A Mixed-Methods Study Investigating How a Video Club Professional Development Relates to Teachers' Mindsets, Beliefs, and Reflections on Instructional Practices

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A MIXED-METHODS STUDY INVESTIGATING HOW A VIDEO CLUB PROFESSIONAL DEVELOPMENT RELATES TO TEACHERS’ MINDSETS, BELIEFS, AND REFLECTIONS ON INSTRUCTIONAL PRACTICES

by

Amy Lynn Kinder

A dissertation submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

Education

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UTAH STATE UNIVERSITY
Logan, Utah
2023
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ABSTRACT

A Mixed-Methods Study Investigating How a Video Club Professional Development Relates to Teachers’ Mindsets, Beliefs, and Reflections on Instructional Practices

by

Amy Lynn Kinder, Doctor of Philosophy

Utah State University, March 2023

Major Professors: Dr. Beth MacDonald and Dr. Jessica Shumway
Department: School of Teacher Education and Leadership

One of the most significant barriers to changing instructional practices is teachers' mindsets and beliefs about teaching and learning mathematics. This study identifies a promising new type of video club professional development that supports teachers in examining their instructional practices and mindsets. This form of professional learning is an important addition to the field due to educators and researchers are just beginning to understand more about how mindset mediates and filters belief systems that impact how instruction is implemented. The purpose of this convergent parallel mixed-methods study is to provide a deeper understanding of how the experience of engaging in video club professional development relates to teachers' mindsets, beliefs, and reflections on instructional practices. Three sources of data were analyzed: a survey, video transcripts of collaborative discussions, and written reflections. These study results extend the current video club research by including established teachers and instructional coaches. Patterns and trends emerging from this mixed method study indicate that engaging in professional development designed with repeated opportunities to (re)examine mindsets, reflect on
instructional practices, and collaborate with peers causes changes in teachers' mindsets. This study adds that changes in mindsets and instruction are more likely to occur if teachers can collaboratively reconcile how new instructional strategies align with their current mathematics beliefs and mindsets. Adding a mindset component to professional development may be a promising approach to assist teachers in refining their instructional practices while examining and resetting their mindsets and beliefs.

*Keywords:* video clubs, mathematics professional development, mindsets, beliefs
PUBLIC ABSTRACT

A Mixed-Methods Study Investigating How a Video Club Professional Development Relates to Teachers’ Mindsets, Beliefs, and Reflections on Instructional Practices

Amy Kinder

One of the most significant barriers to changing instructional practices is often the teacher's mindsets and beliefs about teaching and learning mathematics. This study identifies a promising new type of video club professional development that supports teachers in examining their instructional practices and mindsets. This is an important addition to the field due to educators and researchers are just beginning to understand more about how mindset mediates and filters belief systems that impact how instruction is implemented. The purpose of this convergent parallel mixed-methods study is to provide a deeper understanding of how the experience of engaging in video club professional development relates to teachers' mindsets, beliefs, and reflections on instructional practices. Three sources of data were analyzed: a survey, video transcripts of collaborative discussions, and written reflections. These study results extend the current video club research by including established teachers and instructional coaches. Patterns and trends emerging from this mixed method study indicate that engaging in professional development designed with repeated opportunities to (re)examine mindsets, reflect on instructional practices, and collaborate with peers causes changes in teachers' mindsets. This study adds that changes in mindsets and instruction are more likely to occur if teachers can collaboratively reconcile how new instructional strategies align with their current mathematics beliefs and mindsets. Adding a mindset component to professional
development may be a promising approach to assist teachers in refining their instructional practices while examining and resetting their mindsets and beliefs.

*Keywords*: video clubs, mathematics professional development, mindsets, beliefs
DEDICATION

To my family who inspires me to give it my all: You have shown me the greatest love, I have ever known. Just remember the great song by Lee Ann Womack, "And when you get the choice to sit it out or dance. I hope you dance..." Well, I choose to dance!

To learners of mathematics everywhere: Everyone is a math person; you just need one person to start your journey of seeing this beauty. Find your person and then be that person for others. Viva the Math Revolution!
ACKNOWLEDGMENTS

My family has been my backbone and support from the beginning. My husband, Ted, and children, Lucy and Henry, inspired me daily. From the very first day of this journey, my husband has been my cheerleader, shoulder to cry on, and best friend. This doctoral journey has been challenging for my family. I was often distracted by writing, reading, and studying for classes. Balancing the available time was difficult, especially because I was taking time away from my fabulous family. My family adjusted their work schedules, gave me personal time, went on adventures without me, and so much more. I can never thank my family enough for the sacrifices that they made so that I could complete my dream. To my beloved husband, you have been with me through so many adventures and crazy injuries. I am so grateful for the light that you brought to my life. I continue to fall in love with you every day. I knew that my life would be forever changed for the better after I met you. You are my best advocate, listener, confident, and friend! You made me a better person and helped me complete my dreams.

While my husband is my knight in shining armor, there are two other bundles of joy in my life. First, my daughter, Lucy, attacks life with such zeal. She is a daredevil and puts herself out there to try new adventures like flying in the circus, shining in science, and dancing on a competitive dance team. She melts my heart with her boldness and daring. She is more than willing to say it like it is and to stand up for others. She reminds me the importance of standing up for your rights and the rights of others. Her greatest strength is her kindness. She finds the sweetest ways to share her love and appreciation. She works to bring people together and finds ways to highlight people's strengths. Her zeal to live life to the fullest inspires me daily.
Second but equally remarkable is my son, Henry, who inspires me with his sweet hugs and always cheers me on with jokes, great music, and epic stories. He approaches friendships with a gentle heart. He works to be the best friend he can to everything. He is my excellent rock star! He rocks my heart with great music, athletic feats, and crazy adventures! He is constantly creating and designing, which encourages me to be more creative in my life. Henry asks thousands of questions; that reminds me, you should never stop exploring and discovering. He is always looking for connections and making things more meaningful. Both of my children brought new meaning to my life. I feel like I won the lottery with my family, that has supported me through every step of this process.

To my family, thank you for so many adventures and life lessons. My three brothers push me to examine ideas from all different sides and how to be aggressive when you need to and chill when you don't. Finally, I learned grit and determination. I found a way to tap into that attitude: if you keep at it and fight harder, you will succeed. This experience has led me to fight harder for kids who gave up in poverty because being poor doesn't mean they are incapable and dumb. All it takes is one teacher that can change the trajectory of a child's life and inspire them to be better. Thank you to all the teachers who inspired me and helped me find the joy in mathematics, especially my doctoral professors.

I would also like to thank my dog, Nessy. She was my companion on long walks while I dictated ideas aloud. She laid by my side every night I spent working school. I love the way she would nudge me with her nose and we would get into bed around 1:30 or 2:00 regularly. Her endless capacity for love and zest for the outdoors is so inspiring to me.
I would be remiss if I didn't share my deep gratitude and love from my extended Barratt family. I want to extend a very special thank you to my husband's parents, Ted and Jennifer. They accepted me so readily into their family, especially during my wild younger years, and they have never stopped loving me. Jennifer can always see the positives in any situation and with every person. She also works to make everyone feel valued and cared about. Also, Ted has the kindest heart and is always reaching out to help someone in need. I will never tire of listening to all of Ted's wonderful stories. He has a way of telling inspirational stories and helps me see ideas through new lens. I greatly appreciate them making me a part of the family and for being simply amazing people, in-laws, and grandparents. Also, my children are lucky to have the best aunts, uncles, nieces and nephews ever! I love our family adventures. I love being surrounded by a wonderful family that enriches and enhances my life.

Finally, the group that made this journey awesome! I am so honored to work with such an amazing dissertation committee. The program at Utah State University is inspirational! The design of this program is perfect. It took me from being a good instructional leader to a new level of understanding. Don't get me wrong; this experience was the most challenging thing I have ever done. But it has pushed me in new ways that made me much better! I am a better student, researcher, teacher, and leader. This feeling is all due to these amazing women who have inspired me on this learning journey and pushed me to do better: Dr. Beth MacDonald, Dr. Jessica Shumway, Dr. Patricia Moyer-Packenham, Dr. Alyson Lavigne, and Dr. Kaitlin Bundock. These powerful women taught me to love mathematics, learning, and research even more than I ever thought.
possible. I have grown to love reading research in the bathtub greatly! (This became a ritual to read research in the tub.)

Finally, a very special thank you to my chair, Dr. Beth MacDonald. She was so thoughtful and caring! She was constantly kindly pushing me to be a better researcher, writer, and human being. I learned to love the power of mixed methods! She has such a wonderful kind way of asking questions and pushing me to be my best. I will not forget her impact on me. Thank you for countless hours of being my sounding board and traveling on this fantastic journey with me. I am forever thankful for your assistance, love, and kindness in this journey.

Amy Lynn Kinder
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Chapter I Introduction

This excerpt describes a teacher’s mathematical journey, beginning as a learner in mathematics and going on to become a teacher thereof.

“Confines Amy” I was not successful at mathematics from an early age. I struggled to make sense of mathematics and I didn’t identify as a mathematician. When I began teaching, I promised myself I would make mathematics a more positive experience for my students. Yet, I found myself in a teaching culture that focuses heavily on procedures and skills. All my materials supported teaching this way. Yet, I was not seeing progress in my students’ academic performance and found that my students made no secret of their dislike of mathematics. With the grade-level team, I would regularly discuss the reason for this and often lament that some students were perhaps not ready for sixth-grade level standards.

My administrator suggested that we broaden our understanding and sent our team to the National Council of Teachers of Mathematics Conference. This experience changed my life. I met educators discussing how to help students think critically, enhance academic discourse, and encourage students to make their thinking visible. I saw mathematics in a whole new light. The most profound part of the experience was the way teachers talked about their students as mathematicians and their belief that everyone can learn high-level mathematics. However, upon return, I was not still sure how to implement these practices in my current teaching mode. I was unsure whether I could make this happen in my classroom.

Amy’s predicament is not uncommon. Many teachers, educators, and mathematicians grapple with identifying the best approach to teaching mathematics.
Background of the Problem

Since the inception of math education in the United States, there have been repeated attempts to change instructional practices (Larsen & Kanold, 2016), which are complex and multi-layered (NCTM, 2014, 2018). There is no easy or readymade solution to this problem. Many researchers contend that it will not be solved by educators simply attending more one-day professional development workshops, adopting new curricular materials, or learning about recommended teaching practices (Anderson et al., 2018; Boaler, 2016, 2019; Gutiérrez, 2018; Zager, 2017).

In 1989, the seminal publication of Carpenter et al. Using the Knowledge of Children's Mathematics Thinking in Classroom Teaching sparked a new interest in the importance of developing conceptual understanding by focusing on students’ thinking and making instructional decisions that build and enhance their understanding of mathematical concepts (Carpenter et al., 1989). This approach to instruction garnered more support with the adoption of the Common Core State Standards for Mathematics (CCSSM) in 2010. The new standards promote a balanced approach to mathematics instruction and strengthen both conceptual understanding and procedural fluency.

Many critics claimed that teachers needed more clarification and support on what mathematics instruction should look like, using these standards (Ball et al., 2014; Larson & Kanold, 2016). Researchers find that the majority of textbooks and teaching materials do not provide a means for the teacher to incorporate these practices into daily instruction (Anderson et al., 2018; Boaler, 2016, 2019; NCTM, 2014, 2018; Zager, 2017). To support and promote specific changes in instructional practices needed to effectively teach the CCSSM, the National Council of Teachers of Mathematics (NCTM, 2014, p. 9)
published *Principles to Actions* in 2014. This book recommends eight effective teaching practices that "represent a core set of high-leverage practices and essential teaching strategies necessary to promote deep learning of mathematics". The eight practices are:

1. Establish mathematics goals to focus on learning.
2. Implement tasks that promote reasoning and problem-solving.
3. Use and connect mathematical representations.
4. Facilitate meaningful mathematical discourse.
5. Pose purposeful questions.
6. Build procedural fluency from conceptual understanding
7. Support productive struggle in learning mathematics.
8. Elicit and use evidence of student thinking.

Despite this new guidance, many teachers have difficulties implementing the teaching practices without substantial support (Boaler, 2016, 2019; Darling-Hammond et al., 2017; NCTM, 2014, 2018). Due to the lack of such support, the problem persists, with traditional procedural-based instruction methods still dominating classrooms in the United States (Ball et al., 2014; Ball & Forzani, 2011; Boaler, 2016; NCTM, 2014, 2018).

**Purpose of the Study**

To solve such a complex problem in mathematics professional development, the purpose of this mixed-methods study (Creswell & Creswell, 2018; Creswell & Plano-
Clark, 2018; Saldana, 2016) is to provide a deeper understanding of how the experience of engaging in video club professional development relates to teachers' mindsets, beliefs, and reflection on instructional practices. This study investigated how instructional practices are impacted by specific and intentional video club professional development that included repeated reflective and collaborative practices providing space for teachers to (re)examine their current beliefs and mindsets related to teaching mathematics (Anderson et al., 2019; Ball & Cohen, 2011; Boaler, 2020).

A common way to determine if a professional development is effective is use student achievement scores. Many researchers found that to have an impact on student scores it can take up three years (Darling-Hammond et al., 2017). Given this, student scores were not examined. Instead, this study purpose is to create capacity for future work with video that capitalizes on collaboration and reflective practices. I am seeking to create a continual cyclical process for teachers to reflect and collaborate about their instructional practices by themselves and with peers. This will alter the discussion about videos. This work is starting with 3rd–6th grade teachers and instructional coaches, but hopefully can be expanded to other grade bands and subjects.

**Statement of the Problem**

A growing body of empirical research points to two specific and significant barriers to changing instructional practices:

1. Teachers' own mindsets and beliefs about teaching and learning mathematics
2. The United States' current system of mathematics professional development is not an ineffective means of changing instructional practices, beliefs, and mindsets.

The first and foremost barrier is the teachers' long-standing negative beliefs and mindsets (Aquirre et al., 2013; Boaler, 2019; Dweck, 2008; Haimovitz et al., 2011; Hecht et al., 2021; NCTM, 2014, 2018). A recent new line of research on mindsets provides fresh insights into the issue. Researchers contend that there are some deeply ingrained ideas about the teaching and learning of math and this can influence how a teacher approaches plans, teaching mathematics, makes instructional decisions, plans mathematics lessons, and interacts with students (Anderson et al., 2018; Boaler, 2019; Chestnut et al., 2018; Hecht et al., 2021; Sun, 2018, 2019). Researchers found that mindsets and beliefs may play a more significant role than previously thought in teachers’ reluctance to accept and apply the knowledge learned from professional development programs to improve their instructional practices (Anderson et al., 2019; Boaler, 2019; Sun, 2017, 2018, 2019). Studies have found that many teachers view fixed mindsets ideas as truths. One common example is that teachers have the mindset that only certain students are capable to do mathematics to the highest levels (Chestnut et al., 2018; Hecht et al., 2021; Sun, 2018, 2019). Researchers have found that these mindsets can be damaging and have lasting effects on students' outlook and beliefs about mathematics (Boaler, 2016; Gutierrez, 2018; NCTM, 2014).

Additional research on mindsets has added to the field's understanding that mindsets are represented differently in various situations (Dweck, 2006; Sun, 2018). Sun (2019) found that mindsets and beliefs play a significant role in teachers’ professional
learning experiences; hence, greater understanding is needed of how professional development can be designed not only to encourage teachers to improve their instructional practices but also to provide them opportunities to reflect on those practices and allow them time to re(examine) their beliefs and mindsets. This is important because it is more common for teachers to attend professional development sessions focusing on having a growth mindset or improving instructional practices, it is far less common for them to experience such both ideas integrated into the construct of one professional development.

The second barrier hindering teachers from implementing recommended practices is the current system of mathematics professional development (Banilower et al., 2007; Darling-Hammond et al., 2017; Zager, 2017). Critics contend that there is ample evidence that the current common professional development model of one-time "sit and get" sessions is generally ineffective in assisting teachers in implementing effective instructional strategies (Ball & Forzani, 2011; Larson & Kanold, 2016; NCTM, 2014, 2018). In addition, several recent studies have suggested that teachers do not value the one-time professional development model highly due to: (a) being unsure of how to integrate the new knowledge into the existing instruction and materials and (b) the lack of continued support while trying to implement the concepts learned during their professional development (Anderson et al., 2018; Boaler, 2019; Darling-Hammond et al., 2017; Zager, 2017).

Although research has identified significant barriers to changing instructional practices and mindsets, there is limited understanding of how instructional practices are impacted by specific and intentional video club professional development that includes
repeated reflective and collaborative practices providing space for teachers to (re)examine their current beliefs and mindsets related to teaching mathematics.

Recent research findings offer promising results using video club professional development as an alternate approach to one-time professional development (Amador et al., 2020; Christ et al., 2017; Jilk, 2016; Luna & Sherin, 2017; Sherin & Dyer, 2017; van Es et al., 2017). Video club professional development provides a long-term opportunity for teachers to:

(a) Engage in collaborative practices,
(b) critically plan and orchestrate instructional routines and,
(c) collaboratively reflect on the experience with peers for an extended period, allowing multiple opportunities to engage with the content (Amador et al., 2020; Coles, 2019; Kersting et al., 2021; Santagata et al., 2021).

**Research Design**

This study used a convergent parallel mixed-methods approach (Creswell & Plano-Clark, 2018; Creswell & Creswell, 2018; Saldana, 2016). The rationale for using a convergent parallel mixed methods design is to draw on the strengths of both qualitative and quantitative approaches to interpret the multi-faceted aspects of teachers' collaboration, reflections, beliefs, and mindsets (Creswell & Creswell, 2018). As is consistent with the convergent parallel mixed-methods design, I first individually analyzed two sources of data: quantitative data (surveys) and qualitative data (video club discussions and written reflections) from the Barratt School District’s (a pseudonym)
2021-22 Video Club Professional Development Package. Then, the results were examined for convergent and divergent findings. Thus, this study's results benefited from qualitative and quantitative data analysis to answer the research questions, while providing both insight and generativity (Creswell & Plano-Clark, 2018).

Theoretical Framework

This study draws heavily on the sociocultural paradigm to understand how teachers examine, discuss, and reflect on their instructional practices. This sociocultural perspective emerged from the work of Lev Vygotsky and posits that social interaction with adults and peers influences learning (Rieber & Carton, 1987). Specifically, Vygotsky found social interactions with those more knowledgeable are essential to learning. This effect on learning is not limited to how peers influence learning, as it also encompasses how learning is affected by beliefs and attitudes (Sun, 2018). Indeed, mathematics educators and researchers are beginning to understand more about how a mindset mediates and filters teachers’ belief systems (Boaler, 2016, 2019; Anderson et al., 2018; Sun, 2018, 2019), which impact instructional planning, decision-making, students’ views, and how instruction is implemented (Ball & Forzani, 2011; Dweck, 2017; Gutiérrez, 2018).

While the sociocultural theory is the overarching theoretical framework for understanding the concepts in this study, Lave and Wenger’s (1991) situated learning theory explained how adults learn in a community. The situated learning theory stressed the importance of considering the context and location of learning. Specifically, these researchers averred that learning should be embedded in situations where teachers will
apply the knowledge, such as in the classroom. Lave and Wenger’s (1991) description of the situated learning theory suggested that participation in communities of practice improves the way teachers apply their learning and knowledge. *Communities of practice* are “groups of people who share a concern, a set of problems, a passion about a topic, and who deepen their knowledge and expertise by interacting on an ongoing basis” (Wenger et al., 2002, p. 4). The situated perspective finds that teachers’ learning improves as their participation becomes more meaningful in an ongoing community of practice, which creates a positive feedback loop (Greeno, 2006; Lave & Wenger, 1991; Wenger et al., 2002). Incorporating the situated learning theory in this framework provides insight into how specific contexts and experiences contribute to thinking, learning, and knowledge development (Greeno, 2006). Fundamentally, many researchers believe that learning and knowledge development are built through community involvement (Greeno, 2006; Lave & Wenger, 1991).

**Research Questions**

To meet this aim, the research questions guiding this study are as follows:

1. What is the relationship between teachers’ mindsets and beliefs before and after engaging in a year-long video club professional development?

2. What is the focus of the teachers’ written reflections during the video club professional development and how does it change over time?

3. When teachers collaboratively reflect on their instruction using video, what are the discussion patterns and trends?
Significance of the Study

This study has both practical and theoretical significance for two major areas of research: video club mathematics professional development (e.g., Borko et al., 2008, 2017; Gamoran Sherin & van Es, 2009; Sherin et al., 2011; van Es, 2009, 2012) and mindsets (Anderson et al., 2018; Boaler, 2019; Sun 2018; Yeager & Dweck, 2020). The field of mathematics education needs to critically examine the barriers to a lack of change in instructional practice and then design professional development that overcomes these barriers. Without research on how to refine instructional practices in mathematics, there will continue to be: (1) teachers struggling to implement effective instructional practices, (2) large numbers of students who will struggle with mathematics, (3) students who do not see themselves as a “math persons”, and (4) increases in negative feelings and mindsets towards mathematics.

This study also intends to add to current research understanding that changes in mindsets and instruction are more likely to occur if teachers are able to collaboratively reconcile how the new instructional strategies align with their current mathematics beliefs and mindsets (Boaler, 2020; NCTM, 2014).

Definition of Key Terms

For readers’ convenience, some of the terms appearing in the text are defined.
**Call out.** Frederiksen and colleagues (1998) first introduced the term *call out*, which refers to a teacher calling out specific portions of instruction critical to building conceptual understanding or understanding of a student’s thinking.

**Communities of practice.** These are "groups of people who share a concern, a set of problems, a passion about a topic, and who deepen their knowledge and expertise by interacting on an ongoing basis" (Wenger et al., 2002, p. 4).

**Fixed mindset.** A fixed mindset is a belief that people are born with a certain amount of intelligence and cannot expand it. Thus, people tend to see intelligence as a fixed trait that is unchangeable (Dweck, 2008).

**Funds of knowledge** refer to relating mathematics to, and building on, children’s thinking, questions, interests, culture, community-based knowledge, and experiences (Gutiérrez et al., 2018).

**Growth mindset** is a belief that people can enhance their intelligence incrementally. People tend to see intelligence as malleable and developed through learning, experiences, and effort (Dweck, 2008).

**Mathematical identity** is the “dispositions and deeply held beliefs that students develop about their ability to participate and perform effectively in mathematical contexts and to use mathematics in powerful ways across the contexts of their lives” (Aguirre et al., 2013, p. 14).

**Neuroplasticity** is the brain's ability to change, adapt, and grow as needed (Boaler, 2016, 2019).
**Noticing** is “recognizing important features of classroom interaction and drawing on one’s knowledge and experiences to make sense of those interactions (Amador et al., 2020, p. 3).

**Peripheral participation** means that learning and participation start at the periphery, but as participants increase their involvement and invest more time in the group, their involvement and knowledge grow (Lave & Wenger, 1991).

**Stopping point.** Jacobs and Morita (2002) use the term *stopping point* to describe the stage when teachers focus on and discuss certain time points in instruction.

**Teacher professional learning** provides teacher growth opportunities beyond traditional teacher professional development, as it incorporates models, is connected to specific content, involves active collaborative learning from participants, and employs reflective practices (Ball et al., 2014).

**Professional stock videos** are usually professionally filmed, edited, and packaged with added resources, such as lesson plans, teacher commentary, and student samples.

**Video Clubs** are a professional development experience where teachers collaboratively view classroom videos to make sense of students’ thinking by looking at how: (a) the teacher is orchestrating the discussions, (b) students are interacting with peers to justify their reasoning, and (c) students are making their thinking visible (McDonald et al., 2013; van Es & Sherin, 2008).

**Summary**

This chapter provides an overview of the study and explores the major issues behind why mathematics is still taught in a traditional lecture style, despite years of calls
by researchers and mathematics educators for shifts in instructional practices. There is a consensus view in the domain that teachers need support in implementing the recommended teaching methods effectively and changes are required to design structures for mathematics professional development (NCTM, 2014, 2018). This section also outlines the significance of the study and how a sociological perspective and the situated learning theory was used when examining the research and ends with the definition of key terms.
Chapter II Literature Review

A lot of scientific evidence suggests that the difference between those who succeed and those who don't is not the brains they were born with, but their approach to life, the messages they receive about their potential, and the opportunities they have to learn (Boaler, 2016).

For many years, researchers and practitioners have implored the mathematics education community to shift their focus from lecture-based instruction to methods that build strong conceptual understanding (Ball & Forzani, 2011; Boaler, 2016, 2019; Darling-Hammond et al., 2017; NCTM, 2014, 2018). According to the National Center for Education Statistics (2013), 99% of teachers participate in professional development every year. Nevertheless, the National Council of Teachers of Mathematics (NCTM) argued that the current model of professional development (PD) is largely ineffective in assisting teachers in their implementation of effective instructional strategies (NCTM, 2014, 2018). Some studies claimed that this ineffectiveness is because the dominant type of PD for mathematics in the United States tends to be presented as one-time "sit and get" lecture sessions each of which has a narrow focus, such as examining results from formative assessments or implementing instructional components from a mathematics program (Ball & Forzani, 2011; Darling-Hammond et al., 2017; NCTM, 2014, 2018). Researchers also revealed that a large number of teachers report not valuing mathematics professional development because they are unsure how to integrate knowledge gained from professional development into their classroom, with their materials and already developed instructional style (NCTM, 2014, 2018). The lack of continued support in implementing new knowledge also prevents teachers from effectively implementing such
knowledge in their classrooms (Ball & Forzani, 2011; Boaler, 2019; Darling-Hammond et al., 2017).

