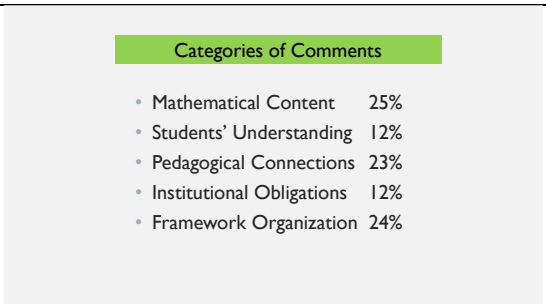
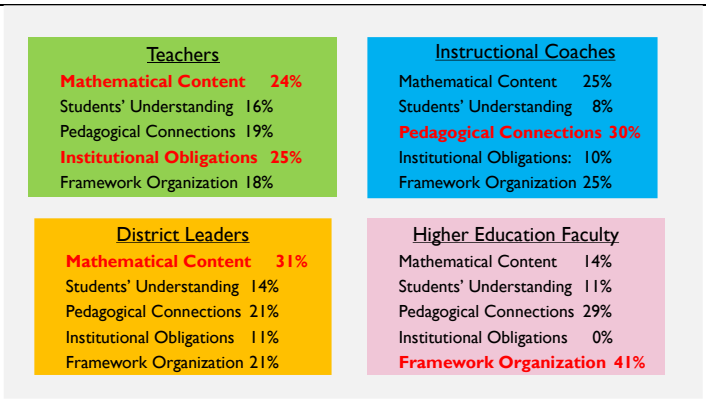
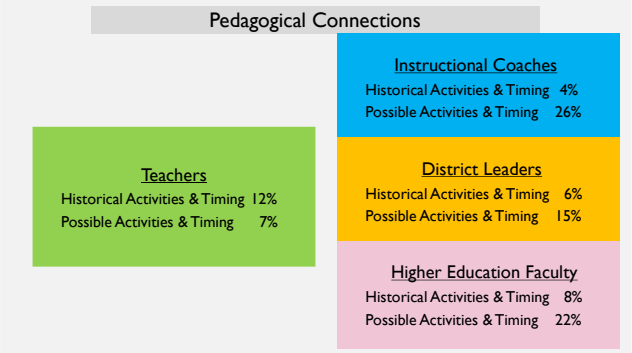
APPENDIX A: QUESTIONS FOR THE FOUR FOCUS GROUPS (MEMBER CHECKING)

Welcome	• Happy to see you, and thank you for being willing to talk with me • Excited to share with you what I have been working on and get your feedback • I listened to the audio recordings of the three summer conversations – June, July, and September meetings. This process was so new for all of us in NC, but it was also new for people across the country, so I thought that an investigation of your conversations could help other people interested in designing frameworks or other resources – that way, they would know what the process was like. • ***So why are you here****?* I want help thinking about some of the patterns I *think* I found, and who better to ask than the writers?! So I'm talking to you today, and I have a few other sessions set up with the other writers who contributed to the third-grade framework in any of the meetings – that way, I can get lots of perspectives. • Something really important for you to know … ***there are no right or wrong answers***. I am just interested in whether my ideas resonate with you, how you think about patterns I saw, whether you have other suggestions, and so on. You are helping me—thank you! • I have a set of questions I will ask but feel free to jump in and share or ask questions at any time – I'm hoping that this will be a fun conversation. And I'll try to save some time at the end so we can just chat and catch up. But I want to be respectful of your time so that we won't go longer than an hour. • **One additional request**—Are you ok with me audio recording the conversation–-that way, I don't have to take notes while we chat? • Any questions? Ok, let's get started…

RQ1 Debatable Topics	 *[Sharing the categories without frequencies]* 1. Are there any immediate reactions to these 3 big buckets? 2. (if not answered) Do they resonate with your sense of the conversations? 3. Anything you would want to add? *[Sharing the categories with frequencies]* 4. Are there any immediate reactions to frequencies before I ask a specific question? 5. Less than 20% of the topics focused on the whole framework, but this was an important part of the process. • Do you think there was enough time talking about the cross-cutting issues? • If organizers wanted to foster more conversation about cross-cutting issues, how do you think facilitators could encourage those conversations?

RQ2 Discussion Points	 *[Sharing and explaining the categories without frequencies]* 6. What are your immediate reactions to the 5 categories on this list? 7. Are there any categories that you are surprised to see on the list? 8. Are there any categories that were missing from the list that you expected to see? *[Sharing the categories with frequencies]* 9. Are there any immediate reactions to frequencies before I ask a specific question? 10. (if not addressed) All of the categories are important, and it makes sense to me that comments about institutional obligations may have been a little less frequent because the focus there was on avoiding roadblocks from other parts of the job—that are mostly part of teachers' daily responsibilities. But I was a little puzzled about why the frequency of the comments about students' understanding was a little lower. I was hoping that you could help me think about that. Remember the students' understanding category focused on the mathematical understanding that the students brought to third grade. The comments in this section focused on the math that students learned in prior grades and if that understanding made them ready to learn in third grade. Any thoughts?

RQ 3 Stakeholder Groups	
	[Sharing data for their stakeholder group only. The data reflect the frequency of discussion-point categories introduced by each stakeholder group, with the most frequently used category (or categories) highlighted.] 11. Are there any immediate reactions to those frequencies? *[Sharing data for all stakeholder groups]* 12. One of the things I looked at was what category of ideas was most common for each group. Does anything stand out or surprise you? 13. To me, what stands out is that the most frequent category was different for each group. Those differences support the idea that it was important that all four groups of participants were involved in the development of the framework so that a variety of issues got raised. Would you agree with that conclusion, or do you have any other thoughts to share about the differences?
	
	14. I have one final comparison that I noticed across participant groups and wanted to ask your thoughts about it. Looking at the pedagogical connection category, I noticed that all the groups shared ideas in this category – about 20 – 30% of each group's comments – but there were some different emphases. Remember that there are two types of ideas in this category. One type focused on how standards were historically taught in terms of the activities

	used and when the standards were taught. And sometimes this "history" was used to argue for keeping something as is and sometimes for why it needed to change. The second type of idea didn't worry about what had been done historically and instead brainstormed possible activities, timing, and needed resources to teach the clusters of standards. And the frequencies for each type of idea varied across groups. • For teachers, the focus was more on historical activities and timing. • For all the other groups, the focus was more on brainstorming new possibilities. I found that distinction interesting. What are your thoughts about that distinction?

Conclusion	Now that I have shared my data with you, I'm curious how you think these data might have looked if you had been creating a traditional pacing guide rather than the framework. (if needed) As a reminder, by *traditional pacing guide*, I mean a pacing resource that traditionally lists the standards and when to teach them. Further, standards are most often taught in their entirety and often one at a time (or sometimes in units). 15. I'm curious about your experience with traditional pacing guides. • Have you ever used a traditional pacing guide? • Have you ever helped design one? 16. (depending on their response) Think about your past experiences designing a traditional pacing guide OR imagine if you were asked to design a traditional pacing guide, how do you think any of the data we have discussed might have been different? 17. Is there anything else you want to share about your experience creating the third-grade framework and working with multiple stakeholder groups from across the state? 18. Do you have any questions for me?

Note. Explanations were provided with each slide.