Given these problems with traditional PD models, the purpose of this mixed-methods study is to provide a deeper understanding of how the experience of engaging in video club professional development relates to teachers' mindsets, beliefs, and reflection on instructional practices. This study investigates how the instructional practices of teachers and instructional coaches are impacted by a specially designed professional development that uses video. During the professional development, there were repeated opportunities for reflective and collaborative practices for teachers to (re)examine their current mindsets related to teaching mathematics (Anderson et al., 2019; Ball & Cohen, 2011; Boaler, 2020). This study seeks to add to the current research base as to how changes in mindsets and instruction are more likely to occur when teachers are able to collaboratively reconcile over long periods of time how their new instructional strategies align with their current mindsets (Boaler, 2020, NCTM, 2014).

To meet this purpose and contribute in this way, this literature review is divided into four major sections. I first frame this study by explaining the literature search inclusion and exclusion criteria used when examining the literature. The second section of the review examines what is known about the four common aspects of video club professional development and its effects on teachers’ mindsets, beliefs, and instructional practices. The third section focuses on the research dealing with mindset and how a mindset affects beliefs and instructional practices. The fourth section introduces the theoretical and conceptual framework proposed for the study. Finally, this chapter
summarizes the current research on video clubs and mindsets to provide insight the context of the field.

**Literature Search: Inclusion and Exclusion Criteria**

In July 2020, I conducted a systematic search to identify literature in two fields of study: “video club professional development” and “mindset”. To frame this search, I used the following data engines: Education Source, ERIC- Education Resources Information Center, APA PsycInfo, Academic Search Ultimate, Professional Development Collection, Google Scholar, Research Gate, Bielefeld Academic Search Engine, and Semantic Scholar. I limited the search to peer-reviewed articles published after 2005, to establish currency. The following Boolean search terms and their derivatives used: "video club," "mindset," "sociocultural theory," and “reflections.” In combination with these terms, multiple subsidiary search terms were used (see Table 1). Finally, the researcher conducted another search for highly cited texts using the ISI citation index and found more recent articles (i.e., within the range of 2012-2022).
Table 1

**Documentation of Search Terms**

<table>
<thead>
<tr>
<th>Main search term</th>
<th>Subsidiary search terms</th>
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<tbody>
<tr>
<td>“Video Club”</td>
<td>+ video professional learning + “mindsets”</td>
</tr>
<tr>
<td></td>
<td>+ video professional development</td>
</tr>
<tr>
<td></td>
<td>+ mathematics* + “reflective practice”</td>
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<tr>
<td></td>
<td>+ “video”</td>
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<tr>
<td></td>
<td>+ “math*”</td>
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<tr>
<td>“Reflections”</td>
<td>+ “written” + “professional development”</td>
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<td></td>
<td>+ “math*”</td>
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<td></td>
<td>+ “mindset”</td>
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<td></td>
<td>+ “professional development” + “beliefs”</td>
</tr>
<tr>
<td>“Sociocultural Theory”</td>
<td>+ “communities of practice” + “situated learning theory”</td>
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<tr>
<td></td>
<td>+ “mathematics” + “professional development”</td>
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<tr>
<td></td>
<td>+ “video clubs”</td>
</tr>
<tr>
<td>“Mindsets”</td>
<td>+ “mathematics” + professional development</td>
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<tr>
<td></td>
<td>+ video + “beliefs”</td>
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<td></td>
<td>+ “video clubs”</td>
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A total of 327 research articles were found, of which the search engine generated 289 articles, with 38 identified through other sources. Removing duplicates yielded 251 articles. Next, a review of the articles' abstracts resulted in the selection of only studies meeting the following inclusion criteria: (a) focused on K-12 mathematics and (b) reported research examining teacher instructional practice using video. After reviewing
the abstracts, 73 articles were excluded (resulting in a total of 178 articles), as they were deemed less relevant to the current study, due to lacking a collaborative approach, using an evaluative approach, or lacking a focus on understanding student thinking. Additionally, articles that were not seminal and published before 2005 were removed. Finally, I examined the remaining 178 articles to determine whether the reported studies were part of teachers’ professional development or a professional learning experience. This analysis netted 149 peer-reviewed articles, 52 focusing on mindsets and 97 on video clubs.

The research field for video club professionals can be generalized into five areas: (1) building teacher capacity, (2) reflection on practice, (3) characteristics of videos, (4) frameworks, and (5) facilitation. Table 2 highlights the different areas of focus for video club studies.
The literature on video clubs focused on five main areas: (1) building teacher capacity, (2) reflection on practice, (3) characteristics of videos, (4) frameworks, and (5) facilitation. Each one of the study had a video club learning experience, just the focus on
the study changed. I will review the aforementioned literature to situate this study and examine the constructs of video clubs and mindset research.

**Video Club Professional Development**

Using video to refine and advance teachers’ instructional practices is becoming more and more common in teacher education and teacher development (Amador et al., 2020). A *video club* is a professional development experience where teachers collaboratively plan and reflect on instructional practices using video. According to the literature review, the first known use of video in mathematics professional development was in 1968. Since then, video professional development has evolved and dramatically increased in use worldwide (Anderson et al., 2018; Castro Superfine et al., 2019; Knight, 2014; Sherin & Dyer, 2017). This development evolved dramatically in the last 15 years, as cameras and editing platforms have become more readily available, affordable, and easy to use in the classroom (Knight, 2014).

In the late 2000s, a trend started in the education of building teacher capacity by increasing collaboration during professional learning and expanding opportunities for reflection on instruction (Amador et al., 2020; Christ et al., 2017; Jilk, 2016; Luna & Sherin, 2017; Sherin & Dyer, 2017). This focus led to the development of video clubs. Video clubs are designed to create multiple opportunities for teachers to learn from other teachers’ instructional actions and refine their own “in-the-moment” instructional decision-making skills. By drawing from video clubs’ purpose and definition from two seminal studies in the field of video clubs (McDonald et al., 2013; van Es and Sherin 2008) in the field of video clubs, I hope to provide a comprehensive lens for this study.
McDonald et al., and van Es and Sherin advocate teaching and learning to be examined together, while situated in a *community of practice* (Lave & Wenger, 1991). Communities of practice are "groups of people who share a concern, a set of problems, a passion about a topic, and who deepen their knowledge and expertise by interacting on an ongoing basis" (Wenger et al., 2002, p. 4). Many video club studies find positive effects in improving preservice teachers’ instructional practices in communities of practice (Beisiegel et al., 2018; Lampert, 2010; McDonald et al., 2013; Sherin & Dyer, 2017; van Es & Sherin, 2010). The field agrees that using teachers’ videos in PD provides an opportunity for teachers to see an objective, accurate view of themselves at work (Amador et al., 2020; Knight, 2014; van Es & Sherin, 2010). Studies have found that a video presents instruction in an authentic way that assists teachers in “seeing” their teaching, and this authenticity increases teachers’ intrinsic motivation (Amador et al., 2020; Christ et al., 2017; Kersting et al., 2021). Borko et al. (2017) concurred with these findings and found that teachers watching their own videos cultivate a deeper level of engagement and involvement. Additionally, Kersting et al. (2016) found that a video is easier for teachers to analyze than actual instruction. They reported that teachers displayed significantly improved observation skills when watching a video, compared to live instruction. Thus, observing videos of their own instruction can assist teachers in “seeing” their teaching in action, increase their motivation, and provide them with insight.

However, the literature is unclear regarding how the experience of engaging in a video club professional development relates to teachers' mindsets, beliefs, and reflections on instructional practices. Sherin and Han (2004) believed that the field does not have an
“understanding of precisely what it is about the video that might provide support for teacher learning” (p. 10). This researcher critically examined what is known in the field about the effects of three common aspects of video club professional development:

1. the effects of using different sources of videos,
2. the effects of using different cyclical frameworks, and
3. the effects of using different collaborative and reflective practices.

This portion of the literature review aims to describe what is known and not yet known in the field about these common aspects and effects within the construct of a video club professional development.

**Effects of Using Different Sources of Videos**

A critical component in video club professional development is determining the source of the video and selecting the video footage to view (Amador et al., 2020). The reasons for choosing the source of video or the section of the video footage to share differ widely. Researchers use videos to focus on a range of topics, such as implementing CCSSM Standards and Principles to Action (Bates et al., 2017), fostering productive discussions about teaching and learning (Amador et al., 2020; Borko et al., 2008; Coles, 2019), increasing skills for noticing student thinking (Castro Superfine et al., 2019; Sherin et al., 2011; Jacobs et al., 2017; Sherin & Dyer, 2017; van Es et al., 2015), examining the effects of feedback on practice (Borko et al., 2008), discussing a problem of practice (Seago et al., 2018), promoting teacher reflection (Sherin & Dyer, 2017;
Sherin et al., 2011), and attending and responding to student thinking (Borko et al., 2017; Castro Superfine et al., 2019; Walkoe et al., 2020).

A few studies provide a detailed summary of the video clip, including its time, topic, grade level, description of the task, and what could be observed therein (Sherin & Russ, 2015). However, this level of video description is not the norm, as most studies have a facilitator who selects the video clips and determines the focus (Lambert et al., 2010; McDonald et al., 2013; Sherin et al., 2011; van Es et al., 2017). Though the focus of video clubs varies widely, all of them used videos as a primary means to facilitate discussions and support teachers’ future instructional decisions and practices. Most video club studies obtain videos from two sources: teachers' classrooms (Borko et al., 2017; Sherin et al., 2011; Seidel et al., 2011) and professional stock videos (Amador et al., 2020; Seago, 2018). A teacher’s classroom video normally comes in two forms: raw footage of a teacher’s personal classroom or edited video clips (Borko et al., 2017; van Es, 2009). In contrast, professional stock videos are usually video clips that have been professionally filmed, edited, and packaged with added resources, such as lesson plans, teacher commentary, and student samples. Unfortunately, only a few studies examine the effects of using a combination of teachers' videos and professional stock videos (e.g., Seidel et al., 2011; Zhang et al., 2011). An examination of the available research points to both benefits and specific concerns regarding the source of videos.

**Benefits and Drawbacks of Using Teachers’ Videos**

Early on, from the conception of video clubs, it was common practice for teachers to film themselves, and then a lead teacher or a facilitator would select a portion of the teachers’ video to share with the group (Lambert, 2010; McDonald et al., 2013; Sherin et
There is an abundance of literature finding that teachers benefit from watching videos of their own classroom (e.g., Amador et al., 2020; Borko et al., 2008; 2017; Zhang et al., 2011). Zhang et al. (2011) reported that when teachers watch their own instruction, they are better able to analyze their instructional practices in a new way, which is impossible amidst teaching. Hargrove (2008) also linked teachers watching their own videos with increases in pedagogical understanding. Additionally, teachers reported feeling called to action to practice their new knowledge learned from the video, by reexamining their lesson design and writing clearer expected learning outcomes. Other studies concur with these benefits and add that teachers view video as a positive experience, though it may seem intimidating initially. Video provides a deeper nonjudgmental view of the reality of their instruction. This offers teachers an opportunity to truly see their practice in action (Knight, 2014; van Es & Sherin, 2010). Indeed, there is widespread literature detailing the multiple positive aspects of teachers viewing their own videos.

Borko and colleagues (2008) examined the long-term beneficial effects in their two-year qualitative study using videos. In this study, 16 teachers reported that watching their own videos resulted in increased feelings of being part of a collective community and enabled deeper reflection. One teacher summarized her feelings thus: "When I watched other teachers' videos, it wasn't critiquing. It was seeing what they do in their classroom and realizing that a lot of what's going on in their classroom is what's happening in mine" (Borko et al., 2008, p. 434). Another finding of this study was that teachers watching their own and their peers’ teaching provides a meaningful way to learn
from other teachers’ instructional actions and refine their own “in-the-moment” instructional decision-making skills.

Only a few studies explore a combination of both teachers' videos and professional stock videos; Seidel et al. (2011) is an example of using both sources of video: teachers watching their own videos (Own Video Group) and watching professional stock videos (Others' Video Group). The Own Video Group reports increased levels of motivation and engagement in discussions, surveys, and interviews. Specifically, teachers who viewed their own video footage report higher levels of clarity in "seeing" their instruction and believe it enabled a higher level of analysis, which enriched future lesson implementation. Additional findings were that the Own Video Group viewed the video club as a more authentic experience than the Others' Video Group. However, the study still found that teachers reported benefits from both video sources (Seidel et al., 2011).

Another study that uses both sources of video is Beisiegel et al. (2018), which examined the effects of having a teacher or trained facilitator lead the discussions. The study uses a factorial design to study these variables. The findings indicate that the depth of video club discussions did not significantly change concerning whether a teacher or a trained facilitator led the video club discussion. However, when comparing the depth of conversation with teachers' own videos vis-a-vis professional stock videos, the results from teachers' own videos displayed slightly better outcomes (Beisiegel et al., 2018). Thus, both these studies using both sources of video illustrated some of the positive effects of teachers watching their own videos, but also report the benefits of professional stock videos.
In contrast, other studies counter concerns about using teachers' videos. One primary concern is that teachers are not always willing to videotape themselves and share the recording with their peers. Sherin and Han (2004) found participants concerned about being "self-conscious about being videotaped" (p. 166). Other researchers believe the concerns are more problematic than teachers not wanting to film themselves. Indeed, Knight (2014) found that some teachers are unaware of the true realities of their teaching practices, and seeing a clear depiction thereof may be very disturbing. Studies found that when a video does not match the teacher’s self-related construct, it can cause an intense emotional reaction and reduce the observer’s ability to reflect and process critically (Seidel, 2011). This made some teachers feel uncomfortable “articulating the reasons for and consequences of critical events” (p. 261).

Other studies (van Es, 2012; Zhang et al., 2011) reported that when teachers discuss their own video, the conversation can be lacking in depth and critical discourse due to the teachers reportedly being reluctant to make critical comments about their peers' instruction. MacDonald (2011) agreed with this perspective and attributes it to our "culture of niceness," which she believes leads to surface-level conversations and shallow analysis of the teaching due to not wanting to hurt a peer’s feelings or make them feel vulnerable. van Es (2012) suggested that many teachers find it easy to offer advice but find it challenging to discuss or give specific instructional changes to those peers whom they believe are struggling or to those who may be unwilling to listen to their advice. To overcome the "culture of nice," some researchers choose to utilize professional stock videos during their video club collaborative discussions, which led to increased critical
discussions and focus on student thinking (Kleinknecht & Schneider, 2013; MacDonald, 2011; Seidel et al., 2011; van Es & Sherin, 2009; van Es, 2012; Zhang et al., 2011).

**Benefits and Drawbacks of Using Professional Stock Videos**

The idea of viewing professional stock videos to refine instructional practices gained in popularity as video professional learning dramatically decreased in price and increased in usability (van Es & Sherin, 2008). Professional stock videos are the other type of video used in video clubs. *Professional stock videos* are usually professionally filmed, edited, and packaged video clips with added resources, such as lesson plans, teacher commentary, and student samples. These come mainly from large databases or libraries and are specifically designed for professional development. Researchers started using stock videos early in the history of video professional development. For example, the 1969 seminal study of Allen and Ryan at Stanford University introduced microteaching (an early form of video professional development) with stock videos. *Microteaching* breaks down essential teaching skills into minor skills that a teacher could sequentially master with the support of explicit video demonstrations (Ünlü, 2018). The idea of viewing professional stock videos to refine instructional practices gained popularity as professional developers recognized that seeing teaching in action assists teachers in refining their own instruction (van Es & Sherin, 2008).

**Development of Large Video Libraries**

The demonstration of some researchers of the power of using professional stock videos in professional development created a need for more videos, which led to the development of large mathematics video libraries. These vary greatly and focus on various aspects of teaching like building content expertise, comparing practices across
countries, exemplar videos, pedagogical techniques, and much more. For example, the Trends in International Mathematics and Science Study (TIMSS) is an example of a video library that filmed more than a thousand videos of 8th-grade mathematics and science classes across seven different countries (Hiebert et al., 2003). The study’s results focus on examining the similarities and differences in instructional styles in those countries. This library spurred a national movement to capitalize on lessons learned from countries like Japan and Finland. Not only were many of the videos released, but all the supplementary material, transcripts, and commentary from the researchers and the teachers. These portions were shared to assist teachers looking to refine their instruction. Many teachers reported gaining insight by examining the similarities and differences in mathematics instruction in countries worldwide (Hiebert et al., 2003).

Not all large video libraries focus on comparing nations; some libraries collect videos as examples of teaching different mathematics concepts. For example, the Annenberg Foundation created an exemplar teaching video library for Grades 9 through 12 using NCTM’s guiding principles for designing and implementing the curriculum. While a limited quantity of videos is available, this library is widely used due to the quality of the professional development supplementary materials. Another that has recently increased in popularity is The Teaching Channel. This growing video library has over 2,000 videos that focus on lesson planning, lesson design, pedagogical techniques, and assessment strategies in multiple subject areas. In addition, some of the videos include supporting documents, reflection questions, and instructional materials (Teaching Channel, 2018). Recently, the company has been working on several professional
learning series that follow teachers’ examinations of different aspects of their teaching, such as professional learning communities and lesson planning.

Zhang (2011) found that when teachers view stock library videos that incorporate themes of instructional practices (e.g., questioning strategies, students sharing their thinking), the videos serve as invaluable exemplars, with teachers considering these themed stock videos pivotal to learning how to orchestrate particular instructional activities in their classrooms. In contrast, other studies (Seidel et al., 2011; van Es & Sherin, 2010) reported teachers feeling that using stock videos left them feeling unconnected to the classroom context (Knight, 2014; Seidel et al., 2011). In addition, some teachers struggled to see how some of the video clips could be applied to their own classrooms, due to viewing a different grade, students from differing socio-economic backgrounds, or a teacher using other curricular materials. Therefore, researchers, educators, and teachers need to pay careful attention to selecting videos for a video club.

Superfine and Bragelman (2018) concurred and believed that much more consideration must be given to the videos used in the video clubs. They developed a six-dimension rubric to determine the complexity of each video: (1) depth of enacted task, (2) clarity of child thinking, (3) teacher participation, (4) number of times children’s mathematical thinking occurs, (5) the number of times multiple children are discussing their thinking, and (6) how children’s thinking is expressed verbally, in writing, or visually. The researchers feel that the rubric assisted the field in increasing the quality of videos that teachers observe. Sherin et al. (2011) added to this finding, as their research focused on identifying the features that encourage deep conversations. The researchers used three criteria to determine this: (1) how the video clip provides a means of looking
at student thinking, (2) the depth of mathematical thinking displayed by the student in the video, and (3) how easy it was to understand a student's thinking (Sherin et al., 2009). They discovered that videos with certain characteristics, such as showing students’ thinking, students sharing multiple paths to a solution, and examining errors in students’ thinking facilitated deeper-level discussions. Amador et al. (2020) went a step further by developing a lens for teachers and researchers to utilize when selecting a video. They stress the importance of examining the critical features of the video for depth, complexity, and students’ thinking. Much more consideration needs to be given to selecting videos.

In summary, while numerous studies report positive benefits for teachers watching and discussing their own videos (Borko et al., 2008; 2017; MacDonald, 2011; Seidel et al., 2011; Zhang et al., 2011), there are also some serious factors to consider (Sherin et al., 2011; van Es & Sherin, 2010). There is a need to examine the video footage to ensure its quality (Sherin et al., 2011; Superfine & Bragelman, 2018). Using a combination of both types of video sources could overcome many of the concerns that previous studies have uncovered. It would be beneficial to have videos with specific characteristics (e.g., rigorous content, ability to hear students' thinking, and demonstrations of in-depth thinking), to add to the depth of the discussions. Additionally, it would also be meaningful for teachers to see and discuss their own instruction with their peers, especially if they focused on a similar instructional practice. Teachers could visualize how similar instructional practices look in different classrooms and see how different teachers use teacher moves and questioning to further their students’ thinking. Therefore, it would be paramount for future research to use a combination of
video types to strengthen the discussions and build off the strengths found in the two kinds of videos.

**Effects of Cyclical Design in Video Club Professional Development**

Almost all video club studies draw from a cyclical framework (Lampert, 2010; McDonald et al., 2013; Sherin, 2007; Superfine & Bragelman, 2018; van Es & Sherin, 2010). The cyclical design follows a similar process, with minor variations: (1) focus on a strategy or practice, (2) teachers film their instruction, (3) teachers reflect on their instruction, and (4) teachers collaboratively discuss the video clips. This section examines four cyclical frameworks and the kinds of learning opportunities these different designs and structures provide for teachers.

1. Microteaching Cyclical Design (e.g., Allen & Ray, 1969; Ünlü, 2018)
2. The Cycle of Enactment and Investigation Cyclical Design (e.g., Lampert & Graziana, 2009; Lampert et al., 2009; Lampert et al., 2013)
3. The Learning Cycle Cyclical Design (McDonald et al., 2013)
4. Video Club Process (Amador et al., 2020)

While it is impossible to describe and represent every cyclical framework used in video clubs, these four were selected due to their variation in focus, and because they represent the kind of cyclical frameworks widely used in the literature.

**Microteaching Cyclical Design**

Many video club cyclical frameworks draw and build on the seminal research of Allen and Ryan (1974) on microteaching that used a structured cyclical cycle to improve novice and pre-service teachers' teaching skills by breaking up essential teaching skills
into more minor skills that teachers could sequentially master (Ünlü, 2018). Allen and Ryan designed experiences that assist pre-service and novice teachers in learning certain behaviors by observing and imitating peers, capitalizing on Bandura's social learning theory and behaviorist learning. Microteaching involves a four-part cyclical series of actions. First, the preservice teachers observe a video clip that demonstrates a specific strategy or skill. Then, they videotape themselves demonstrating this same strategy or skill. Next, the instructor uses the video clips to provide detailed feedback. Finally, teachers modify and adjust their instruction according to the feedback, and then reteach (Allen & Ryan, 1974). By using exemplar videos in repeated cycles, microteaching cycles provide a direct, visual method to increase the instructional abilities of preservice and novice teachers. This cycle allows teachers to reflect after each step, but it is up to the individual to reflect on their own about how to modify their instruction to mirror the instruction in the video. This cycle’s only opportunity for discussion is limited to the professor’s feedback. This study and subsequent ones using this model have shown significant results, with the increasing capacity of preservice and novice teachers to teach different instructional strategies (Allen & Ray, 1974; Ünlü, 2018)

*The Cycle of Enactment and Investigation Cyclical Design*

More recently, Lampert and colleagues (Lampert & Graziana, 2009; Lampert 2010; Lampert et al., 2013) built their cyclic framework using the foundation of microteaching and added components and variations to enhance the professional learning experience for the teacher. Lampert et al. (2009) developed a six-part cyclic process for pre-service teachers to learn to enact specific instructional routines. Their framework used elements similar to Allen and Ray’s (1974) but differs because it adds opportunities
for guided rehearsal with feedback, collective analysis, and reflection (Lampert & Graziana, 2009; Lampert et al., 2009, 2013). Numerous studies use this cyclic design structure and find that it provides a framework that increases preservice teachers' effectiveness in enacting the intended instructional practices (Lampert & Graziana, 2009; Lampert et al., 2009, 2013).

This study’s approach to the cyclic process is to begin with teachers observing the practice and collectively analyzing the same. The next step involves preparing to teach the practice, and the teachers then have guided rehearsals with feedback. Finally, the teacher enacts the lessons and once again collectively analyzes the practice. The cyclic process is then repeated. According to the study, this results in teachers having an improved ability to connect “their own knowledge and relevant aspects of the context to put knowledge to use” (Lampert et al., 2013, p. 240).

Specifically, this research finds that including rehearsals is beneficial, because it provides a safe forum for preservice teachers to practice and receive real-time feedback without trying to navigate the complex demands of instruction simultaneously. This study reports that the repeated use of this cycle with rehearsals and reflections increases the effectiveness of teachers’ instructional skills, as well as their ability to reflect and refine their instruction. One other difference from microteaching is the significant increase in feedback and collective analysis throughout the cycle.

**The Learning Cycle Cyclical Design**

McDonald and her colleagues (2013) subscribed to a different view on the cyclic framework. Their study highlights the various pedagogical practices that could be performed at each stage of the process. The researchers felt that the cyclical process
could move from being a static one to a dynamic one. For example, the researchers found it essential to delineate more ways to learn about an instructional practice or strategy, rather than just through a lesson demonstration. They found that teachers can deepen their understanding of the activity through modeling, watching exemplar videos, and examining written case studies. McDonald et al. (2013) found that these descriptions provided clarity for expectations and choices of each part of the cycle. The cycle has four parts: (1) introducing and learning about the activity, (2) preparing for and rehearsing the activity, (3) enacting the activity with students, and (4) analyzing the enactment and moving forward. Each part of the cycle offers multiple activities; introducing and learning the activity can be done by modeling, watching video exemplars, or examining written cases. While these studies do not focus on examining the cyclic framework’s specific effects, researchers found significant increases in preservice teachers’ abilities to implement instructional routines after repeated cycles.

**Video Club Process Cyclical Design**

While most studies focus on preservice teachers, Amador et al. (2020) are among the few who have implemented video club cyclical frameworks with practicing teachers. Amador and colleagues (2020) introduce a four-part cycle: (1) collaboratively planning the lesson, (2) lesson implementation, (3) meeting preparation, and (4) video club. This cycle focuses on the processes of teachers and facilitators during the video club. The first two parts focus on teachers’ actions and the last two on the coach’s actions. The researchers design the cyclical framework to help educators see the broad and detailed goals. The crucial components of the cycle include introducing the teachers to the task
and the teachers’ collaborative lesson planning. Next, the teachers implement the task and film it. The third step focuses on the facilitator’s steps to prepare for the meetings by selecting, editing videos, and creating discussion questions. The final part is not represented in the cycle but involves the video club discussions. This study's discussions had a set structure lasting 60 to 90 minutes. Prior to the meeting, the facilitators informed which teachers would share their video clips. At the start of the session, the teachers whose videos were selected provided participants with the task that students had engaged in during the video.

This cycle differs from the others explored so far on a few points (Amador et al. 2020). Teachers are shown their videos in succession. While they are watching the videos, they use a Video Club Observation Protocol to reflect and take notes individually. After all the videos have been viewed, participants choose one video they would like to discuss with the group. The researchers found that this format increased opportunities for teachers to decide the focus of the discussion. Results show that teachers mainly chose videos with less complexity, multiple participant structures (i.e., single student, small group, whole class), and students demonstrating a misconception or misunderstanding (Amador et al., 2020). The authors found that this speaks to the need to examine the features of the types of videos that educators choose and why they are selected for discussion. For example, if a facilitator or teacher selects videos with less complexity, a facilitator could strategically compensate for this by adding to the discussion with facilitation questions (van Es et al., 2014). While the cyclical framework was not the
focus of this study, it emphasized the importance of a facilitator selecting and editing videos for discussions and strategically designing facilitation questions.

In summary, the commonality in these cycles is that teachers are collaboratively involved in a repeated cyclical process to refine and reflect on their instructional practices (Amador et al., 2020; Kazemi et al., 2016; Lampert & Graziani, 2009; Lampert, 2010; McDonald et al., 2013). While the cyclical process was not the focal point of these studies, all the studies leverage the cyclic process to refine instruction and increase reflective practices. The cyclic process has the added advantage of providing clarity about each step throughout. The collaborative discussion using the video clips portion of the cycle is a pivotal part of it (Amador et al., 2020; Lampert & Graziani, 2009; Lampert, 2010; McDonald et al., 2013). Within the field of video clubs, there remain unanswered questions about how the cyclical design relates to teachers’ beliefs, mindsets, and instructional practices, as well as a lack of clarity on which cyclical process is the most beneficial to teachers refining and advancing their instructional practices. The combination of providing multiple cyclic opportunities for reflection, feedback, and collaborative planning seem to have the most positive effects on teachers’ instructional practices.

**Effects of Using Collaborative Discussions and Reflective Practices**

This section explores the known effects of different collaborative discussions and reflective practices in video club professional development. Teachers’ video club discussions and reflective practices are affected by many factors, such as the participants’ relationships (van Es, 2009, 2012), the role of the facilitator (Coles, 2014; Castro
Superfine et al., 2019), and the context that the teacher is teaching in (Sherin & van Es, 2009).

**Variations in Collaborative Discussion Structures**

The structure of the discussions varied widely in the field, with most studies using a facilitator to lead the video club discussions (Borko et al., 2008). These facilitators often preview videos from teachers' classrooms and choose three or four clips to discuss (McDonald et al., 2013; van Es & Sherin, 2010). In comparison, others have a teacher guiding the discussion. Coles (2013) found that the studies of only a few video clubs have focused on the effectiveness of facilitating discussions, as the focus is instead on the outcomes of the video club discussions. There are three main issues to consider when examining video club discussions:

1. variations of discussion structures,
2. discussion points
3. the effects of different kinds of facilitators.

There is significant variation in how collaborative discussions are structured. While it is common to have a certain amount of time allotted for discussions, the time given varies greatly. It is common for video club discussions to include two to three videos (McDonald et al., 2011; van Es & Sherin, 2010). It is also true that showing the video clips usually follows a predictable pattern: (a) watch the video, (b) discuss the video, and (c) show the next video (Luna & Sherin, 2017). This format has been revealed as beneficial to teacher learning (Jilk, 2016; Luna & Sherin, 2017; Sherin et al., 2011). Some studies showed that the observation depth increases with the number of videos observed (van Es & Sherin, 2010; Walkoe, 2020). However, other studies countered such
findings and concluded that the length or number of videos is not an indication of the quality or depth of the conversation (Amador et al., 2020). Therefore, examining the time spent discussing videos and the lengths of videos is an essential consideration when planning a video club discussion.

Not all video club discussions are designed similarly. For example, Jilk (2016) had participants view a ten-minute video at each meeting. The meetings consisted of about twenty-five participants, and the discussion gave each person a turn to speak and respond to specific questions. In contrast, Mitchell and Marin (2015) had only four participants, each of whom watched twenty minutes of unedited video before the meeting. Self-reported data showed that the participants in these studies believe the discussions will lead to the refinement of their mathematics instructional practices.

Determining the best approach for discussions is challenging because many video clubs provide different time limits for the discussion, facilitators, structures to their discussions (turn-taking, open discussions, or answering facilitation questions), and length, focus, and context for the videos (Amador et al., 2020).

Discussion Points

Most video club studies focus on examining what the teachers talk about after watching the videos. In this area of investigation, several studies found it common for teachers to pay attention to specific situations and events that stand out personally while watching videos (Amador et al., 2020; Kazemi et al., 2016; Lampert & Graziani, 2009; Lampert et al., 2013; McDonald et al., 2013). These discussion points have been referred to in many ways throughout the literature. Frederiksen and colleagues (1998) first introduced the term call out, which refers to a teacher calling out specific portions of the
instruction that are important to them. In comparison, other studies use the term *noticing* (Castro Superfine et al., 2019; Sherin & van Es, 2009; Jacobs et al., 2011; Russ et al., 2016; Sherin & Star, 2011). Noticing is “recognizing important features of classroom interaction and drawing on one’s knowledge and experiences to make sense of those interactions” (Amador et al., 2020, p. 3). Finally, Jacobs & Morita (2002) used the term *stopping point* to describe when teachers focus on and discuss certain time points in the instruction.

Regardless of the term used to describe these discussion points, many studies focus on what teachers are concentrating on and why it is important (Borko et al., 2008; Santagata, 2021; Sherin & Dyer, 2017). For example, Sherin and van Es (2009) examined whether teachers change their discussion points during long-term professional development. Their findings show that as teachers become more experienced in discussing videos, there is an increased focus on pivotal moments in the classrooms and teachers move from a descriptive stance to a more critical interpretive stance.

*Effects of a Trained Facilitator on the Discussion*

Preliminary research in the field shows that teachers with little or no experience discussing videos do not tend to gain significant insights from just watching the videos (Rosean et al., 2008). However, Borko and colleagues (2008) countered this conclusion if a facilitator is included, as they found this led to an increased degree of discussion focusing on analyzing instructional practices and teachers’ strategies. Their qualitative findings included video club discussion analysis and how facilitators used teachers' interpretations of their students’ thinking to prompt teachers to adopt a more critical approach. Calandra et al. (2009) furthered this understanding with an exploratory multi-
case study, claiming that a lack of a facilitator in video clubs results in superficial discussions among participants that mainly focus on the way the teacher in the video is talking, the time spent on activities during the video, and fundamental classroom management issues illustrated in the video.

Further, van Es and Sherin (2006) corroborated these findings, using fourth and fifth-grade teachers \((n = 7)\) in two different video clubs: the Mapleton Video Club and the Wells Park Video Club. The Mapleton Video Club group had a facilitator who encouraged the teachers to discuss the students' ideas and study mathematics in the video segments. A qualitative analysis of teachers' conversations showed an increased focus on students’ thinking and interpreting events. In contrast, in the Wells Park Video Club, different teachers took turns leading the discussions over multiple sessions, which resulted in no clear goal being addressed, a more extensive range of topics, and broader perspectives being communicated.

**Reflective Practices**

The final component of video clubs is how different studies provide a time and space for teachers to refine and reflect on their practices. Many video clubs actively assist teachers in reflecting on their practice (McDonald et al., 2013; Sherin et al., 2011). Dewey (1960) defined *reflection* as “active, persistent, and careful consideration of any belief” (p. 9). Sherin (2007) contended that video club discussions provide “the luxury of time" (Sherin, 2007, p. 293) needed for reflection. When teachers can examine a lesson, reflect, and debrief with peers, it slows down time and affords them opportunities to observe specific student actions and discussions (Amador et al., 2019;
Calandra et al., 2009; Kersting et al., 2020). Many studies explore various ways for teachers to engage teachers in reflective practices. A common theme that repeatedly arose in the existing research is that teachers need time to reflect on their practice.

For example, Mellone (2011) implemented diaries to assist teachers in examining and reflecting on their beliefs and assumptions about students. Their findings show that a journal is an effective means for teachers to reflect on their behavior and make changes. Rosaen et al. (2008) also capitalized on written reflection and sought to determine how video could assist novice teachers in reflecting on their instructional practices. The researchers used a cross-case analysis to compare data from the first reflection to the final one. Their findings indicate that using reflective practices increases teachers’ skills in observation and their focus on pivotal moments of instruction. The researchers found that teachers’ way of focusing on instructional events changed over time, starting with first describing events, then interpreting and making connections to events. Other studies concurred that collaborative discussions in video club teams build on participants’ expertise, as they view different teachers enacting instructional practices and can make sense of students' thinking together (Hand, 2012; Jilk, 2016). Sherin and van Es (2009) discovered that over time, discussions increased from simply describing instructional moments to more reflective interpretations and evaluations of teaching moments. Another reflection strategy often found in the video club literature is for teachers to repeatedly view the videos to gain new insights (Borko et al., 2008; van Es, 2017; van Es & Sherin, 2010). Many studies found that the more opportunities teachers had for reflection, the more they could start to see themselves responding more appropriately than before (Ball et al., 2014; Kersting et al., 2016, 2021).
The available empirical research indicates essential issues to consider when designing discussions and reflective practices for video clubs. Discussions and reflective practices can empower teachers to rethink and refine their beliefs and instructional practices (Darling-Hammond et al., 2017; Jilk, 2016; Sherin & van Es, 2008; van Es & Sherin, 2010). The research shows effective facilitation can strengthen discussions and increase the depth of reflections. A facilitator can support teachers’ natural discussion points and encourage them to focus on critical moments in instruction. However, careful consideration needs to be given to the videos selected to ensure the quality is sufficient, and facilitators need training on how to plan questions to strengthen the discussions strategically. Reflective practices can play a powerful role in increasing teacher capacity and instructional strategies. Reflective practices, written or verbal, can impact teachers’ instructional practices. It is not known what kinds of training or experiences mathematics educators need to be able to design for rich facilitator experiences with opportunities for reflective practices. Studying the effects of discussions and reflection practices is an area that needs more investigation to better understand how they relate to instructional practices, mindsets, and beliefs.

**Summary of Video Club Professional Development**

In summary, video club designs vary in three significant ways: (1) the sources and quality of the videos, (2) the effects of cyclical design in a video club professional development, and (3) the effects of different collaborative discussions and reflective practices. It is clear from the research that video selection is a critical component of the success of a video club. Video quality can vary greatly, but the literature has shown that
using the teachers’ own videos and professional stock videos can both enhance the discussions and provide a means to refine instruction. Research shows that using a trained facilitator or teacher can enhance how videos are selected and edited. When facilitation is used in video clubs, teachers engage in more in-depth discussions, develop a critical lens for interpreting instructional events and focus on students' thinking. Another important aspect to consider is the video clubs’ cyclic design. Findings suggest that when teachers enact instructional practices as a part of the video club cycle, the repeated cyclical process is instrumental in refining practices. The discussion with the video is pivotal in the cyclical process, as it provides opportunities to reflect as a community of teachers and to learn from the experience. Finally, the reflection process is critical to changing teachers' instructional practices and increasing their ability to observe students’ actions and reasoning critically. Each of these components, though dealt with differently in the literature, plays a key role in a video club professional development. Given these findings, it is clear that each component needs to be critically examined to determine how to design an effective video club professional learning experience. However, it is not yet clear in the literature how effective video clubs are vis-a-vis teachers' beliefs, mindsets, and reflections about instructional practices.
Mindsets Research

When you enter a mindset, you enter a new world.
   In one world- the world of fixed traits-
Success is about proving you're smart or talented.
   Validating yourself.
In the other-the world of changing qualities-
It's about stretching yourself to learn something new.
   Developing yourself.
(Dweck, 2008, p. 15)

This section of the literature review focuses on providing an understanding of what is mindset, in general, and in mathematics, and the current state of the literature on mindsets. Dweck (2016) defines mindset as how a person’s individual beliefs influence actions. Numerous studies have explored the effects of a growth mindset on students’ achievement levels. Student achievement shows increases when they believe their intelligence is not fixed and can be improved through effort and learning (Anderson et al., 2018; Blackwell et al., 2007; Boaler, 2016, 2019; Dweck, 2016; Yeager & Dweck, 2012, 2020). While these ideas of mindset and subsequent effects on students are established in the field, there is less research on the effect mindsets have on teachers. Due to the recent discoveries about the malleability of mindsets (Sun, 2018, 2019) this section of the literature review research seeks to understand what is known in the field about the ways mindsets relate to instruction and beliefs, and some possible interventions to strengthen growth mindsets.

Mindset Theory

Carol Dweck (2016) is the pioneer of the mindset theory, also known as entity theory, and incremental theories of intelligence. Although critics claim that the idea is not
entirely new, Dweck’s research builds on Alfred Binet’s research in her book *Mindset: The New Psychology of Success*. Alfred Binet, a French psychologist, spent his career focusing on creating the first intelligence test (IQ) which led to his reported findings that a person’s intelligence is not fixed and can change over time (Dweck, 2016). Dweck used his findings but created her own approach. Her studies focus on analyzing the effects these mindsets have on people’s perception of their abilities, handling of successes and failures, challenges and risks. Dweck reported that the "view you adopt for yourself profoundly affects the way you lead your life" (Dweck, 2008, p. 6).

Dweck delineated two different mindsets: fixed and growth. Persons believing that they are born only with a certain amount of intelligence and cannot expand it are said to have a fixed mindset. Dweck found that when people with a fixed mindset experience success, it is often attributed to luck, instead of their own hard work and perseverance. Often people with a fixed mindset see failure as a permanent label and feel the need to continually justify or prove themselves (Boaler, 2016; Dweck, 2016). Boaler (2019) posited that fixed mindsets are prevalent in mathematics both in teachers and students.

The other type of mindset is a growth mindset- When people believe they can enhance their intelligence incrementally, that intelligence is changeable and can develop through learning and effort, they are said to have a growth mindset (Dweck, 2016). For example, students with a growth mindset understand that intelligence can be improved through continuous effort and that they can persist despite setbacks and learn from their mistakes (Dweck, 2016; O’Brien et al., 2015). Dweck’s (2016) research found that about 40% of students have fixed mindsets, 40% have growth mindsets, with the remaining 20% fluctuate between the two. Dweck and other researchers discovered that mindsets
Mathematical Mindset

Building on Dweck’s work on mindset, Jo Boaler introduced the mathematical mindset in her *Mathematical Mindset: Unleashing Students' Potential Through Creative Math, Inspiring Messages, and Innovative Teaching* (2016). While Dweck’s work on mindset focused on understanding how a person’s belief influences their actions, Boaler (2016) refined this idea and applied Dweck’s research to mathematics to understand a person’s beliefs about how teaching and learning mathematics influences their actions. Jo Boaler defined a *mathematical mindset* as a person’s self-concept, self-efficacy beliefs, and feelings towards mathematics. In her study, Boaler found that these seven mindset messages are designed to assist students in framing how they can learn and be successful in mathematics (Boaler, 2019).

1. Everyone can learn mathematics to high levels.
2. Mistakes are valuable.
3. Questions are really important.
4. Mathematics is creative and makes sense.
5. Mathematics is about connections and communication.
6. Mathematics class is about learning, not performing.
7. Depth is more important than speed.

Boaler (2016) designed an online course for parents and teachers about mindsets. She found that many adults still had many residual negative feelings from childhood or young adult experiences of learning mathematics. Many believed that they were just not cut out to do mathematics due to not being “a math person” (Boaler, 2016). At the end of the course, many participants reported learning new ways to think about learning and teaching mathematics. Boaler (2016, p. 8) claimed “many of the elementary teachers I have worked with … have told me that the ideas I gave them on the brain, on potential, and growth mindsets have been life-changing for them”.

**Relationship Between Mindsets and Teachers**

In recent times, more studies are investigating the relationships between mindsets and teachers. Researchers claim that teachers’ negative beliefs and mindsets add to low student achievement levels and low student interest in mathematics, particularly with diverse populations (Boaler, 2009). Even more troubling is that many studies reveal how teachers’ beliefs affect their instructional decisions, perpetuate stereotypes, and how they may handicap student learning with a fixed mindset (Boaler, 2020; NCTM, 2019; Sun, 2018; 2019). NCTM (2014) reported that teachers unknowingly and, in some cases, knowingly too, use unproductive instructional practices that send negative mindset
messages and perpetuate unfair stereotypes in traditionally marginalized students like females, minorities, and students with a lower socioeconomic status (NCTM, 2014).

In Boaler’s 2013 study, she examined seven teachers and how their instructional practices varied and represented a range of mindsets and beliefs. Her findings indicated that even though the “language” of a growth mindset was prevalent (for example, some teachers even used the words ‘growth mindset’ during instruction or words pointing to the importance of perseverance and effort) in some cases, the instruction observed contradicted the growth mindset messages being voiced. Kawinkamolroj and colleagues (2015) add to this argument with findings that teachers hold such strong beliefs and mindsets of intelligence and mathematical ability that it affects their abilities to view learning new strategies or see new approaches as valuable or necessary.

*A Growth-oriented Approach*

While there is still so much to be learned about brain plasticity, another new line of research has come to light concerning mindsets, pointing to the importance of adopting a strengths-based approach to overcome fixed mindsets and assist teachers in viewing all students as competent and capable of doing mathematics (Aguirre et al., 2013; Gutiérrez, 2018). This is similar to the researchers’ findings regarding mathematical identity and focusing on using students' funds of knowledge (building on children's questions, interests, culture, community-based knowledge, and experiences) (Gutiérrez, 2018). Swandener (2012, p. 8) implored the field to “reconceptualize all children as ‘at promise’ for success, versus ‘at risk’ for failure”. Boaler (2019) believed that it is common practice for teachers to have deficit discourse about students and mathematics. She contended that changing these common deficit discussions will require teachers to view students and
mathematics through a different lens. Numerous video club studies show that teachers looking for students’ mathematical strengths can radically change their beliefs about students’ mathematical abilities (Hand, 2012; Sherin, 2007; van Es & Sherin, 2009). In addition, some studies explored the side effects when teachers changed their mindsets and started to view students as capable; they found teachers beginning to interact and engage with students differently (Sherin, 2007; Sherin & van Es, 2008; van Es & Sherin, 2009).

Critics counter with the argument that learning to observe strengths and taking advantage of mathematical moments to assist students in showing their strengths is one of the most challenging teaching skills (Rattan et al., 2015, 2017; Rosean et al., 2008; Schoen & LaVenia, 2019). Teachers are immersed in a culture that focuses heavily on the limitations of students, especially in mathematics (Boaler, 2020). Students are often described as falling behind, lacking basic skills, incapable of complex problem-solving, a “Tier 2” student, or a student not proficient in grade-level standards. Many schools use professional development time to focus on highlighting and discussing such deficits. Developing a strengths-based model runs counter to years of focusing on filling holes in students' knowledge and closing achievement gaps (Boaler, 2009; 2019). Sherin and van Es (2008, p. 28) contend, "we are unknowingly trained to identify learners' mistakes and misunderstandings. We analyze what students do not know or cannot do, and then we try to close the gap with what they need to understand".
**Hindering with Handicapping Strategies**

Some researchers contend that the issue is more problematic than teachers conveying negative mindset messages (Boaler, 2009, 2019; Chestnut et al., 2018; Rattan et al., 2015, 2017). Research shows that some teachers’ strong fixed mindsets lead them to believe that they are powerless to assist struggling students, due to the notion that students’ abilities in mathematics are unchangeable. In one study, the researchers found that this mindset left teachers considering their efforts fruitless, making them continue to use instructional strategies that meet the needs of only a few students (Kawinkamolroj et al., 2015).

Stipek and colleagues (2001) found that teachers with a more fixed mindset tended to use increased levels of handicapping strategies (e.g., lessening workload, attributing failures to lack of ability). Rattan et al.’s (2012) university-level study discovered that mathematics teaching assistants heavily relied on “kind” strategies, such as assigning less work or changing the numbers for struggling students. Boaler et al. (2002, p. 638) added to the findings with students’ reports that when they struggled with mathematics, they would receive what they perceived as “baby work”. Boaler interviewed students from classes considered low-achieving and found that "students were particularly concerned about the low level of their work and talked at length about teachers ignoring their pleas for more difficult work" (Boaler et al., 2000, p. 635). Comparatively, students considered high performers were just “supposed to know it all” (p. 636). These expectations communicated a fixed mindset to students, where mathematical ability is not developed through persistence and effort but is just something
that one has or does not. NCTM (2014) found that teachers often see such handicapping mindset messages as a positive way to handle students. Critics claim that it sends strong fixed mindset messages that mathematics is too difficult and that students might be incapable of learning it (Boaler, 2019).

**Dispelling the “Math Person” Myth**

Another type of handicapping found in the research is providing “comfort” feedback, for example, making statements like, “It’s ok, not everyone is a math person.” (Boaler, 2019). Boaler (2016) found that the widespread idea of only certain people being capable of being mathematicians in our United States education system has led to the common negative mindset that there are those of "us" capable of doing mathematics and "others" who are not. The field concurs that this belief and mindset that only some people are "math people" is highly ingrained in our education culture (Boaler, 2019; Esmonde, 2009; Gutiérrez et al., 2017; Hand, 2012).

In mathematics, a prevalent kind of praise focuses on having a “math brain”, having the “math gene”, or just being a “math person” (Boaler, 2019). Boaler believes this is problematic because when students struggle in mathematics, they will attribute it to just not being a “math person”, instead of seeing that students learning something new in mathematics can take time and understanding will accrue through multiple experiences. For example, LeGrand (2015) found that females report being better at reading than mathematics even when their test scores did not support this belief. He found that many females may have inaccurate negative beliefs that they are not a “math person”. Hottinger (2016) reported another aspect to this finding, of some teachers believing that certain students have superior intelligence because they are more mathematically competent and
praising them as being naturally gifted or for being born with innate talents for mathematics. Researchers also found that students the teacher viewed as less capable in mathematics claimed were considered doomed to struggle with mathematics because of their “inferior intelligence and capabilities”. A key finding of the study was that many teachers place students in one of these two groups, and there is minimal cross-over.

**Tracking is Prevalent in Mathematics Education**

Sun (2019) and Boaler (2019) contended that more students and teachers have fixed mindsets in mathematics than in any other subject in school. Boaler (2010) believed that mathematics is a discipline that maintains systems promoting a fixed mindset for students and teachers. For example, Leslie et al. (2017) conducted interviews with professors from more than 30 fields. Professors were asked whether students needed a special "gift" to succeed in their subject in college. The gift that the researchers were referring to is the natural ability to be successful in a subject area with little to no training. The researchers found that a large majority of mathematics professors felt that to be successful, students needed a mathematics gift.

Many researchers claimed that the handicapping process is nothing new; it has been there since the inception of mathematics education in the United States (Larson & Kanold, 2016; NCTM, 2014). Gutiérrez and colleagues (2018) found that as early as the 1900s, only students showing “promising abilities” received higher-level mathematics instruction (Gutiérrez et al., 2018). This was the start of this line of thinking of offering advanced-level mathematics classes only to a select few (Boaler, 2020; Larson & Kanold, 2016). Ellis and Berry (2005) uncovered that this handicapping practice—giving only a small part of the population a rigorous mathematics education—continued largely
unchecked until the 1970s because mathematics knowledge was not considered valuable in most vocational, consumer, or industrial vocations till then.

Tracking students according to perceived ability is so integral to our mathematical system that it has led districts to create complex tracking systems (Boaler, 2020; NCTM, 2014). Some proponents claimed that a tracking system puts students in the highest mathematics class they are able to handle so they can be successful at it (Boaler, 2020). However, other researchers argued that these tracking systems have the opposite effect and perpetuate several negative perceptions of mathematics held by teachers and students (Boaler et al., 2000; Gutiérrez, 2018).

In one study, Boaler interviewed students from classes considered low achieving and found "students were particularly concerned about the low level of their work and talked at length about teachers ignoring their pleas for more difficult work" (Boaler et al., 2000, p. 635). The problem is compounded because some studies find that once some of these students are moved back to the regular mathematics class, it sometimes fails due to students’ limited understanding, their lack of skill set development, and limited teacher scaffolding of materials to meet individual students’ needs (Aguirre et al., 2013; Gutiérrez et al., 2018; Murphy et al., 2007;). Chestnut et al. (2018) found that teachers with a stronger fixed mindset tend to use traditional, procedural teaching methods. Stipek et al. (2001) concurred that such teachers tend to rely heavily on procedures and focus on students having the correct answers, rather than on their displaying strong conceptual understanding.

Therefore, these handicapping strategies connect to negative stereotypes and may lead to self-fulfillment of the stereotypes, increased levels of anxiety, decreased feelings
of competence, and lower achievement levels (Aguirre et al., 2013; Gutiérrez et al.,
2018).

**Developing Mathematical Identity**

Some researchers warned that if these feelings and mindsets are not addressed with different mindsets, students could enter a dangerous cycle of having a fixed mindset, low mathematics achievement, and having negative mathematics identities throughout their education and career (Aguirre et al., 2011; Beilock & Maloney, 2015; Chestnut et al., 2018). Through this research, a relatively new idea has come to light: mathematical identity. *Mathematical identity* is the “dispositions and deeply held beliefs that students develop about their ability to participate and perform effectively in mathematical contexts and to use mathematics in powerful ways across the contexts of their lives” (Aguirre et al., 2013, p. 14). Just as students have mathematical identities, so do teachers: as students themselves, as mathematicians, and as teachers.

Researchers are finding that mathematical mindsets and mathematical identity are closely connected due to learning experiences positively or negatively impacting their identity (Anderson et al., 2018; Sun, 2018, 2019). Mathematical identity is intertwined with each person’s other identities and can be influenced by teachers, parents, friends, and social media (Hottinger, 2016; Aguirre et al., 2013). Cooley (1902) coined the term “looking glass self,” which finds that one’s perception of oneself is partly influenced by how others perceive one. For example, Bouchey and Harter (2005) found the students’ perceived understanding of the beliefs of their parents and teachers about learning
mathematics and the students’ capabilities mirrored what students believed about their own competence in mathematics.

Researchers contend that to strengthen mathematical identity, teachers need to build on students’ funds of knowledge (Gutiérrez et al., 2018). The term *funds of knowledge* refers to relating mathematics to, and building on, children’s questions, interests, culture, community-based knowledge, and experiences. Other studies recommend other ways as well to strengthen a person’s mathematical identity: (a) have students feel that their ideas and work are valuable, (b) position the students as knowledgeable, and (c) build a community of math doers (Hufferd-Ackles et al., 2015). Through positive experiences and understanding how identity plays a significant role in mindsets, teachers can, in turn, examine their own identity; indeed, teachers’ self-image is reflected in their teaching practices (Gresalfi & Cobb, 2011). Dweck (2007, p. 9) claimed that “as educators, we want all of the students we teach to profit from our efforts...a growth mindset—ours and theirs—helps students to seek learning, to love learning, and to learn effectively”. There is a need to add to the understanding of how mathematical identity relates to mindsets.

**Neuroscience Research on Brain Plasticity**

Recent neuroscience studies are beginning to focus on dispelling the “math person” myth with this new line of research on the brain’s neuroplasticity (Anderson et al., 2018; Boaler, 2019; Luculano et al., 2015; Woollett & Maguire, 2011). Neuroplasticity is the brain's ability to change, adapt, and grow as needed. Researchers in neurology agree that a brain can be strengthened and has the ability “to actually change
its physical structure as a result of learning” (Mercola, 2015, p. 15). Some studies report findings of the brain changing, rewiring, and strengthening (Maguire et al., 2006; Woolett & Maguire, 2011). Even more, researchers point to increased brain activity occurring when students make mistakes and struggle with solving problems (Boaler, 2016; Moser et al., 2011). Other studies add to the findings by showing that individuals' brains change due to neuroplasticity, especially when students engage in rigorous instruction (Ackles et al., 2015; Gresalfi & Cobb, 2011).

In 2019, Boaler published Limitless Mind: Learn, Lead, and Live Without Barriers, a sequel to her Mathematical Mindsets (2009), extending her discussion about neuroplasticity. She focused on examining and explaining the six keys to having a limitless mind. Her first, third, and fourth keys to a limitless mind focus heavily on brain research. Her first learning key is “every time we learn, our brain forms, strengthens, or connects neural pathways” (Boaler, 2019, p. 13). Her third key focuses on when beliefs shift, teachers’ bodies and brains transform as well. Her fourth key is that “neural pathways and learning are optimized” (p. 101) when considering a multidimensional approach to learning.

Some critics in the neurological field question some of Boaler’s findings, terming them neuromyths, a misinterpretation of neuroscience (Simms, 2016). Boaler wrote that “every time a student makes a mistake in math, they grow a synapse” (p. 11). She cited in support a study by Moser et al. (2011), which focuses entirely on how increased levels of growth mindset were related to the level of focus given to (non-mathematical) inhibition tasks for 25 graduate students. The scientific blogger and neuroscientist known as Neuroskeptic claims that this study does not support Boaler’s finding and does not even
connect with our understanding of synaptic brain growth (Neuroskeptic, 2016). These incongruencies result in the Neuroskeptic labeling many of Boaler’s claims as neuromyths and criticizing that her mathematical mindset book fails to “accurately present scientific evidence and theory […] and creates] perpetuations of neuromyths” (Simms, p. 319). This line of research about brain plasticity is new and there is still much to be understood.

**Interventions to Create a Mathematical Growth Mindset Culture**

According to Boaler (2019), to enable viewing students as competent and capable, a growth mathematical mindset culture should be created. Research finds it increasingly important to assist every mathematics teacher in learning how to develop a growth mindset culture by using growth mindset interventions. Researchers have discovered positive effects from different specific targeted growth mindset interventions (Boaler, 2019; Dweck, 2008; Trzesniewski & Dweck, 2007). While critics claim that mindset research is still unproven, researchers are increasingly beginning to confirm the undeniable importance of assisting students in having a growth mindset, especially in mathematics (Simms, 2016; Sun, 2018, 2019).

All these mindset interventions focus on involving students in rich experiences in mathematics, with teachers supporting their learning with positive mindset messages. The difference is how the mindset messages are embedded in the instruction. For example, researchers claim that growth mindset interventions are effective at countering the threats of damaging stereotypes about achievement in mathematics. For instance, Boaler (2016) developed a mindset intervention as an 18-lesson summer mathematics program for
middle school students. Many students started with fixed mindsets, a negative disposition towards mathematics, and low achievement. Students even proclaimed that they were not a “math person” but could name a student back at their school who was a “math person”. After 18 lessons focusing on building students’ mindsets and the beauty of mathematics, students’ scores on average increased by 50% from the pretest to the posttest. The test was provided by the school district. In interviews, many students claimed that their outlook on mathematics and their beliefs about their abilities in mathematics had changed.

Other researchers are also finding effective interventions for building positive mindsets in mathematics. Sun (2018) developed the Math Teaching for Mindset Framework (MTMF), which focuses on four classroom instructional practices teachers can use to strengthen a growth mindset and counter the narrative of negative mindset messages. She divided the framework into four main categories: (1) sorting, (2) norm-setting, (3) engaging in mathematics, and (4) providing feedback and assessing. In describing the first category of sorting, Sun’s studies refer to the “expectation that all students will contribute to and be able to successfully ‘do’ the math” (2018, p. 341). Her findings show that the framework assists teachers in examining and reflecting on their practice.

Anderson and colleagues (2018) also designed an approach to increasing positive mindsets. It is based on four principles: (1) content-focused, (2) active learning and inquiry, (3) coherence with state standards, and (4) building a community of learners. Their major finding was that having principals and teachers engage in the same professional learning fosters teachers’ modification of mathematics instruction. Two
other significant findings were that a growth mindset increases students' achievement and increases the quality of instruction. These researchers identified five large categories of mathematical mindset practices: (1) growth mindset culture, (2) nature of mathematics, (3) challenge and struggle, (4) connections and collaboration, and (5) assessment. These researchers use a rubric to provide insight into different mathematical mindset practices that affect planning, teaching, assessing, and reflecting. This not only allows teachers to self-assess and reflect on where they are on this mindset practice but also to use the rubric criteria to further enhance their level of use of mathematical mindsets.

**Praise Intervention**

Another intervention showing possibilities of counteracting some mindset messages is the practice of changing the kinds of praise teachers voice during instruction. For example, studies discovered that students who were praised for having a growth mindset or for their high level of effort tend to be more willing to try to overcome obstacles and try multiple iterations to achieve success (Dweck, 2016; Skipper & Douglas, 2012). Praising abilities in mathematics—while well intentioned—may also result in adverse effects. In these studies, those who receive praise for their intelligence tend to focus more on appearing smart and getting good grades. This is especially so with gifted students, who may fear losing their label of giftedness, and hence choose not to engage in activities considered difficult or challenging.

In 2007, Bronson published an article called “How Not to Talk to Your Kids: The Inverse Power of Praise”. This article popularized the study of Blackwell and colleagues (2007) by discussing how to modify a single sentence of praise, namely, “You must be smart at this”, into a phrase that is more growth mindset oriented: “You must have
worked hard at this.” This article garnered public support and started many parents, teachers, and administrators examining the types of praise they were heaping on students and the effects thereof.

Some earlier studies laid the groundwork for understanding the effects of praise. For example, Mueller and Dweck (1998) found that praising students for their abilities can significantly negatively affect student motivation, compared to praising them for effort. Their study examined these ideas with fifth-grade students and found that students praised for intelligence were more likely to show less persistence and motivation than students praised for effort. Similarly, praise focusing on gender, race, or socio-economic status (SES) can also negatively impact students. Meyer (1992) too found the effects of well-intentioned praise. For example, when students were praised for an easy task, they reported feeling that the teacher perceived that they had low abilities. On the other hand, if a teacher criticized students during a challenging task, they were more likely to report that they were perceived as having high abilities.

Other studies found that if the praise or feedback was specific, it resulted in students putting in more effort to improve their work and acquiring higher reported levels of growth mindset (Boaler, 2019; Yeager et al., 2012, 2020). Cimpian and colleagues (2010) explored the effects of giving general feedback, such as “Girls are good at math”, versus very specific language feedback “Lucy is working hard on constructing a justifiable argument for her solution” on students’ motivation. It was found that students who receive general feedback were more likely to be less motivated and less apt to enjoy the task. Research is needed to examine the effects of praise and feedback on a person’s mindset.
**Summary of Mindsets**

Researchers agree that mindset messages are being conveyed to students daily in mathematics classes, which can have positive and negative effects. Dweck says, “Mindsets are just beliefs” (2008, p. 16), but more and more studies are pointing to the powerful effect beliefs have on teachers and how they approach lesson design, see students in the classroom, implement instruction and incorporate ideas from professional development into their practice (Boaler, 2019; Sun 2018, 2019). Professional learning could provide an appropriate avenue to explore mindsets and beliefs because many teachers unknowingly employ a fixed mindset about teaching and learning mathematics. This mindset may inadvertently lead some teachers to employ handicapping strategies supposed to be “kind” and “caring” yet have the opposite effects on students by sending damaging messages. It is important to understand how to dispel myths like only certain people are “math people” and citing the current brain plasticity research may not be enough to change mindsets and beliefs. More work is needed in the field to understand how to assist teachers in recognizing handicapping teaching strategies and how to have teachers examine these beliefs and mindsets effectively. Some researchers point to the positive effects of having teachers use mindset interventions with students. The interventions vary from shifting praise, but for an intervention to be successful, it needs to be tied to providing time for teachers to reflect on how these new practices and mindsets fit in with their current practices. While these interventions have been successfully used by themselves, it is not clear how the design or structure is most helpful to teachers with fixed mindsets.
Anderson et al. (2018) found that unless teacher professional development begins to incorporate ways to explore and examine minds and beliefs, teachers’ instructional practices are unlikely to change. A lack of complete understanding persists on how to design a teacher professional development that has teachers exploring their mindsets about teaching and learning mathematics (Anderson et al., 2018; Sun, 2017).

**Theoretical Lens and Perspective**

This study employs a *sociocultural paradigm* to understand how teachers discuss and reflect on their instructional practices. The sociocultural perspective finds that interactions influence learning (Rieber & Carton, 1987). Specifically, Vygotsky stated that social interactions with more knowledgeable peers are essential to learning. This effect on learning is not limited to how peers influence learning, but also encompasses how learning is affected by beliefs and attitudes. Indeed, mathematics educators and researchers are just beginning to understand more about how a mathematical mindset mediates and filters teachers’ belief systems (Boaler, 2009, 2019; Anderson et al., 2018), which impact instructional planning, decision-making, students’ views, and how instruction is implemented (Ball & Forzani, 2011; Dweck, 2016). For example, some educators believe that only certain people have innate abilities for mathematics, while others are bound to always struggle with the subject. When applied to teachers’ video club professional development, these differing beliefs help explain why teachers react differently when interacting with peers in a collaborative context and how such experiences shape their beliefs and future instructional decisions.
While the *sociocultural theory* is the overarching theoretical framework for understanding the concepts in this study, the *situated learning theory* of Lave and Wenger (1991) explained how adults learn within a community. Situated learning theory stresses the importance of considering the context and location of learning (Greeno, 2006). Specifically, Borko (2004) posited that teacher learning should be embedded in situations where they will apply the knowledge, such as in the classroom. Lave and Wenger’s (1991) description of the situated learning theory contends that participation in communities of practice improves how teachers apply their learning and knowledge. *Communities of practice* are “groups of people who share a concern, a set of problems, a passion about a topic, and who deepen their knowledge and expertise by interacting on an ongoing basis” (Wenger et al., 2002, p. 4). The situated perspective also contends that teacher learning improves as their participation becomes more meaningful in an ongoing community of practice, which creates a positive feedback loop (Greeno, 2006; Lave & Wenger, 1991). Within these practices, the participants’ identities shape how they learn from the group. Incorporating the situated learning theory in this framework provides insights into how specific contexts and experiences contribute to thinking, learning, and knowledge development (Boaler, 2002; Greeno, 2006). Fundamentally, researchers believe that learning and knowledge development are built through community involvement (Greeno, 2006; Lave & Wenger, 1991). Video clubs are a context where teachers can reflect and refine their instructional practices through an authentic discourse community.

Lave and Wenger (1991) contended that teachers might initially hesitate to engage in video clubs, resulting in peripheral participation, where participants begin
learning from the periphery, but as they become more involved in the group, participation and learning grow. A vital aspect of peripheral participation is that participants’ roles evolve as they process information and replicate the community’s behaviors. Due to this aspect, such participation provides space for participants to build cognitive apprenticeships while the community models and then leverages the reflection processes (Wenger, 1998). Each participant’s mindset and beliefs influence how and what they learn from the video club community. As this community of practice learns and grows together, participants become part of the shared development of artifacts, routines, techniques, stories, and histories (Lave & Wenger, 1991; Wenger, 1998). Incorporating the situated learning theory provides insights into how specific contexts and collaborative experiences contribute to thinking and learning (Boaler, 2019; Greeno, 2006).

**Conceptual Framework**

This final section introduces a conceptual framework that was used for this mixed-methods study to understand how the experience of engaging in a video club professional development relates to teachers’ mindsets, beliefs, and reflections on instructional practices. The purpose of this mixed-methods study is to provide a deeper understanding of how the experience of engaging in a specific professional development that included repeated reflective and collaborative practices assisted teachers in (re)examining their current beliefs and mindsets related to teaching mathematics (Anderson et al., 2019; Ball & Cohen, 2011; Boaler, 2020).
This conceptual framework is formulated broadly with the sociocultural paradigm and incorporates critical ideas from the situated learning theory, as shown in Figure 1. The central point of the framework is professional development in video clubs. This professional development involves teachers engaging in a four-step video cycle: (1) collaboratively planning the video club lesson, (2) orchestrating the routine and capturing it on film, (3) individually reflecting on instruction, and (4) collaboratively discussing the video club. Mindset practices are at the center of the cycle because they are infused in every step. This video club cycle is modified from McDonald et al., 2013, and van Es and Sherin, 2009.
This conceptual framework is based on three different relationships:

1. Relationship between engaging in video club cycles and teachers’ beliefs and mindsets

2. Relationship between reflective practice and instruction

3. Relationship between collaborative reflective discussions and instruction

These three relationships informed this study’s research questions, methods, and professional development design, as they are not yet well-understood in the literature.

The causal arrows point in both directions, as each creates a feedback loop, with the other
component also strengthening as one gets stronger. It is consequently not clear which element is playing the larger role in strengthening teachers’ practices, but this study focuses on the relationships. In the following section, I will explain the relationships between these concepts in more detail.

**Relationship Between Video Clubs and Teachers’ Mindsets**

This study adopts a situated learning perspective, positing that learning occurs over time through peer interactions (McDonald et al., 2013). Indeed, studies have found that repeated experiences of teachers collaborating and focusing on student thinking can change instructional practices and build growth-oriented mindsets (Boaler, 2020, Dweck, 2017). Lave and Wenger (2002, p. 111) found that participants’ experiences in communities of practice resulted in “an increasing sense of identity as a master practitioner”. When teachers are a part of a process that plans, orchestrates, reflects, and then discusses the videos, it can create an environment that challenges teachers’ beliefs and mindsets regarding students’ abilities (van Es et al., 2015). As teachers begin to see students as more competent, they increasingly develop a growth mathematical mindset, prompting them to fully engage in examining their instructional practices throughout the video club cycle (Boaler, 2016, 2019). This process can have reciprocal effects; each time teachers strengthen their instructional approach, this change can increase feelings of success and change mindsets and beliefs about students, the teaching, and the learning of mathematics (Dweck, 2017).
**Relationship Between Reflective Practice and Instruction**

Over time, as teachers learn from their peers in an ongoing community of practice, their participation and involvement strengthen (Greeno, 2006; Lave & Wenger, 1991). The collaborative sharing of instructional practices provides a means to reflect on personal practices. Further, participating in a community of practice results in teachers becoming part of the shared development of instructional techniques, strategies, artifacts, and histories (Lave & Wenger, 1991; Wenger, 1998). Such shared development is created from being reflective and being open to learning from each other.

**Relationship Between Reflective Discussions and Instruction**

Implementing new instructional practices is a complicated endeavor that involves an in-depth reflection of one’s current beliefs about student learning and abilities (Boaler, 2019). Participating in video club professional development creates a safe space for teachers to adopt more effective instructional practices (Borko et al., 2008; Sherin et al., 2009). The focus of the 2021-22 Video Club was to engage in and plan short instructional routines as grade-level teams. When collaborating in instructional planning and video club discussions, teachers can examine student thinking, interpret student models, ask questions, press others’ thinking, and critically analyze instructional moments in a collaborative manner, which strengthens their critical analysis skills (Hand, 2012; Jilk, 2016; Sherin, 2007). These repeated cycles of using videos for self-examination lead to strengthening teachers’ observation, reflection, and orchestration skills within instructional routines for their video club communities of practice (McDonald et al.,
Video club studies demonstrate positive effects on changing instructional practices (Gamoran Sherin & van Es, 2008; Lampert 2010; McDonald et al., 2013; Sherin & Dyer, 2017; van Es 2009, 2012). Video clubs provide a platform for collaborating, reflecting, and refining practices in a safe environment (Rosaen et al., 2008; Sherin & Dyer, 2017; Sherin et al., 2011), as well as for deep reflection and analysis to help strengthen teachers’ in-the-moment decision-making skills (Castro et al., 2019; Hand, 2012; Sherin, 2007; van Es & Sherin, 2009). It is necessary to explore these relationships in more depth and gain a greater understanding of how the experience of engaging in a video club professional development relates to teachers' mindsets, beliefs, and reflection on instructional practices.

**Literature Review Summary**

This study seeks to fill the gaps in our current understanding of how using video club professional development relates to teachers' mindsets, beliefs, and reflection on instructional practices. Changing a teacher’s instructional practices, beliefs, and mindset is not an overnight fix. Numerous parents, teachers, and administrators still subscribe to fixed mindset messages, such as believing that people are either capable or not at mathematics (Boaler, 2019). Many math educators find it challenging to change procedure-based instructional practices and mindsets (Boaler, 2016; Darling-Hammond et al., 2017; NCTM, 2014). Researchers have determined that while some teachers have growth mindsets, they also may continue to adhere to fixed mindsets in certain situations or with specific content (Dweck, 2016; Sun, 2018, 2019).
Additionally, teachers continue to struggle with how isolating it can be as a learner to try and implement effective instructional practices. NCTM consequently suggests a shift towards more collaborative approaches that can create a positive learning environment for teachers (NCTM, 2014). Many studies show positive results from using collaborative professional development to address persistent unproductive beliefs, fixed mindsets, and ineffective teaching practices (Aguirre et al., 2013; Ball et al., 2014; Boaler, 2016, 2019; Dweck, 2017; NCTM, 2014). Mason (2011) found that collaboration creates a space for teachers to reflect on their practices and to “imagine themselves in the future acting and responding more appropriately than before” (p. 38). When a teacher attends to students’ thinking and the visible models of their thinking, it can change deficit viewpoints and mindsets and allow teachers to view their students as mathematically capable (Boaler, 2016). Other studies agree that collaboration is essential and suggest a need to embed professional development into actual teaching practice (Sherin & van Es, 2008; Star & Stickland, 2008; van Es et al., 2015). Gaps remain in our understanding of how to design a professional development plan that capitalizes on collaborative design, allows for reflective practices, and provides teachers with a safe way to examine their mindsets.
Chapter III Methodology

The purpose of this mixed-methods study (Creswell & Creswell, 2018; Creswell & Plano-Clark, 2018; Saldana, 2016) is to provide a deeper understanding of how the experience of engaging in video club professional development relates to teachers' mindsets, beliefs, and reflection on instructional practices. This study narrows the focus of the relationships on how instructional practices are affected when teachers and instructional coaches engage in multiple reflective and collaborative practices while examining their current beliefs and mindsets related to teaching mathematics in a video club professional development.

To meet this aim, the central research questions guiding this study are as follows:

1. What is the relationship between teachers’ mindsets and beliefs before, during, and after engaging in a year-long video club professional development?
2. What is the focus of the teachers' written reflections during the video club professional development, and how does it change over time?
3. When teachers collaboratively reflect on their instruction using video, what are the discussion patterns and trends?

The rationale for using a convergent parallel mixed-methods design is to draw on the strengths of both qualitative and quantitative approaches to interpret the multi-faceted aspects of teachers' collaboration, reflections, beliefs, and mindset (Creswell & Plano-Clark, 2018). Consistent with the convergent parallel mixed-methods design, I first collected and analyzed qualitative and quantitative data simultaneously from Barratt
School District's (a pseudonym) 2021-22 Video Club Professional Development Package. Then, I found convergent and divergent results. Thus, this study's results benefited from qualitative and quantitative data analysis to answer the research questions, while also providing both insight and generativity.

In this chapter, I present the methods and methodology of the study. This chapter begins by describing my approach to the study and I clarify my positionality as a researcher. Next, I describe the previous pilot studies that I completed on this topic and how they led to revisions and improvements in the 2021-22 Video Club Professional Development Package. Then, I provide a detailed description of the setting, participants, materials, the consent process, and the 2021-22 Video Club Professional Development Package. Following that, I describe the process I employed to analyze and interpret the data. I conclude this chapter by explaining the anticipated contributions.

**Approach to the Study**

First, it is important to understand the approach to designing this study. I strategically decided to wear two hats when preparing for this study, to ensure a clear distinction of roles. First, I created and implemented the 2021-22 Video Club Professional Development Package as a district leader. As per the district's norms of professional development, teachers enrolled in the course using the professional development system. To earn the credit for the course, teachers were required to attend all sessions and complete all assignments, projects, and reflections. Throughout the professional development, I collected data from multiple sources: such as exit tickets, written reflections, responses to the Implicit Theories of Intelligence Inventory (Dweck,
2008), videos of collaborative discussions, lesson planning evidence, lesson plans, videos of instruction, classroom artifacts, and teachers’ discussions. This data was used to individually assist and provide specific feedback to teachers so that they could reflect on ways to refine and advance their instruction. The Barratt School District Mathematics Department also used the data for program improvement.

After completing the 2021-22 Video Club Professional Development Package, I donned my researcher hat. I was particularly interested in focusing on three sources of data: videos of teachers' collaborative discussions, written reflections (about the sessions and their instruction), and survey responses to the Implicit Theories of Intelligence Inventory (Dweck, 2008). I offered a $100 stipend to incentivize teachers to participate in the study. All participants opted to share their data. Using these three data sources, I applied a mixed-methods convergent parallel approach and conducted a much more extensive and in-depth examination of the data sources.

Table 3 outlines the study's quantitative and qualitative data sources and analysis. The table is organized by the study's research questions, data sources, instrument, and analysis.
Table 3

Outline of Research Questions, Instruments/Data Sources, and Analysis

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Instrument/Data Source from the 2021-22 Video Club Professional Development Package</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ#1 What is the relationship between teachers’ mathematics teaching/learning mindsets and beliefs before, during, and after engaging in a year-long video club professional development?</td>
<td>Implicit Theories of Intelligence Inventory (Dweck, 2008)</td>
<td>Quantitative Analysis Descriptive Statistics, ANOVA, Multiple Linear Regression (Creswell &amp; Creswell, 2018)</td>
</tr>
<tr>
<td>RQ#2 What is the focus of the teachers' written reflections during the video club professional development, and how does it change over time?</td>
<td>After filming their instruction and each video club session, teachers and instructional coaches completed written reflections.</td>
<td>Qualitative Analysis Thematic Coding (Saldana, 2016)</td>
</tr>
<tr>
<td>RQ#3 When teachers collaboratively reflect on their instruction using video, what are the discussion patterns and trends?</td>
<td>Video of Teachers’ Video Club Discussions</td>
<td>Qualitative Analysis A priori coding (van Es &amp; Sherin, 2008)</td>
</tr>
</tbody>
</table>

Role and Positionality of the Researcher

I am a middle-aged, Caucasian bilingual (Spanish/English) female in my twenty-fifth year of education. I was a teacher, a mathematics coach, instructional coach, and now I serve as the District Administrator in charge of K-12 Mathematics for a large suburban district. As a District Leader, I leveraged my knowledge of the district's professional development protocols and curriculum expectations for teachers to save valuable time learning about the intricacies of the district and the nuances of how professional development is conducted (Creswell & Creswell, 2018; Creswell & Plano-Clark, 2018). My knowledge, experience, and position were advantageous due to the trust
and rapport built with teachers in the district. This, in turn, enabled more effective data collection than possible for an outsider (Creswell & Creswell, 2018).

In addition to my most recent position in the district, I position myself as a mathematics educator, informed by my 25 years of experience as a district administrator, mathematics coach, and teacher. This experience framed my interactions with participants and added to their comfort levels because of my positive, interactive approach to professional development. Further, these experiences made me more relatable, given that I have been in their role and can position myself as a teacher (Dwyer & Buckle, 2009). In fact, according to Creswell and Creswell (2018), a researcher who has a depth of understanding of the study under examination can increase the reliability and validity of the study. However, I was careful that my leadership role did not endanger the validity of the results; accordingly, I collected data after the conclusion of the professional development. Further, I chose to start the research after the professional development ended to prevent any possible coercion, as my position could create a power dynamic that might make participants feel powerless to do anything other than consent.

Pilot Projects

I piloted the video club professional development design model in the fall and winter of 2019 and spring of 2020. I used the participants' feedback from the piloted professional development experiences to strengthen the delivery by modifying the reflection protocols, rewriting discussion facilitation questions, and redesigning the scaffolds for the video club cyclic framework. In particular, three significant and two minor changes were made. The first significant change to the design was to change the
group dynamics from static, similar grade-level groupings to dynamic groupings at the
district level (similar grade levels, mixed school groups, and mixed grade level) and
school level (vertical teams of 3rd-6th teachers at the same school). This change was due
to numerous teachers reporting returning to their school and having vertical team
discussions with peers on their own. Many expressed in their written reflections that they
would have loved vertical grade level and grade level discussions, believing that these
conversations would provide a richer understanding of the instructional routine and how
it builds in the third, fourth, fifth, and sixth grades. Additionally, having video clubs at all
three levels—the district, school, and the class—assists with (a) individual teachers being
able to apply it to their classrooms, (b) strengthening reflective practices at the school
level community with peers, and (c) providing opportunities for teachers to gain
knowledge from the larger district level community.

Another critical change was adding more explicit mindset activities to each
session so that teachers could (re)examine and reflect on their beliefs during professional
development. The feedback was that the mindset needed to be more integrated into
professional development because teachers needed more time to collaboratively reflect
and figure out how to integrate the ideas into their instruction. The last change was the
addition of instructional coaches from the participating teachers' schools. This added
another level of support for the teachers at the school level for support with video and
implementation of instructional routines. This change was pivotal because it also
strengthened the district's ability to enhance and refine instructional coaches' skills. It also
built the coaches’ conceptual knowledge and increased their capacity to lead discussions
focused on students’ thinking and teachers’ instructional moves. Interestingly, each change these teachers suggested increased collaboration and reflective opportunities.

There were two minor changes. First, I found that attention needed to be paid to building a collegial environment. Teachers needed time to get to know each other and make connections. So, I decided to include relationship-building questions and activities throughout the session. Additionally, participants needed clarity about all the components of the video clubs. I increased clarity by creating a graphic that described each step of the cycle so teachers could easily reference what was to be expected during each part of the cycle, as well as reviewing the goals and purpose of the video club each session. I added the theme of football, as football players regularly viewed film to improve their practice, and this was something participants could relate to as a practice that improved performance. All these revisions and refinements were incorporated into the design of the 2021-22 Barratt School District Video Club Professional Development Package. The following section will describe the participants and the setting of the study.

Participants and Setting

Seventy-seven third through sixth-grade teachers and fifteen instructional coaches (n = 92) representing 14 elementary schools participated in this study. The elementary schools are located in Barratt School District in the mountain west portion of the United States. There are more than 2,500 teachers in the Barratt School District K-12. The teacher demographics are 80% White, 1% Black, 12% Hispanic, 3% Asian, 1% Pacific Islanders, and 2% ascribed to two or more races. Table 4 displays the participants’ data by demographic characteristics.
Table 4

Demographic Characteristics of Video Club Participants (n=92)

<table>
<thead>
<tr>
<th></th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>82</td>
<td>89%</td>
</tr>
<tr>
<td>Male</td>
<td>10</td>
<td>11%</td>
</tr>
<tr>
<td>Job Description</td>
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<td></td>
</tr>
<tr>
<td>Teacher</td>
<td>78</td>
<td>85%</td>
</tr>
<tr>
<td>Instructional Coach</td>
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<td>15%</td>
</tr>
<tr>
<td>Years of Experience</td>
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<td></td>
</tr>
<tr>
<td>1-3</td>
<td>5</td>
<td>5%</td>
</tr>
<tr>
<td>4-6</td>
<td>21</td>
<td>23%</td>
</tr>
<tr>
<td>7-10</td>
<td>22</td>
<td>24%</td>
</tr>
<tr>
<td>11-20</td>
<td>25</td>
<td>27%</td>
</tr>
<tr>
<td>21-30</td>
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<td>17%</td>
</tr>
<tr>
<td>31-40</td>
<td>4</td>
<td>4%</td>
</tr>
<tr>
<td>Grade Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd Grade</td>
<td>8</td>
<td>10%</td>
</tr>
<tr>
<td>4th Grade</td>
<td>28</td>
<td>36%</td>
</tr>
<tr>
<td>5th Grade</td>
<td>18</td>
<td>23%</td>
</tr>
<tr>
<td>6th Grade</td>
<td>24</td>
<td>31%</td>
</tr>
</tbody>
</table>

The breakdown of the teachers’ grade levels was eight third grade teachers, 28 fourth grade teachers, 18 fifth grade teachers, and 24 sixth grade teachers. The histogram in Figure 2 represents each participant's years of teaching experience. The mean of the participants’ (n=92) years of experience is 13.09 years (s= 8.710). The range of experience was from 1 year to 38 years. There is a large cluster of participants (n=25), with 21% who have 11-20 years of teaching experience with 73% of them having more than seven years of experience ranging from 7-36 years. This is an essential component of the data analysis due to the minimal research in this area with experienced teachers; the large majority of the literature in the field focuses on pre-service and novice teachers with an n-size around ten.
A power analysis was used to determine the required number of participants. The analysis indicated that for multiple linear regression analysis with three predictors, a minimum sample size of 40 is required to yield a statistical power of at least .8 with a large effect size ($f^2 = 0.35$) and an alpha of .05.

**Description of Video Club Professional Development Package**

The 2021-22 Barratt School District Video Club Professional Development Package was designed using the most current research on mathematics professional development (NCTM, 2019), video clubs (van Es et al., 2017), and mathematical mindset (Anderson et al., 2018; Boaler, 2019; Sun, 2018, 2019). Consequently, the Package sessions followed a predictable structure. There are three different clubs: (1) four 8-hour long District Level Video Clubs, (2) four 2-hour long School Level Video Clubs held at
individual school locations, and (3) at least three Classroom Level Video Clubs. This is depicted in Table 5.

### Table 5

**2021-22 District Video Club Professional Development Cycles**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Early Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>District Video Club</strong></td>
<td>Final Reflection on 1st Routine with Grade Level Peers Explore Your Mindsets and Beliefs about Mathematics Engage in Routine as an Adult Learner Collaboratively Plan with Grade Level Peers Across the District</td>
<td>Final Reflection on 2nd Routine with Grade Level Peers Explore Your Mindsets and Beliefs about Mathematics Engage in Routine as an Adult Learner Collaboratively Plan with Grade Level Peers Across the District</td>
</tr>
<tr>
<td><strong>Classroom Video Club</strong></td>
<td>Orchestrate the Routine in Your Classroom Capture the Routine on Video with Swivl Individually Reflect on Your Film</td>
<td>Orchestrate the Routine in Your Classroom Capture the Routine on Video with Swivl Individually Reflect on Your Film</td>
</tr>
<tr>
<td><strong>School Video Club</strong></td>
<td>Explore Your Mindsets and Beliefs about Mathematics In vertical teams, reflect on routine orchestration</td>
<td>Explore Your Mindsets and Beliefs about Mathematics In vertical teams, reflect on routine orchestration</td>
</tr>
<tr>
<td><strong>District Video Club</strong></td>
<td>Final Reflection on 3rd Routine with Grade Level Peers</td>
<td></td>
</tr>
<tr>
<td><strong>School Video Club</strong></td>
<td>Explore Your Mindsets and Beliefs about Mathematics In vertical teams, reflect on final 3rd routine orchestration</td>
<td></td>
</tr>
</tbody>
</table>
Each session focused on laying the groundwork, setting procedures, and enacting designed components that would assist in teachers' successful implementation of video club cycles at the district, classroom, and school levels. To clarify each step in the video club cycle, I designed a 5-step Video Club Collaboration Cycle with Action Steps. Figure 3 describes big ideas to consider in the five parts of the video club professional development cycle.

**Figure 3**

*Five-Step Video Club Collaboration Cycle with Action Steps*

These are, in order: Step 1: Collaboratively plan the orchestration of the instructional routine; Step 2: Orchestrate the instructional routine and capture it on film; Step 3: Individually reflect on instruction; Step 4: Meet other teachers for a Video club collaborative discussion; Step 5: Engage in reflective processes about mindset.
The 2021-22 Video Club Professional Development Package design focused on four components:

1. creating a vision, purpose, and expectations for video clubs,
2. increasing the effective implementation of three instructional routines,
3. (re)examining personal mindsets and beliefs, and
4. engaging in collaborative, reflective practices.

**District Level Video Club**

To provide clarity on the vision and purpose of video clubs, I outlined five expectations for the district-level video club:

1. Have fun learning about yourself as a math person and math teacher.
2. Actively participate and all video club gatherings.
3. Engage in all four parts of the video club cycle.
   
   Part 1: Lesson plan with grade-level peers
   
   Part 2: Orchestrate the task and film yourself
   
   Part 3: Use the Individual Self Reflection on Video Clip Protocol to reflect on your video clip.
   
   Part 4: Engage in the video club collaborative discussions while teachers are sharing their video clips.
4. Use the provided time to reflect on your beliefs, feelings, mindsets, and practices to develop yourself as a learner and teacher.
5. Keep all information shared in communities of practice confidential to maintain a safe collegial environment.
To further teachers' understanding of the critical components of a video club professional development, I grounded the work using Meg S. Bates, Cheryl Moran, and Lena Phalen’s article “Supporting Excellent Teaching of Common Core Content and Practices with Video Clubs” (2017). Bates and colleagues share experiences about how using video clubs assists teachers in implementing the state mathematics standards and increasing rich mathematical discourse in the classroom. This article became one of the guiding documents teachers referenced throughout the professional development at the district, classroom, and school-level video clubs.

Another critical component of the video club was to build a collegial atmosphere. Teachers were divided into grade-level teams, school groups, and vertical teams. They engaged in collaborative discussions on different topics to assist them in getting acquainted. In addition, they made connections to their practices or experiences (see Appendix A for further details). These activities were integrated into every session and served to assist teachers in connecting and enabling them to see the strengths of their different team members.

**Implementing Three Specific Instructional Routines**

The professional development focuses on three main instructional routines—number talks/visual images (Humphreys & Parker, 2015; Parrish, 2014; Parker & Humphreys, 2018; Shumway, 2011, 2018), and five practices for orchestrating productive mathematics discussions (Smith & Stein, 2018), and three-act tasks (Lomax et al., 2017). I chose these instructional routines because each routine requires planning, focuses on building student thinking, builds conceptual understanding, and calls for specific teacher
moves. In the afternoon session of each professional development, teachers engaged in an instructional routine (number talks, five practices, or 3 acts) as adult learners (see Appendix B for more details). This provided them an opportunity to engage in the instructional routine as a learner, before planning to implement the same instructional routine with their students. The professional development strongly encouraged participants to learn mathematics the way that they would teach mathematics. This is not pretending to be a fourth grader but authentically engaging in mathematics as an adult learner. After engaging in the routine, teachers viewed a short video clip of a teacher modeling the routine. Next, they were asked to compare their own experiences with what they had watched in the video. Then, there was a discussion about what mathematics in the instructional routine talks. Finally, teachers and instructional coaches identified key features and teacher moves used during the instructional routines that helped highlight student thinking.

Following this discussion, teachers worked in their grade level teams to strategically plan to implement the instructional routine. The lesson planning for each instructional routine centered on three key aspects:

1. preplanning questions and actions to assist in orchestrating the routine,
2. preplanning teacher moves to provide opportunities for students to justify, prove, and explain their reasoning, and
3. preplanning tools to assist students in making their thinking visible (Zager, 2017).

While numerous and different mathematical routines are available, these routines were strategically selected due to having the potential to be applied to other areas of
mathematics and multiple grade levels. The following section will describe each type of instructional routine in more detail.

**Number Talks/Visual Images**

The purpose of this instructional routine is to increase students’ flexibility with numbers by developing an understanding of number relationships and increase sense-making by using the structure of numbers. Number talks and visual images are a short (approximately 10-15 minutes) instructional routine that focuses on strengthening students’ number sense through a mental math exercise. The students are asked to solve a problem or series of problems and share their thinking orally with peers in a whole group setting (Humphreys & Parker, 2015; Parker & Humphreys, 2018; Parrish, 2014; Shumway, 2011, 2018). The problems selected can be solved in a variety of ways. This routine provides a rich mathematical environment where teachers and students can gain insights into others’ thinking by hearing their thought processes and approaches to finding a solution to the problem.

**Five Practices for Orchestrating Productive Mathematics Discussions**

This instructional routine is designed to assist the teacher in orchestrating a productive mathematics discussion by using six components:

1. First, anticipate students' solutions and strategies to a mathematics task.
2. Monitor students as they grapple with tasks in assessing and advancing questions.
3. Select approaches and methods to share with the class to move students' thinking forward.
4. Sequence students’ presentations purposefully to maximize the development of understanding.

5. Connect students’ approaches and the significant mathematics.

6. Recently, a Practice 0 has been added, focusing on planning and goal setting (Smith & Stein, 2018).

Some key features are to be understood while working to implement the five practices. The first critical feature is that the task selected needs to have an entry point for multiple levels of students, as referenced by some researchers as having a high floor and low ceiling (Boaler, 2016). The other key is the problems that need to involve decision-making. The final key point is that strategies are strategically selected and ordered for sharing for developing conceptual understanding. This instructional routine can vary from 15 minutes to 60 minutes.

**Three Act Tasks**

Dan Meyer, a secondary educator, developed 3 Act Tasks (Lomax et al., 2017). This mathematics task has three distinct parts called acts. In Act 1, the teacher shares a piece of engaging information with the students, such as a video, image, or situation. Students notice, wonder, generate questions and make estimates about the situation. In Act 2, students design strategies and approaches to solving the task. Students may request additional information and materials to strengthen their approach. They share their approaches, thinking, and solutions in the final Act. The teachers should assist students in synthesizing the information by comparing solutions and connecting them to the mathematical goal of the task. This task can last from 10 minutes to more than an hour.
Strategically Planning to Implement the Instructional Routines

To assist each teacher in feeling prepared to orchestrate the lesson plan in their classroom, participants received a lesson planning kit (See Appendix B) for number talks/visual images (Humphreys & Parker, 2015; Parker & Humphreys, 2018; Parrish, 2014; Shumway, 2011, 2018), (2) five practices tasks (Smith & Stein, 2018), and (3) three act tasks (Lomax et al., 2017). An example of a planning kit for “Number Talks” is shown in Table 6. A more detailed explanation of the kits is found in Appendix B.

Table 6

Lesson Planning Kit for Routines: Number Talks and Visual Images

<table>
<thead>
<tr>
<th>Number Talks and Visual Images</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All About the Routine</strong></td>
</tr>
<tr>
<td>● Explanation of the routine</td>
</tr>
<tr>
<td>● Research on the routine</td>
</tr>
<tr>
<td><strong>Orchestration of the Number Talks and Visual Images</strong></td>
</tr>
<tr>
<td>● Sample Lesson Plan</td>
</tr>
<tr>
<td>● Sample Lesson Planning Template</td>
</tr>
<tr>
<td>● Two Videos of Teachers Implementing the Routine</td>
</tr>
<tr>
<td>● Tech Tools that Support Implementation</td>
</tr>
</tbody>
</table>

I stored the planning kit on a 2021-22 Video Club Professional Development canvas course to provide continued access to teachers for years to come. Each kit included a complete explanation of the routine, research on that instructional routine, a
sample lesson plan with a planning template, a video of the teacher implementing the routine, and technology tools to support implementation.

**Opportunities For (Re)Examine Mindsets and Beliefs**

One portion of each professional development session was dedicated to having participants collaboratively engaging in tasks that cause teachers to (re)examine their mindsets and beliefs about the teaching and learning of mathematics. Studies report benefits from teachers engaging in strategically designed mindset interventions (Anderson et al., 2018; Laskasky, 2018). To add to the collective understanding of mindset, each teacher received a copy of *Mathematical Mindsets- Unleashing Students’ Potential Through Creative Math, Inspiring Messages, and Innovative Teaching* by Jo Boaler. Due to the sometimes-sensitive nature of mindsets, each mindset session had a similar structure, and the whole group did not share most of the discussion ideas. I did this to ease anxiety and promote safety while critically examining mindsets. Each mindset session included short video clips, a chapter discussion with guided questions, a small group discussion using guided questions, and a final reflective discussion. The same overarching question was used in each final discussion “How does this mathematical mindset idea fit into your current beliefs about teaching mathematics?” See Table 7 for an example of the mathematical mindset lesson plan.
Table 7

Example of Mathematical Mindset Book Study Lesson Plan

| Have the teachers read Chapter 1 in Mathematical Mindsets to set the stage for the discussion. |
| Review of norms. |
| Watch two short video clips. |
| **Video Clip #1** Mindsets |
| **Video Clip #2** Brain Plasticity |

Facilitate the Mindset Discussion with Facilitation Questions.

**Mindset Facilitation Questions**

1. What are your thoughts on the latest brain research?
2. Why is learning about brain plasticity important?
3. How does this apply to teaching mathematics or planning for mathematics?

Overarching Question:

How does this mathematical mindset idea fit into your current beliefs about teaching mathematics?

For a complete list of mindset activities used for this book discussion and discussion facilitation guide, see Appendix C.

Classroom Video Club

After completing the District level video club, the teachers shifted to a classroom-level video club with their students. The teachers were strongly encouraged to film multiple iterations of the routine, as filming it multiple times increases the comfort level of the teacher and the students with having a camera in the classroom. Following the filming of their instruction, teachers reflected on their instruction electronically, using the Individual Self-Reflection on Video Clip Protocol Document (see Appendix D). The
reflection protocol was available as a Word template. Teachers completed the form and submitted it electronically to the Canvas course. This reflection protocol had the participants view the video thrice. The first viewing asks teachers to cite specific timestamps of instances where (a) students interact with peers to justify and explain their reasoning, (b) students make thinking visible, and (c) teachers strategically orchestrate the discussion by using math talk moves and other conversational tools. If the teachers did not find evidence of these practices, they cited a possible timestamp for incorporating that practice into the routine and described the insertion. After watching their video clip, the second viewing focused on what pleased, surprised, and concerned the teacher. The teacher could choose to respond to all three prompts or focus on one. The final part of the reflection was for teachers to select a portion of their video to share with their peers and determine the next steps for instruction.

**School Level Video Club**

The next step was for teachers to meet at the school level with their coach and peers in third to sixth grade. The instructional coach was the facilitator and used the Video Club Facilitation Discussion Guide shown in Table 8.
Table 8

*Video Club Facilitation Discussion Guide*

<table>
<thead>
<tr>
<th><strong>Video Club Sharing of Videos</strong></th>
<th><strong>Video Club Facilitation Questions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Discussion</strong></td>
<td><strong>Look For:</strong></td>
</tr>
<tr>
<td>1. Have teachers choose a short video clip to share with their peers.</td>
<td>* Students discussing and interacting with peers to justify, prove, and explain their reasoning</td>
</tr>
<tr>
<td>2. Teachers can share by using the discussion questions from the reflection form.</td>
<td>* Students making their thinking visible through models, showing thought processes, etc.</td>
</tr>
<tr>
<td>3. To facilitate the discussion, use the article as a guiding tool. It is linked here. Use the questions for open discussion. If appropriate, you can use the content or practice questions as well. It would be great to give each teacher a copy of the questions again. They are found at the bottom of this form.</td>
<td>* Teacher guiding and strategically orchestrating the discussion using math talk and other conversation tools (Revoicing, Restating, Wait Time, Prompting, Applying Reasoning).</td>
</tr>
</tbody>
</table>

**Open Discussion Questions**

1. What did you notice?  
2. What are the questions you have about the clip?  
3. You said ______. Can you tell us more about that? What evidence can you state for that?  
4. What questions does the teacher ask to help students focus on the mathematics in the task?

**Reflect on Practice**

Finally, have the teachers reflect on the School Video Club experience. Discuss the reflection questions as a group. Have the teachers discuss the reflection questions as a group, then fill out the reflection form in Canvas.

**Reflective on Practice Questions**

1. How did today’s School Video Club challenge or align with your current beliefs and mindsets about teaching mathematics?  
2. What did you learn from today’s video club session?  
3. What did you learn from collaboratively discussing instructional routines using videos?  
4. Which part of the school discussion was the most impactful and why?

Instructional coaches led the meetings and used the Video Club facilitation questions, while teachers shared their videos. To conclude every session, time was set
Aside for teachers and instructional coaches to reflect on their practice and their learning from the session using these four reflective prompts:

1. How did today’s School Video Club challenge or align with your current beliefs and mindsets about teaching mathematics?
2. What did you learn from today’s video club session?
3. What did you learn from collaboratively discussing instructional routines using videos?
4. Which part of the school discussion was the most impactful and why?

**Building Skillset with Video Equipment**

A critical component for filming instruction is learning to utilize the technology effectively. Each participating school received the following materials: iPad, Swivl device, four microphones, a cloud-based video editing platform, and yearlong access to TeachFX, an app that provides feedback to audio recordings. I also connected teachers to a specific district technology specialist, who was available for technical help and to assist the teacher in setting up and using the recording equipment to film themselves over the school year. Teachers learned how to use technology by completing three "super tech challenges" as a grade-level team. The challenges increased teachers' comfort levels with editing, uploading, storing, sharing, and selecting video clips for video clubs. See Table 9 for the three challenges.
Table 9

*Super Tech Challenges*

<table>
<thead>
<tr>
<th>Purpose: The challenges are designed to increase teachers’ comfort level with editing, uploading, storing, sharing, and selecting video clips for video clubs.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Challenge 1: Filming</strong></td>
</tr>
<tr>
<td>● Review of Nasos Papadopoulos’s article Why Your Mindset Matters and How to Improve It. Decide how to share two big ideas from the article (e.g., a commercial, news report)</td>
</tr>
<tr>
<td>● Film your concept. Check for quality sound and video.</td>
</tr>
<tr>
<td>● Upload the Video to the Swivl platform. Save the Video in this format GROUPNAME, DATE VIDEO #1. Share it on Canvas.</td>
</tr>
<tr>
<td><strong>Challenge 2: Using the Microphones and the Swivl App</strong></td>
</tr>
<tr>
<td>● Figure out how to set up the Swivl.</td>
</tr>
<tr>
<td>● Place microphones at four different points in your designed classroom.</td>
</tr>
<tr>
<td>o Film a short speech about anything and have group members sit at each table and talk.</td>
</tr>
<tr>
<td>o Check for quality sound and video.</td>
</tr>
<tr>
<td>● Upload the Video to the Swivl platform. Save the Video in this format GROUPNAME, DATE VIDEO #2. Share it on Canvas.</td>
</tr>
<tr>
<td><strong>Challenge 3: Selecting a Portion to Share and Putting Time Stamps on Your Video</strong></td>
</tr>
<tr>
<td>● Film a short discussion about 5 minutes about the best restaurants in the city.</td>
</tr>
<tr>
<td>● Select two different time points to share with the group and tag them with the video software. Check for quality sound and video.</td>
</tr>
<tr>
<td>● Upload the Video to the Swivl platform. Save the Video in this format GROUPNAME, DATE VIDEO #2. Share it on Canvas.</td>
</tr>
</tbody>
</table>

Each of the challenges focus on an aspect of technology that some teachers might struggle with. This is an effort to have teachers collaboratively learn together how to engage with the technology. In the first challenge, teachers focused on sharing two big ideas from the article and chapter one in a creative format (e.g., a commercial or news report) using the equipment. Next, they checked for the quality of sound and video. Then, teachers uploaded the video to the Swivl app and saved the video in this formatted title: GROUP NAME, DATE VIDEO #1. The last step was to share the video on Canvas. Sharing on Canvas was to prepare the teachers to learn how to submit their own videos.
from their classrooms. The second tech challenge focused on how to use the microphone and the Swivl app. The last tech challenge was about selecting a portion of a video to share and how to place timestamps at certain time points in the video. Each school had a specific technology specialist available for assistance during these super tech challenges. By completing each of these challenges, teachers increased their sense of community and improved their abilities to use the technology required in the video club professional development.

In conclusion, the 2021-22 Barratt School District Video Club Professional Development Package was designed and implemented, focusing on four main components: (1) creating a vision, purpose, and expectation for video clubs, (2) learning to orchestrate three instructional routines, (3) (re)examining personal mindsets and beliefs, and (4) engaging in collaborative, reflective practices. These components were designed to follow a predictable structure that capitalizes on these components to create an impactful learning experience.

Data Collection and Analysis

This mixed-methods study utilized a convergent parallel design. This research process is symbolized as qualitative and quantitative (QUAL+QUAN). A convergent parallel design entails the researcher conducting the quantitative and qualitative elements in the same phase of the research process, weighing the methods equally, analyzing the two components independently, and interpreting the results together (Creswell & Pablo-Clark, 2018). This research design was appropriate, as it compared and combined
quantitative statistical information with two types of qualitative findings from written reflections and video discussions regarding how the experience of engaging in video club professional development relates to teachers' mindsets, beliefs, and reflecting on instructional practices. This design focuses on comparing and summarizing data from different sources to identify points of convergence and divergence, as well as issues of inconsistency or dispute (Creswell & Plano Clark, 2018). A benefit of this research method is that each data piece is analyzed individually, and comparing data strengthens its interpretation and triangulation (O'Leary, 2017). I suited the research questions for the quantitative survey, the qualitative written reflections, and video discussions for a juxtaposed comparison related to the research questions. This research aimed to gain a deeper understanding of how the experience of engaging in video club professional development relates to teachers' mindsets, beliefs, and reflections on instructional practices, as well as how instructional practices are impacted by specific and intentional video club professional development that included repeated reflective and collaborative practices providing space for teachers to (re)examine their current beliefs and mindsets related to teaching mathematics (Anderson et al., 2019; Ball & Cohen, 2011; Boaler, 2019).

Consent Process

The Institutional Review Board (IRB) reviewed and approved study #12434. See Appendix E for the email, advertisement, and recruiting script consent forms. District-level permission was also granted to conduct the study, and individual principals were notified; see Appendix F for details. The consent process started with participants being
invited to participate in the study during the last 2021-22 Barratt School District Video Club professional development session. A script was prepared and read to the participants. The script described the risks, benefits, and the consent process. It clarified that this is a minimal risk research study as all data is de-identified, and the identity of participants would not be revealed in any publications, presentations, or reports resulting from this research study. Although participants did not directly benefit from this study, they benefitted by being a part of an engaging, reflective, and collaborative learning experience. After the professional development ended, participants received an advertising flyer and email about participating in the study.

Participants were given two weeks to decide about participating in the study. Their consent allowed the me access to video recordings, reflections, and survey results from the 2021-22 Barratt School District Video Club Professional Development Package, as shown in Table 10. To determine each participant's approval or denial of consent, participants were sent an email from the doctoral chair with a link to a Qualtrics survey. All participants received the survey and were asked to either decline or consent. They were assured that their participation was entirely voluntary and they could withdraw at any time by contacting the me. By agreeing to participate in the study, teachers and coaches were compensated with $100.
Table 10

Data Sources

<table>
<thead>
<tr>
<th>Written Reflections</th>
<th>Video and written transcripts of collaborative discussions</th>
<th>Implicit Theories of Intelligence Inventory (Dweck, 2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One written reflection for each session</td>
<td>5 video recordings of video club discussions Three videos, approximately 60 minutes each Two videos, approximately 12 minutes each</td>
<td>Pre-, Mid-, and Post-Inventory Results</td>
</tr>
<tr>
<td>Total of 6 Reflections (3 District Level and 3 School Level)</td>
<td>Total of roughly 3.5 hours of video For every 5-6 teachers</td>
<td>Total of 3 Inventories per Person</td>
</tr>
</tbody>
</table>

Prior to the analysis, all the quantitative and qualitative data was organized and placed in a secure, password-protected drive. Each participant was assigned an identification number, which replaced their names on all pieces of data. I used this identification number to pair demographic information, survey data, lesson reflections, session reflections, and video club videos. The participants’ data was securely stored in a restricted-access folder in an encrypted, cloud-based storage system.

Quantitative Data Source and Analysis

The quantitative data source and analysis focused on answering:

RQ1: What is the relationship between teachers’ mindsets and beliefs before and after engaging in a year-long video club professional development?
Two data sources were used to answer this question: the teachers’ years of experience and the final scores from the Implicit Theories of Intelligence Inventory (Dweck, 2008) given at the beginning, middle, and end of the professional development. The entire inventory is found in Appendix G. The data were analyzed using descriptive statistics, ANOVA, and multiple linear regression. Table 11 outlines the variables, data sources, and instruments of the quantitative portion of this study.

Table 11

*Study's Variables, Data Sources, and Instruments*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Instrument Name</th>
<th>Variable Name</th>
<th>Number of Items</th>
<th>Format of Item</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variable</strong></td>
<td>Implicit Theories of Intelligence Inventory (Dweck, 2008)</td>
<td>Y = Mindset Post Score</td>
<td>8</td>
<td>6-point scale</td>
</tr>
<tr>
<td><strong>Independent Variables</strong></td>
<td>Demographics - Years of Experience</td>
<td>X₁ = Years of Experience</td>
<td>1</td>
<td>Interval Data</td>
</tr>
<tr>
<td></td>
<td>Implicit Theories of Intelligence Inventory (Dweck, 2008)</td>
<td>X₂ = Pre-Mindset Score</td>
<td>8</td>
<td>6-point scale</td>
</tr>
<tr>
<td></td>
<td>Implicit Theories of Intelligence Inventory (Dweck, 2008)</td>
<td>X₃ = Mid Mindset Score</td>
<td>8</td>
<td>6-point scale</td>
</tr>
</tbody>
</table>
Instrumentation

I gave the Implicit Theories of Intelligence Inventory (Dweck, 2008) thrice (at the beginning, middle, and end) during the 2021-22 Barratt School District Video Club Professional Development Package. The Implicit Theories of Intelligence Inventory (Dweck, 2008) is an 8-item inventory survey. Dweck (2000, 2006) designed the inventory on the premise that individuals’ beliefs are deeply ingrained and filter how they view their interactions and experiences. The inventory is constructed to determine how an individual views intelligence as either a fixed and immutable entity (entity theory; fixed mindset, or entity belief) or as a dimension that can be changed or improved upon with effort (incremental theory; growth or incremental belief). Dweck (2008) found this scale’s correlations between the entity and incremental domain scores typically moderate to large, and internal consistency reliability high. Cronbach's Alpha value indicated high internal consistency.

Quantitative Analysis

To analyze data from the inventory and demographic data, each participant was assigned an ID number, which replaced their name on the inventory and was used to pair demographic information with pre-, mid-, and post- inventory results. To further organize this data, an excel database was created, organizing each of the inventory survey’s items with participant responses and ID numbers. All submissions had a set of three assessments: pre-, mid-, and post. Due to some of the test items being written in a
positive direction (numbers 1, 3, 5, and 7) and others in a negative direction (2, 4, 6, and 8), the test responses were re-coded to enable comparisons by item and domain. Participants rated each statement using a six-point scale: 6 = strongly agree; 5 = agree; 4 = mostly agree; 3 = mostly disagree; 2 = disagree; 1 = strongly disagree.

Assumptions and Reliability

Before beginning parametric analysis, I examined the data to ensure the scale's reliability. Cronbach's alpha determined the reliability of the participants' responses from the pre-test to the mid-test to the post-test. Additionally, I assessed the assumptions of normality, absence of multivariate outliers, sphericity, homoscedasticity of residuals, and absence of multicollinearity. The normality assumption requires that the residuals of the repeated measures ANOVA follow a normal distribution (a bell-shaped curve). Normality was assessed graphically using a Q-Q scatterplot (Bates et al., 2014; Field, 2017). For the assumption of normality to be met, the quantiles of the residuals must not deviate strongly from the theoretical quantiles. The normality assumption of residuals assumes that the residuals of the regression model follow a normal distribution (a bell-shaped curve). Normality was examined with a Q-Q scatterplot of the residuals (Field, 2017; Bates et al., 2014). The assumption of normality was met due to the quantiles of the residuals not deviating strongly from the theoretical quantiles.

There were no strong deviations that indicated that the parameter estimates were unreliable. Next, multivariate outliers were determined by calculating Mahalanobis distances on the residuals (Newton & Rudestam, 2012) and comparing them to the .999 quantile of a $\chi^2$-distribution with the degrees of freedom being $n-1$, where $n$ is the number
of measurements conducted on the dependent variable. No outliers were present that needed to be removed from the data before analysis. Sphericity requires that the mean differences between each pair of combinations of the measurements over time must have equal variance. Mauchly's test for sphericity was conducted to examine this assumption (Field, 2017; Mauchly, 1940). The assumption of sphericity was not violated ($p < .05$), obviating the need for using Greenhouse-Geisser corrections to adjust for the violation of sphericity (Greenhouse & Geisser, 1959). Homoscedasticity assumption requires no underlying relationship between the residuals and the fitted values. The assumption was examined with a scatterplot of the residuals and the fitted values (Creswell & Creswell, 2018; Creswell & Plano Clark, 2018; Field, 2017), and homoscedasticity was met, as the points appeared randomly distributed with a mean of zero and no apparent curvature. Next, the absence of multicollinearity assumption implies that the predictor variables are not too highly correlated and were assessed using variance inflation factors (VIF). There were no VIF values over 10 to suggest the presence of multicollinearity (Menard, 2009). Finally, a lack of outliers is determined as any observation with a studentized residual (Field, 2017; Pituch & Stevens, 2015) that exceeds the .999 quantile of a $t$-distribution, with the degrees of freedom being $n-1$, where $n$ is the sample size.

After meeting assumptions and reliability, I inspected the data using descriptive statistics using only central tendency, variability, and frequencies, as these measures are appropriate for using Likert scale data. Next, I compared the total composite scores from all the pre-, mid, and post-inventories using a repeated-measures ANOVA, which is an appropriate analysis when the goal is to assess whether significant mean differences exist on the dependent variable (mindset scores) by time (pre vs. mid vs. post). The repeated-
measures ANOVA was used to test the effects of a continuous dependent variable measured over time. To analyze the results, the $F$-test was used to determine whether there were any significant differences at a significance level, $\alpha = .05$. There were significant effects, so paired $t$-tests were conducted using Tukey comparisons to determine where the differences lay.

Besides the repeated measures ANOVA, I used multiple linear regression analysis to assess whether the independent variables ($X_1=$years of experience, $X_2=$ pre-mindset score, $X_3=$ mid-mindset score) predict the dependent variable ($Y=$ post-mindset score). Multiple linear regression is an appropriate analysis when the goal is to determine whether there is a predictive relationship between a set of predictor variables on a dependent variable. Therefore, the regression equation (main effects model) was $Y =$ Post-mindset score $= B_0 + B_1 \times$ years of experience $+ B_2 \times$ pre-mindset score $+ B_3 \times$ mid-mindset score $+ B_4 \times$ post-mindset score $+ \ldots +$, where the Bs are the unstandardized beta coefficients.

The $F$-test was used to assess whether the independent variables (years of experience and inventory scores) collectively predicted the dependent variable (post-mindset score). Additionally, $R$-squared, the multiple correlation coefficient of determination, was reported. The $R$-squared value determined how much variance in the final mindset score can be accounted for collectively by the independent variables. The model was significant, so $t$-tests determined the significance of each predictor. Beta coefficients determined the magnitude of prediction for each independent variable. For significant predictors, for every one-unit increase in the predictor, the final mindset score will increase or decrease by the magnitude of the unstandardized beta coefficient.
Qualitative Data Sources and Analysis

Two data sources were subjected to qualitative analysis: individual electronic written reflections and videos of video club discussions.

Written Reflections

There were two types of written reflections: reflection on the professional development sessions and reflections on instruction. The written reflections were analyzed using open coding. While coding, I referenced (1) my theoretical and conceptual framework and (2) the goals of this study. Then, I open-coded and developed axial codes in a six-step process. First, I familiarized myself with the reflections by reading each reflection and taking analytical notes. Next, I highlighted sections of the reflections and developed open codes to describe the content. I reviewed the codes, identified patterns, and started to categorize the codes to determine axial codes and themes. For example, the axial codes of Scary and Intimidating, Leveraging the Many Advantages of Video, and Growth in Instruction formed the theme “Video is a Powerful Tool.” Once I created the major axial codes and themes, I rechecked the participants’ reflections to see whether the axial codes and themes broadly represented the data. Finally, I used the positive incidents when codes are present and negative incidents when codes are absent to define and operationalize the axial codes and themes. These
definitions established relations between the axial codes and themes. Finally, direct quotes were collected to depict the themes more clearly.

**Video Club Collaborative Discussions**

I collected five videos from eleven groups of teachers and instructional coaches. There were two different lengths of videos. The first type was a longer video from 48-118 minutes. There were three of these videos taken at the beginning, middle, and end of the professional development. The focus of the more prolonged filming was to reflect on the mindset as a school video club and then share their teaching video clip. The videos were filmed in eleven different school locations. The second video was a shorter video club discussion and was filmed during the Video Club professional development. These tended to last 10-14 minutes in length. The focus of these videos was to provide teachers another chance after collaborating with their peers throughout the district about the experience of orchestrating the instructional routine to discuss how to elevate their practice. There were two of these videos. The first was filmed halfway through the professional development, and the second about two-thirds of the way through. The filming of the video followed a pattern; first, the instructional coaches filmed a video club discussion with teachers discussing their video clips; a few weeks later, there was a district-wide discussion about the instructional routine, and instructional coaches filmed the teachers’ next steps about elevating their practice. This resulted in 2,316 minutes of video (five videos for each of the eleven groups), as shown in Table 12.
Table 12

Type of Video Club Collaborative Discussions with Minutes

<table>
<thead>
<tr>
<th>Video Club</th>
<th>Beginning Video Club Discussions (48-118 minutes)</th>
<th>Short Video Club District Discussions (10-14 minutes)</th>
<th>Middle Video Club Discussions (45-108 minutes)</th>
<th>Short Video Club District Discussions (10-14 minutes)</th>
<th>Final Video Club Discussions (40-101 minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Videos</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Minutes of Video Analyzed</td>
<td>684</td>
<td>131</td>
<td>694</td>
<td>126</td>
<td>681</td>
</tr>
<tr>
<td>TOTAL MINUTES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2,316 minutes of Video= 38.6 Hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Videos from the video club collaborative discussions were analyzed using *a priori* coding (Van Es & Sherin, 2010). Van es and colleagues noted that digital video data enables increased coding detail and depth by adding codes after multiple viewings.

1. *First Dimension:* Object of Focus
2. *Second Dimension:* Topic of Focus
3. *Third Dimension:* Analytic Approach
4. *Fourth Dimension:* Level of Detail
5. *Fifth Dimension:* Source of Evidence

I added a sixth dimension of mindset due to mindsets being a focus of the study as seen Table 13. The mindset dimension focused on analyzing whether the discussions focus on growth mindset ideas, fixed ideas, or were just neutral. This dimension provides a deeper understanding of how the experience of engaging in video club professional
development relates to teachers' mindsets, beliefs, and reflections on instructional practices.

Table 13

Six Dimensions Used as Coding Categories for Video Club Videos

<table>
<thead>
<tr>
<th>First Dimension Object of Focus</th>
<th>Student</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teacher</td>
</tr>
<tr>
<td></td>
<td>Professional Development</td>
</tr>
<tr>
<td></td>
<td>Self</td>
</tr>
<tr>
<td>Second Dimension Topic of Focus</td>
<td>Classroom Management</td>
</tr>
<tr>
<td></td>
<td>Climate</td>
</tr>
<tr>
<td></td>
<td>Student Thinking</td>
</tr>
<tr>
<td></td>
<td>Pedagogy</td>
</tr>
<tr>
<td></td>
<td>Mindset</td>
</tr>
<tr>
<td></td>
<td>Technology</td>
</tr>
<tr>
<td>Third Dimension Analytic Approach</td>
<td>Describe</td>
</tr>
<tr>
<td></td>
<td>Evaluate</td>
</tr>
<tr>
<td></td>
<td>Interpret</td>
</tr>
<tr>
<td>Fourth Dimension Level of Detail</td>
<td>Specific</td>
</tr>
<tr>
<td></td>
<td>General</td>
</tr>
<tr>
<td>Fifth Dimension Source of Evidence</td>
<td>Video-Based</td>
</tr>
<tr>
<td></td>
<td>Non-video Based</td>
</tr>
<tr>
<td>Researcher-added dimension Sixth Dimension Mindset</td>
<td>Growth</td>
</tr>
<tr>
<td></td>
<td>Fixed</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
</tr>
</tbody>
</table>

All the videos were uploaded in MAXQDA2020 to begin the analysis. The analysis of the video club began by first watching all the videos and making memos on each video. van Es and colleagues (2017) noted that digital video data enables increased coding detail and depth by adding codes after multiple viewings. All the videos were viewed at least four times. The first viewing focused on the content and involved making analytic memos. The second viewing focused on dividing the videos into segments. A new segment was created when the topic of the discussion changed, or a new idea was
brought up. These will be called “meaningful chunks” (Grant & Kline, 2004). Each meaningful chunk was coded using all six dimensions. A video divided into meaningful chunks using MAXQDA is shown in Figure 4.

Figure 4

Video Analysis of “Meaningful Chunks”

Note. The colors represent the six different coding dimensions.
Each meaningful chunk ranged from 25 seconds to two minutes and thirty seconds. The average length of a meaningful chunk was one minute and forty-seven seconds in the beginning. By the middle of the professional development, the meaningful chunks average increased to two minutes and seven seconds. At the end of the professional development, the meaningful chunk average increased again to two minutes and twenty-three seconds. The third viewing of the videos focused on ensuring that the meaningful chunks and codes were accurately represented in the analysis. The final viewing focused on identifying the trends and patterns in the discussions and how the video club discussions changed from the beginning to the last.

**Reliability and Validity**

Qualitative validity indicates that “the researcher checks for the accuracy of the findings by employing certain procedures” (Creswell & Creswell, 2018, p. 199). I used validity procedures to ensure the study's credibility (Creswell & Creswell, 2018; Creswell & Plano Clark, 2018). I employed several strategies to establish the trustworthiness of qualitative data: I (1) collected the data after the professional development had ended, (2) used an instrument that has high reliability and validity, (3) performed reliability checks on the coding, and (4) performed methodological triangulation of data.

**Limited Researcher Interference**

The validity of a qualitative study is affected by the interactions between me the researcher and participants. I stayed neutral during the discussions. Most of the time, I was not present during the filming of the video clubs. This allowed the participants to express their thoughts and ideas fully and without being interrupted or influenced by
body language or expressions that could suggest levels of interest or an evaluative stance (Mills & Gay, 2019).

**Data Protection**

To protect the teachers’ identities, I assigned ID codes to participants, school sites, and the school district (Creswell & Creswell, 2018). All the data sources were de-identified. Thereafter, the original data with identifiable markers were destroyed. I ensured ethical and appropriate collection and analysis of all data. To protect participants' data, the I did not allow anyone access to participants' password-protected folders. To keep the data protected at all times, I deleted the video recordings from the discussions immediately after uploading them onto the secure drive storage. All other data, including protocol tools and written reflections, were stored on the secure drive storage and will be deleted three years from the study's completion.

**Instrument Reliability and Validity**

Dweck’s Implicit Theories of Intelligence Inventory (Dweck, 2008) is a widely used inventory survey. Dweck reported that this scale’s correlations between the entity and incremental domain scores typically have been moderate to large, and internal consistency reliability for each domain score has been high. Cronbach Alpha values range from 0.88 to 0.91, indicating high internal consistency. Additionally, one of the objectives of the pilot studies was to gain information on how well this survey could answer the study’s questions. I determined that this survey would assist the best in answering the research questions. The survey was administrated via Qualtrics and saved to a password-protected drive.
Reliability Checks on the Coding

Another educator with more than twenty years of experience coded ten percent of the videos to ensure consistency of coding. The coder has experience with classroom, district level experience working with teachers, and college level working as an adjunct professor. Coding co-occurred for two videos to clarify codes and then ten percent of the videos were coded independently to provide inter-rater reliability in this portion of the analysis. The videos were randomly selected but represented the beginning, middle, and end of video club discussions. Inter-rater reliability was 91%. After coding individually, we reconvened and collaboratively discussed the observations and noted the similarities and differences. All the differences between the two coders were discussed and resolved through consensus.

Methodological Triangulation

I used methodological triangulation to increase the validity and credibility of my findings. This is one of the reasons why the study’s utilized a convergent parallel design. This was to overcome the flaws and biases that rely on a single research methodology. This allowed me as a researcher to analyze the data using mixed methods, but start with focusing on the outcomes of each method. After finding each result and findings, then I finally merged the results to find convergent and divergent findings. This triangulation assisted in: (1) improving the internal validity of the study, (2) reducing researcher bias, and (3) providing a more complete understanding of how the experience of engaging in video club professional development relates to teachers' mindsets, beliefs, and reflection on instructional practices.
The purpose of this mixed-methods study (Creswell & Creswell, 2018; Creswell & Plano-Clark, 2018; Saldana, 2016) is to provide a deeper understanding of how the experience of engaging in video club professional development relates to teachers' mindsets, beliefs, and reflection on instructional practices. This study investigated how instructional practices are impacted by specific and intentional video club professional development that included repeated reflective and collaborative practices that provided space for teachers to (re)examine their current beliefs and mindsets related to teaching mathematics (Anderson et al., 2019; Ball & Cohen, 2011; Boaler, 2019).

This chapter reports the data results using a convergent parallel mixed-methods design drawing on the strengths of both qualitative and quantitative approaches to interpreting the multi-faceted aspects of teachers' collaboration, reflections, beliefs, and mindset (Creswell & Plano-Clark, 2018). The data results are organized around the three research questions and the quantitative and qualitative results. Finally, the chapter merges the data results to discuss convergent and divergent findings.

### Quantitative Results

The first research question examined was: RQ1: What is the relationship between teachers’ mindsets and beliefs before and after engaging in a year-long video club professional development? To answer this question, I analyzed the Implicit Theories of Intelligence Inventory survey (Dweck, 2008) that was given at the beginning (pre-),
middle (mid-), and end (post-) of the video club professional development. This inventory consists of 8-questions. Participants rated their responses using a 6-point Likert scale. The Likert scale was 1=Strongly disagree, 2=Disagree, 3=Mostly disagree, 4=Mostly agree, 5=Agree, and 6=Strongly agree. Items 1, 2, 4, and 6 were recorded for analysis in a positive direction. The sum of the eight Likert scale responses created a total score, referred to as the participants' "mindset score." The post-mindset score served as the dependent variable to examine the independent variables of participants' years of teaching experience and the mindset scores given at three different time points—pre-, mid-, and post-mindset. This data was used to answer

**Internal Reliability**

Cronbach’s alpha was used to determine the internal consistency of the participants’ responses to the pre-mindset inventory, the mid-mindset inventory, and the post-mindset scores. Table 14 shows the results.

**Table 14**

*Internal Reliability of Implicit Theories of Intelligence Inventory*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Cronbach’s alpha (n=92)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre- Mindset Inventory</td>
<td>.86***</td>
</tr>
<tr>
<td>Mid- Mindset Inventory</td>
<td>.88***</td>
</tr>
<tr>
<td>Post- Mindset Inventory</td>
<td>.91***</td>
</tr>
</tbody>
</table>

***p<.001
The Cronbach’s alpha values are significantly high, indicating that the inventory for this study has demonstrated good to excellent internal consistency (Creswell & Creswell, 2018).

**Descriptive Statistics Results**

Descriptive statistics were used to evaluate the changes in the mean mindset scores from the three different periods. The mean results are a pre-mindset survey score of 36.42 (s= 6.11), a mid-mindset score of 40.93 (s=5.43), and a post-mindset survey score of 40.45 (s=6.7), as shown in Table 15.

**Table 15**

*Mean Mindset Score and Standard Deviation by Time Period*

<table>
<thead>
<tr>
<th>Time Period</th>
<th>M</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Mindset Score (n=92)</td>
<td>36.42</td>
<td>6.11</td>
<td>13</td>
<td>48</td>
</tr>
<tr>
<td>Mid-Mindset Score (n=92)</td>
<td>40.93</td>
<td>5.43</td>
<td>25</td>
<td>48</td>
</tr>
<tr>
<td>Post-Mindset Score (n=92)</td>
<td>40.45</td>
<td>6.7</td>
<td>22</td>
<td>48</td>
</tr>
</tbody>
</table>

There was a +4.51 change in the mean from the pre-mindset score (36.42) to the mid-mindset score (40.93), with only a slight decrease of -0.48 from the mid-mindset score to the post-mindset score. The largest deviation was found in the pre-mindset score with a range of 13 to 44. The range decreases with the mid-mindset score to 25-48. With the post- mindset score, the minimum decreases from 25 in the mid-mindset score to 22, but the maximum remains at 48.
Figure 5 shows a profile plot of the relative behavior of all variables in this multivariate data set (n=92). The profile plot represents each participant's pre-, mid-, and post-mindset survey score. This shows the results for the survey that was given prior to beginning the first session, at the end of the second sessions, and at the end of the last session. The profile plot helps to compare the marginal means in the model. A profile plot is a line plot in which each point indicates the estimated marginal mean of a dependent variable of the post-mindset survey score at one level of the factor, in this case, time. This profile plot analysis allowed me to see both inter- and intra-individual interpretations of test scores. I could also see the degree of similarity between observed and expected test score profiles.

**Figure 5**

*Profile Plot*

| Time Periods: (1) Beginning, (2) Middle, and (3) the End |
|------------------|------------------|
| **Note.** Mean Scores (N=92) on Mindset Survey at three time periods: Pre-mindset score, mid-mindset score, and post-mindset score. |
By utilizing both Figure 5 and Figure 6, I was able to see individual response variations and the mean. Figure 6 has a box plot depicting a graphical representation of the data for the three-time periods and indicating the variations in the standard deviation and mean scores from the numerical analysis. The data spread indicates that the pre-mindset score had a larger dispersion of data, while this lessens with mid-and post-mindset scores.

**Figure 6**

*Box Plots for Three Time Periods*

Figure 7 shows that the marginal means increased from the pre-mindset survey score to the mid-mindset survey score, but there was a minimal decrease from the mid-mindset survey score to the post-mindset score.
This result may indicate that participants' mindsets changed the most in the period after the pre- to the mid-inventory was administrated. However, this could also be evidence of a ceiling effect because many participants' mindsets scores are at or near 48, the highest possible value for the mindset score. Table 16 shows which participants had decreases from the mid- mindset score to the post-mindset score and how many points it decreased by.
Table 16

Participants’ Mindset Score Point Decreases

<table>
<thead>
<tr>
<th>Number of Participants with a Decrease Per Age Group</th>
<th>0-1 Point Decrease</th>
<th>2-3 Point Decrease</th>
<th>4-5 Point Decrease</th>
<th>6-7 Point Decrease</th>
<th>Greater than 8 Points Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5 Years</td>
<td>17</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>6-10 Years</td>
<td>14</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>11-15 Years</td>
<td>11</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>16-20 Years</td>
<td>12</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>21-25 Years</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>25+ Years</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Teachers with 0-5 years of experience showed the most decreases in scores from the mid-mindset to the post-mindset with 25% of the participants. All of the instructional coaches had more than five years of experience. The teachers and instructional coaches with 6-10 years were a close second with 21%. Most of the decreases were just by one point. Teachers and instructional coaches with 11-15 years of experience and 16-20 years of experience had similar levels of decrease points on the mindset inventory. There were still decreases with 21-25 years and 25+ years. Of the fourteen instructional coaches, only one had a decrease in mindset score and it was by one point.

ANOVA Results

The Analysis of Variance Repeated-Measures (ANOVA) was used to compare the differences of the means at three periods to determine whether and where there were any significant findings. First, I ensured the reliability of the data set of differences between mindset scores by assessing the assumptions of normality, absence of multivariate
outliers, and sphericity. Using the Mahalanobis distances formula (Varmuza & Filzmoser, 2016, p.46) on the residuals found $d_{\text{Mahalanobis}} = [(x_B - x_A)^T \cdot C^{-1} \cdot (x_B - x_A)]^{0.5}$, no multivariate outliers were present in the data set. In addition, Mauchly's test of sphericity indicated that the assumption of sphericity has not been violated, $X^2(2) = 3.002, p = .223$.

Given that the data did not violate assumptions, ANOVA was performed to compare the differences between the means of the three periods. The significance level was set at $\alpha = 0.05$. Results indicated a significant difference between the means of the mindsets between the means of the different levels of the within-subjects variable (time) ($F(2, 182) = 619.721, p < .001$). To understand where the significance lies, pairwise comparisons were made. The pairwise comparison table (see Table 17) features three unique comparisons between the means for pre-mindset survey score, mid-mindset score, and post-mindset survey score.

### Table 17

**Pairwise Comparisons for Mindset Measure**

<table>
<thead>
<tr>
<th>Time</th>
<th>Time</th>
<th>Mean Difference</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>-4.45</td>
<td>.71</td>
<td>&lt;.001</td>
<td>-5.86 - -3.03</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>-4.54</td>
<td>.81</td>
<td>&lt;.001</td>
<td>-6.15 - -2.93</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>4.45</td>
<td>.71</td>
<td>&lt;.001</td>
<td>3.03 5.86</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>-0.1</td>
<td>.71</td>
<td>.891</td>
<td>-1.51 1.32</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>4.54</td>
<td>.81</td>
<td>&lt;.001</td>
<td>2.93 1.51</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>0.1</td>
<td>.71</td>
<td>.891</td>
<td>-1.32 1.51</td>
</tr>
</tbody>
</table>

Note: The mean difference is significant at the .05 level. Based on estimated marginal means.

There were two significant findings. The pre- to the mid-mindset scores (mean=40.93, SD= 5.349) evidenced a significant difference in $t(91) = -6.15, p < .001$ and the
pre- to post- $t(91)=-5.86, p < .001$. There were no significant findings from the mid to post-survey scores.

**Multiple Linear Regression Results**

This multiple linear regression model was fitted to explain how the independent variables ($X_1$=years of experience, $X_2$=pre-mindset scores, $X_3$=mid-mindset scores) predict the dependent variable, the post-mindset score. The following regression equation (main effects model) was used: Post-Mindset Score = $(B_0) + (B_1 \times \text{years of experience}) + (B_2 \times \text{pre-mindset score}) + (B_3 \times \text{mid-mindset score})$. Before running the multiple linear regression, three additional assumptions were met: homoscedasticity of residuals, absence of multicollinearity, and lack of outliers (Creswell & Creswell, 2018; Creswell & Plano Clark, 2018; Field, 2017).

A multiple linear regression analysis was performed to examine whether the Pre-Mindset Score, Mid-Mindset Score, or years of experience variables significantly predicted the Post-Mindset Score. The regression model indicated that the predictors explained 9.93% of the variance, and no collective significant effect was found. $F=3.23, p = .026, R^2 = 0.1$. The individual predictors result in: (1) Pre-Mindset Score: $\beta=0.16, t=1.55, p=.126$, (2) Mid-Mindset Score: $\beta=0.23, t=2.23, p=.028$, and (3) Years of Experience: $\beta=0.03, t=0.28, p=.783$ as shown in Table 18. The F-ratio value yielded an efficient model with 41.693. Assuming $H_0: \beta^* = 0$, $H_#: \beta^* \neq 0$ for all IVs.
Table 18

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients B</th>
<th>Standardized Coefficients Beta</th>
<th>Standard Error</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>21.95</td>
<td>5.99</td>
<td>3.67</td>
<td></td>
</tr>
<tr>
<td>Pre-mindset Score</td>
<td>0.18</td>
<td>0.16</td>
<td>0.11</td>
<td>1.55</td>
</tr>
<tr>
<td>Mid-mindset Score</td>
<td>0.29</td>
<td>0.23</td>
<td>0.13</td>
<td>2.23</td>
</tr>
<tr>
<td>Years of Experience</td>
<td>0.02</td>
<td>0.03</td>
<td>0.08</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Summary of Quantitative Results

Summing up, this quantitative section reported findings from descriptive statistics, ANOVA, and multiple linear regression. Descriptive statistics found the mean increase from the pre- to the post mindset score, with the greatest gains from the pre- to the mid mindset score. A repeated-measures ANOVA determined that mean mindset scores differed significantly across three-time points (F(2, 58) = 5.7, p = .006). A post hoc pairwise comparison using the Bonferroni correction showed a decreased mindset score between the mid-mindset survey scores and the post-mindset survey score (40.93 vs. 40.45, respectively), but this was not statistically significant (p = .891). However, the increase in mindset survey score did reach significance when comparing the pre-mindset survey score to the post-mindset score (36.49 vs. 40.45, p=<.001) and the pre-mindset score to the mid-mindset score (36.49 vs. 40.93, p=<.001). Therefore, the results for the ANOVA indicate a significant time effect on mindset survey scores. Finally, the regression analysis found that years of experience and the pre-and mid-survey scores do not predict the post-mindset score.
Qualitative Findings of Written Reflections

Written Reflection Results

The second research question investigated the focus of the teachers’ written reflections during the video club professional development and how it changed throughout the development. I collected two types of written reflections during the video club professional development—one focused on the participants' reflecting on the professional development experience, and the other on their reflecting on their own instruction. The reflections were collected at six different points during the professional development and analyzed using a multi-step coding process. For example, the axial codes of Scary and Intimidating, Leveraging the Many Advantages of Video, and Growth in Instruction formed the theme Video is a Powerful Tool. The in-depth coding analysis of the written reflection responses (n=92) led to the emergence of four major themes:

1. questioning beliefs and mindsets,
2. video is a powerful tool,
3. new perspectives on teaching and how students learn mathematics, and
4. the design of the professional development.

After the development of a tree diagram for themes, found in Appendix H, I organized the themes on a timeline to represent them highlighted at different time points in the professional development, as seen in Table 19. These themes answered RQ2: What is the focus of the teachers’ written reflections during the video club professional development, and how does it change over time?
After determining each significant theme, I found that the themes changed after either the district video club meeting or the school video club meeting. I constructed a timeline for each theme by the months in which the professional development occurred. I examined all the reflections for each theme and determined after which session the focus of that theme changed. For example, the theme of the video is a powerful tool changed three times throughout the professional development. In September and October, the reflections heavily focused on how videos were scary and intimidating. After the October School Video Club meetings, there was a noticeable shift in focus in this theme to teachers seeing the many ways to leverage the many advantages of videos. Then, after the
January school video club meeting, there was another shift to how the video was a powerful tool to assist in seeing growth instruction.

This analysis moved beyond the semantic level to the latent level "to identify or examine the underlying ideas, assumptions, and conceptualizations- and ideologies- that are theorized as shaping or informing the semantic content of the data" (p. 84, Braun & Clarke, 2006). I constructed a similar timeline for the remaining three themes. A significant difference was that the three remaining themes only changed twice on the timeline. The second theme's changes occurred after the November district video club meeting. Participants went from focusing on what it means to be a math person to how these mathematical practices coincide with their current teaching practices. The third theme's change occurred after the December school video club meeting. The teachers' and instructional coaches' reflections decreased in focusing on doing the mathematics as a learner and moved toward focusing on how they were learning mathematics in a new way. The final theme didn't change until almost the very end at the start of the February district video club. This theme starts with multiple professional development components that impact participants' learning. The reflections changed again after the January school video club to the importance of moving away from having "just nice" discussions to more reflective conversations. The timeline was instrumental in understanding how the reflection themes changed throughout the year-long professional development. The following section will examine each theme construct in more detail; the section will conclude with summary findings.
Video is a Powerful Tool

The first theme evidenced by the written reflections was the power of video. In the beginning, 85% of the participants expressed feelings such as "not happy," "nervous," "terrified," "uncomfortable," and about videotaping themselves. One participant wrote,

The video is so scary. I hate seeing and hearing myself. It makes me cringe. After the first three videos, I got over this. The video was so informative about my instruction and student learning. I learned how small differences in my instruction could make a powerful difference with students. I learned so much about myself and my students. Video helps me see things I could easily improve and other things that will take time. For example, I can see how football players watching film improves their playing.

Another participant stated, “I hate watching myself. I look bad, sound bad, and have the worst taste in clothes, but for the first time, I saw my impact. I have many strengths, but there are definite areas to work on.”

After the October school video club, the reflections showed that participants' fear and discomfort with watching videos had lessened considerably. Moreover, this experience revealed to them many advantages of the video, as shown in Figure 8.
One advantage of repeatedly emphasized videos was the ability to focus on students' thinking. One participant said, "I loved discussing what student thinking we saw in the video. I have never looked at students' thinking so closely. It has made me rethink my practices." Another participant echoed this, "I doubted my students' abilities to express their thinking in the beginning because they are only ten, but after seeing other classes, I started asking for more.” Some teachers were surprised how certain teachers were able to get students to share their thinking, “I loved seeing how her students talk, after talking as a group I could see things that I should do that would help my students do the same thing.”

Another advantage reported was that it created a forum to celebrate learning with peers. One teacher illustrated this idea,
It was nice to be in each other's classrooms for a while and see everyone's ideas and reflecting together was so fun. We loved learning from each other's mistakes and seeing how we questioned the kids and guided the discussion. It might initially feel like we are comparing each other, but it helped us all bond, discuss, and celebrate each other.

The reflections began evidencing that by using video, participants were enjoying learning and refining instructional practices together. For example, one teacher wrote, "I went from worrying about how I looked to truly examining my teacher moves and carefully listening to students' thinking." Also, "I loved seeing the other grade levels. I learned so much from being there in their class. Video made it so real." By expressing how knowledge increased through video, participants seemed to better position themselves in other participants' perspectives and engaged more actively as a community of practice.

Another advantage was that it gave a new perspective and ways to refine future instruction. One participant wrote,

Watching videos and discussing with each other allows a sort of "do-over." Not in the same moment, but in a future moment. If you never examine what you should or could have done differently, it isn't likely to happen next time. So, I first process the video privately; then, I am ready to decide which part of the video I want to discuss collaboratively. This collaboration discussion is so empowering.

Many people expressed similar sentiments from "I wish I would have done that," "that is such a great strategy," to "next time, I will add that to my lesson." Participants could use other teachers' strengths to refine their practices.

There were many positive reflections on the video. Some participants voiced appreciation for using the video as it enabled them to see and hear about other teachers' struggles and how that was powerful for them. One participant wrote, "Honestly, it was
helpful for me to see other people struggle in implementing the task and using the questions effectively. I learned so much talking through those struggles with other teachers, where the focus was not on blaming teachers, but just refining our practice."

Another teacher said, "I was so worried that I was the only one who struggled with classroom management or forgot to have students' partner-talk. Fortunately, I am not the only one. This let me see my practice in a new light." Finally, one teacher commented, "I saw teaching math in a whole new way. Video helps me discuss issues and concerns that usually get glossed over."

In the final written reflections after the February district video club meeting, a large majority stayed focused on how it was helping them refine their practice. Still, a third of the participants focused on how the videos helped them see positive changes and growth in their instruction. One participant wrote,

> Our team has loved the videos. We should have done this sooner. Our sixth-grade teachers wish they had started this professional development even earlier in the year to compare how much their students and themselves have progressed. One of the teachers showed her class the last video of the three-act task to her students. She wanted feedback on what worked for them as students and also for students to see how they could improve. Video has changed my instruction. I will keep filming and try to make this a regular part of our collaboration.

Another person wrote, "I just rewatched my first video again a few times, I have grown so much. But I can also see so much growth with my students. I need to do this more." Finally, the instructional coach from the school said, "The growth is amazing and palatable. Teachers are loving sharing their videos. Teachers are truly valuing each other and what each person brings to the table. This changed my coaching discussions.”

Another coach added, “I was worried about this in the beginning, but this was such a powerful experience for teachers in helping them improve their instruction.” These
results show that teachers may view video as daunting at first, but given time, participants start finding numerous advantages. Video also provided teachers a means to see growth in instruction.

**Questioning Beliefs and Mindsets**

The second theme focused on how participants were *Questioning Beliefs and Mindsets* throughout the professional development. This was evidenced in the written reflections when participants noted things like, "all students are not math people," "not developmentally ready," "this is an unrealistic expectation," and "their brains just don't work that way." For example, one participant pointed out, "I thought you were just born with a math brain. You either lucked out, and there was no changing this." Another participant elaborated on this idea with a personal connection and wrote, "I don't believe that all students are math people. My son is gifted in mathematics; I can see that some students just don't have what it takes, and it is unrealistic to think that they will," while yet another commented, "This idea that all kids are math people does not ring true. I have been teaching for quite a while and have seen the opposite." This participant's reflection echoes that of more than half the participants:

I still am not entirely convinced that all people have a math brain. Some of my students seem more capable, while others are constantly struggling. Nevertheless, I am not a math person.

Seventy-six participants articulated in their written reflections disbelief about all students being "math persons" (47 reflections in the beginning, 22 in the middle, and seven in the end).
In the beginning, reflections focused heavily on questioning mindsets and beliefs at a personal level, emphasizing what it means to be a "math person." About midway through the professional development, there is an evident change in mindset focus. Participants begin questioning their personal mindsets and beliefs and how they relate to their current instructional practices and beliefs. For example, one person wrote, "this gave me a new perspective about why we need to reexamine our practices because we are repeating history. I am making students hate math just like I did." Another participant contributed, "I cannot believe how much engaging learning math is! This new way helps you feel like a true mathematician. My kids need this. I need this. How do I teach like this?" One participant concluded, "I love learning math this way. I want my students to love math. They currently do not. How can I bring the energy in this class to my class?"

Numerous other participants confirmed that this way of engaging in mathematics is changing their beliefs and mindsets about what it means to teach mathematics. For example, "this is transforming my beliefs about students' capabilities and my capabilities. I could be a math person, so could my students if I taught math better. This is not actually super easy to do. Our math book teaches the wrong way." Another participant added, "I have never felt as mathematically powerful as I have in this class. I need to do this for my students as well. All teachers at my school need to do this."

Starting after the December school video club reflections, the reflections evidence that many teachers were still questioning their current instructional practices and how they fit with their mindsets and beliefs, "I do not teach math like this every day, but when I do, kids love it. It makes me wonder why I don't do it every day." Another example: "This experience has changed me as a person and a teacher. I see that I can be a math
person and a great math teacher. I should have done this sooner." It also left some people still struggling with their perspective, "I learned so much from this experience. I loved every minute, but I still struggle with how to do this in my classroom. I can't see how it fits." From the beginning to the end, the participants questioned their mindset and beliefs, relating them directly to their instructional practices.

New Perspectives on Teaching Mathematics and How Students Learn Mathematics

The third theme in the session's written reflections focused on new perspectives on teaching mathematics and how students learn mathematics. Almost 71% of the written reflections involved teachers writing about how the professional development assisted participants in seeing instruction and student learning in a new light. For example, one participant noted,

I thought going through the activity was important. We didn't act like 4th graders; we were adults trying to solve the problem. I got to feel how it felt like to be a student. These tasks stretched my brain about how I would implement this in my class. It was great to think through how to teach the lesson with my peers.

Another participant shared,

Doing the math task, myself opened my eyes to struggles or issues that students might have. The discussions about starting the task, what questions to ask, and how students share their thinking were powerful to me. I need to do this more often, so I can plan better lessons to move their thinking forward instead of trying to use worksheets to teach.

Many reflections commented that this type of instruction using number talks, five practices, and 3 act tasks was new to them. While number talks were the most familiar, many teachers had not considered before the nuances of how to question students, provide opportunities for peer discussions, and record their thinking. One teacher
expounded on this: "I have never taught math like this. I did not learn this when I was a child or as a teacher." Another commented, "This has opened a new math world to me that I didn't even know existed. I had a magical time learning; I also want that for my students." Finally, participants highlighted, “I am so glad that I did these tasks myself and watched a teacher do it. It tells me how to do it myself” and “I need to do more lessons like this. Where do I find them?”

Starting after with the January school video clubs, the reflection started reflected that there were struggles with these tasks, especially with the five practices tasks. Participants found number talks as a practice easier to incorporate and seemingly easier to implement. Yet, when the professional development introduced the five practices with the goat and chicken task, there were increased concerns. This task is shown in Figure 8. Third through sixth grade, teachers taught this same instructional routine task.
The reflection comments showed that many teachers struggled as learners and teachers of the task. "That chicken and goat task was so hard" and "I can't believe she expects us to do math like that with our students." In addition, some participants struggled with discovering their solutions and strategy to solve the problem. "I was not even sure how to solve the problem myself; how could my students?" or "we worked on just one problem for over 45 minutes; is that what I should do in my classroom." After struggling as learners, the reflection focuses on what would happen in their classroom. "I will never be able to pull this off. You have to focus on student thinking." Many teachers
also wrote that planning for these tasks took longer than they usually do with their peers. "We just planned out our questions, which I never do, but I can now see how it can make a difference," and "you need to be prepared to teach these tasks well."

Many reflections said that the collaborative planning time and the collaborative, reflective discussions thereafter considerably eased some of the struggles. "I could not wait to talk to my peers about this. I learned so many different strategies and techniques" and "This will be great to discuss with other teachers; I wonder what happened with their class." After doing the task with their students, more than half the participants were surprised by their students' abilities. "I was so proud of my students; they got right to work and tried so many different ways," and "I was so surprised that so many of my students were able to come up with a solution to the task." But heightened concerns and struggles remained- "only one student came up with an answer" and "I never solved these types of problems in elementary school. Is this appropriate?" This way of approaching instruction is new to many; they are still building their skills to teach in a way that was never taught.

**Design of the Professional Development**

The last theme is the *Design of the Professional Development*. Reflections revealed that participants viewed this professional development as of a different type. For example, “Today was so interesting. I have never worked harder in mathematics and had so much fun”, “the day flew by, there is something about this pd that I love,” and “we did so many things, the most impactful for me was the combination of all the things.” Participants specifically reflected on their professional development using the same four questions each time:
1. How did today’s School Video Club challenge or align with your current beliefs and mindsets about teaching mathematics?

2. What did you learn from today’s Math Mindsets session?

3. What did you learn from collaboratively discussing instructional routines using videos?

4. Which part of today’s session was the most impactful and why?

The first question primarily resulted in participants saying that the session aligned with their beliefs. The second and third questions generally accounted for what occurred during the mindset session and while collaboratively discussing routines. The last question provided much more variation. I wrongly assumed that when participants answered this question, they would focus on a specific part of the professional development, such as mindset sessions, engaging in the task as an adult learner, collaborative planning, or reflecting on practice. Instead, participants overwhelmingly focused their reflections on a combination of ideas. For example, one participant wrote after the beginning video club session,

The most impactful to me to improve my practice was seeing that practice, but it was also important that I engaged in it first and then observed another teacher do it on video. Wow, I need to attend more closely to what my students say, but that would not be possible if I kept just using the textbook to teach. Instead, I would need to use one of these math tasks. But I still struggle to believe that all students can do math like this.

This excerpt of a participant's written reflection exemplifies that the participant is focusing on multiple parts of professional development design as being impactful: (1) questioning with their mindset, (2) the power of using video, and (3) examining their instructional practice as a learner and teacher of mathematics. This was not the only
participant to reflect on multiple parts of the professional development design in the reflections. Another participant echoed this:

There was not just one more impactful thing; the combination of the ideas had the most impact. I needed to do the math task and then plan it. I hated using video but loved the conversation when watching another teacher’s video. I would not have thought about my mindset without engaging in the task of planning my practice. This was a great day for me. The day flew by.

Their response has four categories mentioned and points to how some participants saw the multiple components as a strength of the professional development. Seventy-eight percent of the reflections had two or more components mentioned in their reflections as being most impactful. Since multiple components were outlined in reflections, an analysis was done of the frequency of specific categories in each period. The results are shown in Table 20.

**Table 20**

*Frequency Table of Categories Discussed as being “Most Impactful”*

<table>
<thead>
<tr>
<th>Sessions</th>
<th>Mindset</th>
<th>Engaging in the Task as an Adult</th>
<th>Planning the Task</th>
<th>Refining Your Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborative Session Discussions</td>
<td>54 (59%)</td>
<td>45 (49%)</td>
<td>27 (29%)</td>
<td>45 (49%)</td>
</tr>
<tr>
<td>Middle (55%)</td>
<td>57 (62%)</td>
<td>42 (46%)</td>
<td>48 (52%)</td>
<td>62 (67%)</td>
</tr>
<tr>
<td>End (525)</td>
<td>45 (49%)</td>
<td>28 (30%)</td>
<td>68 (74%)</td>
<td>70 (76%)</td>
</tr>
</tbody>
</table>

*Note.* Frequency of mention of a category in reflections (n=92).
The table illustrates how many categories were discussed in the participants' written reflections. The category with the highest frequency was "refining your practice with peers using video," mentioned 45-70 times in reflections. The subsequent highest frequency was the "mindset session," with 45 to 57 mentions. The lowest category mentioned was "engaging in the task as an adult learner," but it still was mentioned an average of 38 times in written reflections. The written reflection on professional development may indicate that this combination of ideas creates a meaningful professional development learning experience.

Another part of this theme of the professional development design was evidenced by the written reflections about instruction. In the pilot study, a scaffolded written reflection protocol was used. I began this by asking the participants questions about what pleased them, surprised them, and concerned them. The pilot study found that the teachers focused on negative, non-mathematical aspects in this part of the reflections, such as (1) students being off task, (2) students unable to do basic tasks, and (3) classroom management issues. Therefore, this time, the I modified the reflection to have the teachers focus first on student thinking and teacher moves, as shown in Figure 10.
### Figure 9

**Written Reflection on Instruction**

<table>
<thead>
<tr>
<th>Name:</th>
<th>Instruction Strategy/Focus:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td></td>
</tr>
<tr>
<td>Lesson objective:</td>
<td></td>
</tr>
<tr>
<td>Standard:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>Observation Notes: Add a reflection about the students’ responses within the categories. <strong>Include the timestamp</strong> in the video and evidence to support how this promotes student engagement.</th>
<th>Time Stamp(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students discussing and interacting with peers to justify, prove, and explain their reasoning.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students making thinking visible through models, showing thought process, etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher is guiding and strategically orchestrating the discussion by using math talk and other conversation tools. (Revoicing, Restating, Wait Time, Prompting, Applying Reasoning)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What questions does the teacher ask to help students focus on the mathematics in the task?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What pleased you?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>What surprised you?</td>
<td></td>
</tr>
<tr>
<td>What concerned you?</td>
<td></td>
</tr>
<tr>
<td>What thoughts do you have about video reflection?</td>
<td></td>
</tr>
</tbody>
</table>
Changing the reflection to focus on student thinking and teacher moves, then asking what pleased, surprised, and concerned the teacher, resulted in a dramatic change in focus. The results evidence that teachers focused more on four of the eight effective teaching practices from the book *Principles to Actions: Ensuring Mathematical Success for All* (2014):

Practice 2: Implement tasks that promote reasoning and problem solving.

Practice 4: Facilitate meaningful mathematical discourse.

Practice 7: Support productive struggle in learning mathematics.

Practice 8: Elicit and use evidence of student thinking.

This slight change of starting with focusing on students’ thinking may have caused teachers to see students from more of a strengths-based approach than a deficit-based approach. In over 85% of the reflections on instruction, teachers saw students' thinking and were surprised and pleased. For example, "I can't believe what my kids came up with. They are so clever." Another participant wrote, “It was awesome to hear all the different strategies and methods. I never taught them this.” This change in reflection may enable teachers to focus on facilitating instructional practices and how their actions played a role in developing students' understanding.

Some participants struggled initially to find timestamps for all these ideas. One participant said, "Oh no, I didn't have my students interacting with their peers or explaining their reasoning" another added, "I wasn't sure where I was orchestrating the discussion." If participants could not find a timestamp, they were encouraged to put a timestamp where it could have happened. After the first reflection, teachers no longer
struggled in finding timestamps or were able to see where a possible point in the instruction could be inserted. For example, one person wrote, "I planned with my peers how to increase math talk and great questions," "I started to enjoy watching my video so that I could highlight these times," and "I was able to find all four timestamps multiple times in video, success!" The scaffolded reflection seems to assist in building success in this area and focusing attention in the reflection on students' thinking and teachers' moves.

While there was also an increase in teachers focusing more on students' thinking, there was also a sharp focus on teachers' own instructional practices and how to facilitate the task. For example, "I need to incorporate my student talk. I am doing all the talking" or "how will I get students to share their thinking? What if they don't start working?" One common thread evidenced in reflection was that participants appreciated discussing the task with peers, and many would write about how that helped improve their instruction. For example, "I love planning with my team; I feel so empowered when I teach in my class and remember what I saw others do and try to do it myself," or "This is making me a better teacher; I never considered which teacher move to use or how to ask a better question in math."

Another way this theme of the design of the professional development was evidenced in the reflection after the January School Video Club professional development was the desire to transform the collaborative discussion beyond just being nice conversations with colleagues to moving toward a community of practice focused on refining their practice with honest discussions concentrated on refining and improving everyone's teaching practices. During the professional development, the participants were
introduced to the 2011 article "When Nice Won't Suffice" by Elisa MacDonald. This article focuses on moving the collaborative discussion past just being nice to incorporate ideas that will assist when authentic reflection improves instruction. This article resonated with the participants, and many wrote about how that changed their discussions on using the video. One participant stated,

I loved the article, "When Nice Won't Suffice." It's important to be positive with each other, but it is more important to be honest, AND nice. We expect our students to receive feedback to improve. Likewise, teachers should give and receive the same feedback to become more effective. Another teacher pointed out, "We are free to incorporate the feedback completely or partially, but if we never receive it, we don't have further ideas to think about." One instructional coach wrote, "Teachers are just polite and say that great job to each other and give very little feedback. We just need a little push." When many touted the positive aspects of increasing collaboration, 18 of the 91 participants questioned whether it was a safe environment for refining their instruction. One teacher wrote, "This is so new, I am not sure how safe I feel," while another said, "I don't completely trust that these honest discussions will stay private." Finally, one added, "I am not a good math teacher. I am worried that people will now know."

This final theme centered on the design of the professional development. It started with focusing on the reflection on professional development and how its multiple components impacted participants. Then, it examined how the design of the reflections changed the participants' reflection focus. It finished with how adding a research article on feedback to the professional development design assisted participants to work toward a more reflective community of practice. Each component was a specific part of the
professional development design and played a large role in participants' written reflections.

Summary of Qualitative Results for the Written Reflections

In conclusion, four integrative themes emerged from the written reflections about the professional development sessions. The first theme centered on how participants were initially anxious about video but began to see it as a powerful tool for collaboration and strengthening instruction. Video also provided a means for teachers to observe the growth in their instructional practice. The second theme focused on how participants were (re)examining their mindsets about learning and teaching mathematics. Participants were questioning what it means to be a "math person", as well as how the new mindsets and beliefs about teaching and learning mathematics coincide with their current beliefs and mindsets about teaching mathematics. The next theme focused on how participants react to new perspectives on teaching and learning. Participants are seeing how doing the mathematics themselves strengthens their instruction, as well as the importance of purposefully planning instruction for such tasks. The final theme considered the design of professional development. It highlighted structures that resonate with participants: (1) the combination of multiple components, (2) strategically designed written reflections, and (3) the use of research articles to spur more productive conversations that include meaningful feedback. These four themes were threaded throughout the reflections about the Video Club session from beginning to end and represent a coherent narrative of the written reflections.
Qualitative Findings For Video Club Discussions

The third and last question analyzed was when teachers collaboratively reflected on their instruction using video, what were the discussion patterns and trends. A vital purpose of this study was to investigate how instructional practices are impacted by specific and intentional repeated, reflective collaboration practices that provided space for teachers to (re)examine their current mathematics beliefs and mindsets. One of those repeated practices was teachers meeting in video clubs and engaging in collaborative discussions about instruction, using video clips of their instruction as the focal point. The Video Club professional development comprised of 11 video clubs (5-9 participants) led by an instructional coach (n=92). Each group videotaped five video club discussion sessions: three long videos that ranged from 40 minutes-118 minutes and two shorter ones running for 10-14 minutes. Fifty-five videos were collected, resulting in 2,316 minutes of video. Using videos of those discussions, this study sought to answer the last research question:

**RQ3:** When teachers collaboratively reflect on their instruction using video, what are the discussion patterns and trends?

The video analysis was done using *a priori* coding of different dimensions from leading researchers in video clubs (van Es & Sherin, 2008, van Es et al., 2017). The existing literature had five dimensions: the object of focus, the topic of focus, analytic stance, level of detail, and the source of evidence. Coding of the dimensions occurred in the multi-step coding process. First, each video was viewed multiple times, and analytical notes were created. The last step was to segment each video into “meaningful chunks”
Videos were segmented into meaningful chunks according to the focus and what was being discussed. A new chunk was created when a new idea was voiced or there was a change in direction for who or what was being talked about. Each meaningful chunk ranged from 25 seconds to two minutes and thirty seconds. The average length of a meaningful chunk was one minute and forty-seven seconds in the beginning and increased in the middle to two minutes and seven seconds and was two minutes and twenty-three seconds in the end. An interesting trend in the discussions was that the length of the meaningful chunks in the videos increased throughout the professional development. Table 21 shows the meaningful chunks each type of video club discussion was divided into.

Table 21

*Meaningful Chunks in Videos of Video Club Discussions*

<table>
<thead>
<tr>
<th>Club</th>
<th>Beginning Video Club</th>
<th>Short Video Club</th>
<th>Middle Video Club</th>
<th>Short Video Club</th>
<th>Ending Video</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Videos</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>No. of Chunks</td>
<td>1,285</td>
<td>768</td>
<td>1,220</td>
<td>497</td>
<td>1,039</td>
</tr>
<tr>
<td>Average Length of Meaningful Chunk minutes</td>
<td>1 minute</td>
<td>1 minute</td>
<td>2 minutes</td>
<td>2 minutes</td>
<td>2</td>
</tr>
<tr>
<td>Average Length of Meaningful Chunk seconds</td>
<td>47 seconds</td>
<td>49 seconds</td>
<td>7 seconds</td>
<td>18 seconds</td>
<td>23</td>
</tr>
<tr>
<td>Average Times for 11 Videos minutes</td>
<td>49 minutes</td>
<td>12 minutes</td>
<td>55 minutes</td>
<td>11 minutes</td>
<td>52</td>
</tr>
</tbody>
</table>
A Priori Coding Dimensions

There were five original dimensions: the object of focus, the topic of focus, analytical stance, level of detail, and the source of evidence, with the additional one of mindset, as seen in Table 4.9. I saw the need to add a dimension during the coding process, viz., that of mindsets, because it is a prevalent part of many discussions and fits the professional development goals. Next, each dimension is detailed in Table 22. This table’s detailed was used during the coding process.

Table 22

Six Dimensions of Coding Categories for Video Club Videos

<table>
<thead>
<tr>
<th>Six Dimensions</th>
<th>Six Dimensions for Coding Videos Club Discussions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension 1: Object of Focus</td>
<td>Student</td>
</tr>
<tr>
<td>Classroom Management</td>
<td>Focus on discipline issues</td>
</tr>
<tr>
<td>Dimension 2: Topic of Focus</td>
<td>Describe</td>
</tr>
<tr>
<td>Dimension 3: Analytical Stance</td>
<td>Specific statements</td>
</tr>
<tr>
<td>Video-Based</td>
<td>The comment was in direct relation to a video</td>
</tr>
<tr>
<td>Dimension 5: Source of the Evidence</td>
<td>Growth mindset ideas or topic discussed.</td>
</tr>
<tr>
<td>Dimension 6: Mindset</td>
<td></td>
</tr>
</tbody>
</table>

The results of the *a priori* coding are presented in Table 23, which displays the percentage results of the coding of all videos by their dimensions and type of video club.

### Table 23

**Six Dimension Results**

<table>
<thead>
<tr>
<th>Percentages of Focus in 2021-22 Video Club Professional Development</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beginning School-Based Video Club Session #1</strong></td>
</tr>
<tr>
<td>No. of Meaningful Chunks</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1st Dimension: ACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student</strong></td>
</tr>
<tr>
<td>Teachers</td>
</tr>
<tr>
<td>PD</td>
</tr>
<tr>
<td>Self</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2nd Dimension: TOPIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
</tr>
<tr>
<td>Climate</td>
</tr>
<tr>
<td>Student Thinking</td>
</tr>
<tr>
<td>Pedagogy</td>
</tr>
<tr>
<td>Technology</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3rd Dimension: ANALYTICAL APPROACH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe</td>
</tr>
<tr>
<td>Evaluate</td>
</tr>
<tr>
<td>Interpret</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4th Dimension: LEVEL OF DETAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific</td>
</tr>
<tr>
<td>General</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5th Dimension: SOURCE OF EVIDENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video-Based</td>
</tr>
<tr>
<td>Non-Video</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6th Dimension: MINDSET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth</td>
</tr>
<tr>
<td>Fixed</td>
</tr>
<tr>
<td>Neutral</td>
</tr>
</tbody>
</table>

**Note:** The percentage represents the frequency of each dimension found in the meaningful chunks of 11 videos for each period. Green represents highest dimension, while red denotes the lowest for each dimension.
Some interesting findings stand out when analyzing the results by dimension. The first dimension focuses on who the focus of the discussion was. In each meaningful chunk, a determination was made about whom the discussion focused on—students, teachers, professional development, curriculum designers, or self. The main focus by the end of the video discussions was on students, starting with 36% and ending with 69%, while teachers were the focus only 27% of the time. There were also considerable changes in the mean for self as a focus, decreasing from 33% to 4% from beginning to end. This exchange represents the topics of video club discussions (self and pedagogy) that teachers focused on at the beginning of their professional development.

**Instructional Coach:** What do you notice? What are the questions you have about the clip?

**Teacher 1:** Mental math and the power of mistakes. I cannot believe they can do this in their heads. When Mark made that mistake, I got worried, but he was able to walk through what he had done, and the other students were able to see the mistake as well, which was impressive to me. The student just forgot about the digits in the one’s place.

**Teacher 2:** I like how you were asking good questions in the video and didn't just tell Mark that he made a mistake. I like how you had them compare and contrast strategies, so students really looked at other students' thought processes.

**Teacher 3:** I think allowing and celebrating mistakes is a big deal.

**Teacher 4:** I think so; I just started talking to my kids about how our brains learn more from mistakes.

**Teacher 1:** I agree; when you go back and catch your own mistakes, it is less likely you will make the same mistake again.

**Teacher 3:** We have to change our mindset about mistakes. We say it all the time, but do we really believe it? Sometimes, I try to stop my students from making mistakes, or I don't help them see their mistakes; I just mark them wrong.

**Teacher 2:** We all say that, but it is harder to believe. Even though there are times as an adult in my professional development, I made mistakes. It was hard to see I was learning this deeper at the moment because of the fear of being called.

**Teacher 4:** We weren't called on in this class. We discussed it with a partner. I found my mistake and was able to move on. I need more partner talks; sometimes, I forget to do it.

The second dimension is the topic of focus: classroom management, climate, student thinking, pedagogy, mindset, or technology. The second dimension results point
to student thinking (28% in the beginning and 61% at the end) and pedagogy (34% in the beginning and 24% at the end) as being the prominent topics of focus in the discussions. Student thinking as a topic of discussion increased by 33%, while pedagogy decreased by 10%. The least focus was on technology and climate. For example, technology as a topic occurred 4% of the time in the beginning video club discussions but decreased significantly to just 1% in the final video club discussions.

The *third dimension* focused on the teachers' stance when discussing each other's videos. There were three stances that participants could take: describing, interpreting, or evaluating the situation. The description stance refers to a participant describing what occurred or providing a summary of events. The interpreting stance focuses on teachers making inferences and hypotheses and making sense of their views. Finally, the evaluating stance focuses on teachers discussing whether what occurred was positive or negative and what could have been done differently. The results for the *third dimension* found that participants used the “describe” approach in the first videos 61% of the time, but it decreased to 18% by the last video club, a difference of 43%. The “evaluate” approach started with 27% and had a 35% percent increase to 62%. The evaluative analytical approach is evidenced in four ways: (1) possible improvements and refinements to instruction, (2) portions of the lesson that were either being taught well or not, (3) figuring out steps they could take to improve the instruction next time, and (4) making sense of students’ strategies and evaluating their questions to see whether there were effective at advancing and assessing students’ thinking. This excerpt from a video club discussion illustrates how teachers are changing from a descriptive-analytical approach to more of an evaluative analytical approach.
Teacher 1: I have no idea why they are not thinking about the numbers. All they are doing is dividing the numbers. Their answers do not even make sense. One group started thinking about the numbers but struggled to start doing the problem.

Teacher 2: I noticed that one of the students was using the cubes.

Teacher 1: Yes, but he couldn't keep track of the legs. Once he divided it in half, he was committed that there would be an equal number of goats and chickens. So, he got 16 chickens and eight goats.

Teacher 3: I love how you asked, "Do the number of animals you have represent the same as the farmer's legs with 56 feet?" It got the table talking. The one student also abandoned the unifix cubes and tried to make sense of it on graph paper. That table was having a hard time keeping track of legs and the number of animals.

Teacher 1: I should not have spent so much time at that other table. I got fixated helping two students because they were really struggling, but I can see in the video that many students started to goof off. I should have pulled them together and highlighted some ideas from students to push their thinking forward, as Teacher 3 did in her video.

Teacher 2: What would you do differently next time?

The “interpret” approach remained consistently in the teens (12%-20%) throughout the professional development.

The fourth dimension focuses on the level of specificity that teachers use in their collaborative discussions with peers. There are only two choices for this category, general or specific. Throughout all the videos, there was an increase in focusing on specific instances from 34% to 68%. Conversely, participants, general discussions decreased from 66% to 12%, a 54% decrease. This excerpt from a video club discussion illustrates this.

Instructional Coach: Thoughts on the video?
Teacher 1: I can’t believe how well you handled students struggling with the problem. Some of my students did not even start working on the problem.
Teacher 2: You were asking very strategic questions about their thinking. Do you plan them?
Teacher 3: Yes, I planned the advancing and assessing questions. I forgot when I did a similar task, which was a flop. This time, did you see how it engaged Kevin in the task and made his table think about the chart more in-depth?
Teacher 4: The other student was using manipulatives and was trying to make sense of the legs. That was a perfect time for a question or a push to help their thinking.
Teacher 2: I agree. I loved that you walked away, and the students went after the problem with a new, reenergized effort. I should have done that while I was doing the task.
**Teacher 1:** That student made a ratio table very similar to mine. How did he figure out when to stop and change to chickens? I see how an assessing and an advancing question could help this student.

**Teacher 4:** Genius! In my class, only two students solved it. But, in yours, your questions are helping everyone that's struggling. The most substantial part for me was the comparison of strategies and when students were all saying, "Oh, I see it now. I get it."

**Instructional Coach:** What was it about the questions that made a difference?

_The fifth dimension_ primarily focused on whether teachers' discussions were focused on evidence from the video or were non-video based. Throughout the professional development, participants had a consistent discussion focus 60%-69% of the time.

_The sixth and final dimension_ was determining whether the conversation focused on growth, fixed, or neutral mindset ideas. When looking at the _sixth dimension_ on mindsets, in the first video club discussion, 41% of the talks focused on fixed mindset ideas, and by the end, there was 2% discussion on this topic. This means that there were only 20 meaningful chunks out of 1039 chunks focused on fixed mindsets ideas. This did not result in increases in growth mindset discussion, as that remained at around 10% throughout the professional development.

**Summary of Findings for Video Club Discussions**

In summary, the results for the video club discussions using the _a priori_ coding of the six different dimensions provide insight into the focus, topic, analytical stance, level of attention to detail, source of evidence, and mindset. These dimensions created a narrative of how teachers were discussing videos. Some key findings were increased focus on students and student thinking over the duration of the professional development. Further, participants changed from a descriptive-analytical approach to more of an
evaluative approach. Finally, there was a decrease in fixed mindset discussions, but this did not result in increases in growth mindset discussions.

**Convergent and Divergent Results**

This section reports the convergent and divergent findings of this study. This study used the concurrent parallel design to leverage the strengths of both qualitative and quantitative approaches and to interpret the multi-faceted aspects of teachers' collaborations, reflections, beliefs, and mindsets (Creswell & Plano-Clark, 2018). Therefore, this section focuses on the final mixing of the results to provide an overall interpretation of convergences and divergences in the quantitative and qualitative results. Table 24 shows a juxtaposed comparison of the results used to determine the two convergent and two divergent results.
### Table 24

Convergent and Divergent Results

<table>
<thead>
<tr>
<th>Convergent/Divergent Results</th>
<th>QUAN Inventory</th>
<th>QUAL Written Reflections</th>
<th>QUAL Video Club Discussions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mindsets Represented and Evidenced Differently in Various Situations</strong></td>
<td>Increased reported Growth Mindset overtime</td>
<td>Theme: Questioning Beliefs and Mindsets</td>
<td>Second Dimension Topic of Mindset Sixth Dimension Mindset</td>
</tr>
<tr>
<td><strong>DIVERGENT</strong></td>
<td>Most growth pre-to mid-inventory scores</td>
<td>Still questioning, but I believe in students and want to limit negative experiences.</td>
<td></td>
</tr>
<tr>
<td><strong>How Mindsets Relate to Instruction</strong></td>
<td>Most change in mindsets from the pre-mindset score to the post-mindset score</td>
<td>Theme: Questioning Beliefs and Mindsets Enjoyable, engaging, deeper conceptual understanding, struggles with how to reconcile in new current practice.</td>
<td>Third Dimension Analytical Approach to Discussions Descriptive Analytical Approach to More of an Evaluative Analytical Approach</td>
</tr>
<tr>
<td><strong>DIVERGENT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Growth-Oriented Approach</strong></td>
<td>Increased reported Growth Mindset</td>
<td>Theme: Questioning Beliefs and Mindsets</td>
<td>First Dimension Focus on Students Second Dimension The Topic of Students' Thinking</td>
</tr>
<tr>
<td><strong>CONVERGENT</strong></td>
<td></td>
<td>Theme: New Perspectives on Teaching and Learning</td>
<td></td>
</tr>
<tr>
<td><strong>How Years of Experience Relate to Mindset</strong></td>
<td>No relationship between years of experience and final post-mindset score</td>
<td>There was no change in the thematic results according to years of experience.</td>
<td>There was no change in the dimension results according to years of experience.</td>
</tr>
<tr>
<td><strong>CONVERGENT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This study evidenced two divergent results. The first is how mindsets are represented and evidenced differently in various situations in this study. The second is how mindsets related to instruction. These divergent results will be outlined in more detail next.

**Mindsets Represent and Evidence Differently in Various Situations**

The first divergent result is regarding how mindsets represent and evidence differently in various situations. The first way that is evidenced differently was the mindset inventory showed significant changes in mindset over time. Participants' mindsets showed a significant increase from the pre-to the mid-mindset scores and the pre-to the post-mindset scores. Interestingly, these results also show that the highest growth occurred from the pre-mindset to the mid-mindset inventory, with little change from the mid-mindset inventory to the post-mindset inventory.

When investigated individually, the individual scores show substantial variations and fluctuations. The individual participants' results provide greater detail on how their mindsets evidenced themselves differently. For example, some participants started with a lower degree of growth mindset score, which increased minimally. In contrast, others rated their mindset at the highest degree of growth mindset and maintained that reporting. At the same time, others showed small and large fluctuations in their mindset scores. These variances between fixed and growth mindsets suggest that mindsets may fluctuate and may be more on a continuum due to various situations, but throughout the professional development, became more growth mindset-oriented.

However, the written reflections evidenced different results. The second way that it evidenced differently was in how the written reflection themes evolved over the
duration of the professional development. One of their themes was *questioning mindsets*. The reflections showed that participants never stopped questioning their mindsets, resulting in the theme of questioning mindsets evolving. In the beginning (September to November), many participants were focused on how growth mindsets related to their students. Many participants reflected fixed mindset ideas about students’ competence and capabilities. Starting in December, the reflections changed to participants questioning how these new growth mindset ideas fit into their current mindset about mathematics instruction and learning. In the final written reflections, many teachers still questioned how to reconcile their current instructional practices with a more growth-oriented mindset.

The video club discussions evidence varying types of growth and fixed mindsets, and their mindsets change in video club discussions as well. The results from the video discussion did not reflect an increased focus on mindset or evidence of increasing growth mindset vocabulary in their discussion; instead, they showed a decrease in fixed mindset discussions over time. For example, the video club discussions started with teachers speaking positively about having a growth mindset when implementing number talks. Still, when the task changed to the five practices task of goats and chicken, there was an increase in fixed mindset conversations. Teachers started questioning the abilities of themselves and their students, resulting in fixed mindset conversations about the limitations of some students being able to solve the problems. By the end of the conversation, results showed decreased fixed mindset discussions. The decrease did not increase the growth mindset; instead, it resulted in expanded neutral discussions that did not bring up mindset ideas.
This divergent finding demonstrates how mindsets manifest in different ways and situations in the qualitative and quantitative data results, suggesting that the participants may have more than one mindset about the learning and teaching of mathematics, especially as they encounter instructional tasks they consider more difficult. This is important because teachers might want to have a growth mindset. Still, there may be certain instructional areas of mathematics in which they might need additional support to employ a growth mindset.

*How Mindsets Relate to Instruction of Mathematics*

Another divergent finding was how the participants’ mindsets related to their teaching of mathematics. The quantitative results showed significant changes in growth mindsets from the beginning to the end. Contrary to this, the written reflection results showed that most participants reported seeing mathematics instruction differently. On the one hand, teachers discussed how such mathematics instruction using these instructional routines was highly engaging. The process was enjoyable, and they had a deeper understanding of mathematics.

On the other hand, the results show how many participants struggled to reconcile this mathematics instruction with their current mindsets about mathematics instruction. While many may have reported a growth mindset, there was clear evidence in the written reflections that teachers were struggling with some fixed mindset ideas about mathematics instruction, such as students needing to be explicitly taught how to solve problems before they can engage with mathematical ideas. This was evidenced in the number talks, but more so with the five practice tasks of goats and chickens and the
three-act tasks, as well as the fixed mindset idea that without explicit instruction, some students are incapable of solving such problems.

Many reflections said that the collaborative planning time and the video club discussions enabled teachers to see instruction differently. Participants could see each other's videos and notice different aspects of the instruction. As participants increased a focus on students' thinking, they moved from a descriptive-analytical approach to more of an evaluative analytical approach in their discussions in four ways: (1) possible improvements and refinements to instruction, (2) portions of the lesson that were being taught well or not, (3) figuring out steps they could take to improve the instruction next time, and (4) making sense of students’ strategies and evaluating their questions to see whether they were effective in advancing and assessing their thinking. This evaluative analytical approach in video club discussions assisted teachers in seeing instruction in a new light.

Interestingly, as teachers and instructional coaches participated in a community of practice over time, participants evidenced that it created a safe forum that assisted participants in moving from a descriptive-analytical approach (dimension three) to more of an evaluative analytical approach when discussing and reflecting on their mathematics instruction. This meant that teachers moved from just describing their instruction to their peers to adopting an evaluative approach and beginning to adopt an interpretative approach when addressing their mathematics instruction. This is important because the change in the analytical approach seems to indicate a growth mindset change in how mathematics instruction is viewed.
This study evidenced two convergent results. The first convergent result was all the data indicates a movement toward a growth-oriented approach. The second is that the teachers' years of experience did not affect the results in this study. These findings will next be discussed in detail.

**Growth-Oriented Approach**

The first convergent finding for the results was an increased growth-oriented mindset. The quantitative results indicate that the participants' growth mindsets did increase significantly from the beginning to the end. The inventory has participants rate four kinds of intelligence, as shown in Table 25.

**Table 25**

*Implicit Theories of Intelligence Inventory*

<table>
<thead>
<tr>
<th>Implicit Theories of Intelligence Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Items 1 and 7</strong></td>
</tr>
<tr>
<td>Changeability of Amount of Intelligence</td>
</tr>
<tr>
<td><strong>Item 1</strong> You have a certain amount of intelligence, and you can't really do much to change it.</td>
</tr>
<tr>
<td><strong>Item 7</strong> No matter how much intelligence you have, you can always change it quite a bit.</td>
</tr>
<tr>
<td><strong>Items 2 and 3</strong></td>
</tr>
<tr>
<td>Changeability of Intelligence as a Human</td>
</tr>
<tr>
<td><strong>Item 2</strong> Your intelligence is something about you that you can't change very much.</td>
</tr>
<tr>
<td><strong>Item 3</strong> No matter who you are, you can significantly change your intelligence level.</td>
</tr>
<tr>
<td><strong>Items 4 and 5</strong></td>
</tr>
<tr>
<td>Changeability of Your Intelligence</td>
</tr>
<tr>
<td><strong>Item 4</strong> To be honest, you can't really change how intelligent you are.</td>
</tr>
<tr>
<td><strong>Item 5</strong> You can always substantially change how intelligent you are.</td>
</tr>
<tr>
<td><strong>Items 6 and 8</strong></td>
</tr>
<tr>
<td>Changeability of Basic Intelligence Level</td>
</tr>
<tr>
<td><strong>Item 6</strong> You can learn new things, but you can't really change your basic intelligence level.</td>
</tr>
<tr>
<td><strong>Item 8</strong> You can change even your basic intelligence level considerably.</td>
</tr>
</tbody>
</table>
The inventory shows that participants' scores increased significantly from the beginning to the end, suggesting that they viewed intelligence from a growth-oriented angle in four different ways: (1) amount of intelligence, (2) intelligence as a human, (3) changeability of intelligence, and (4) basic intelligence level. These quantitative results suggest that as participants' mindset scores increased, they demonstrated more of a growth-oriented approach to intelligence.

Similar findings were echoed in the analysis of the participants’ written reflections and video club discussions. The results here evidenced that when teachers reflected on their instruction with a focus on students' thinking, they could view students in a more growth-oriented manner. The written reflection results over time evidenced an increased focus on students and their thinking. In short, results indicated that throughout the study, teachers began viewing students differently, changing teachers' beliefs about students' intelligence. There was also more evidence of participants recognizing students’ mathematical strengths. The qualitative results indicate that as participants adopted a more growth-oriented mindset and started to view students as competent, there was an increased focus on understanding students' thinking and how to incorporate these instructional routines into their current teaching practice effectively.

How Years of Experience Relate to Mindsets

Another convergent finding was that the teachers' years of experience did not significantly predict changes in their mindsets. In particular, the results of the multiple linear regression revealed that the years of experience did not significantly predict the post-mindset score. Echoing this finding, the written reflections and discussions showed
no variation in the qualitative results by years of experience. This seemed evident in both the themes created from open coding and the \textit{a priori} coding results.

The responses of teachers and instructional coaches in the inventory, written reflections, and video club discussions varied widely. However, years of experience were not a point of discussion in teachers’ video club discussions or evidenced in their written reflections, which revealed that participants valued taking part in a community of practice. Still, there is no evidence in the reflections that years of experience played a role in those communities of practice.

In summary, this study provided two divergent findings and two convergent findings. The first divergent finding was that participants' mindsets changed in different ways. While the quantitative results indicated significant increases in their growth mindsets from beginning to end, there were many variations in how their mindsets changed throughout the study. The qualitative results found that mindsets were represented differently in various situations. The second divergent finding was how participants' mindsets related to their mathematics instruction. In particular, there was a significant increase in their growth mindset, but the way their mindset related to mathematics instruction was evidenced differently throughout the study. One participant's statement exemplified the feelings of many teachers, "I see math instruction in a whole new way. I love every minute; I am not sure how to put it into practice."

The first convergent result suggested that participants were moving towards a more growth-oriented approach in both the quantitative and qualitative results. The significant increase in the inventory scores was echoed in the participants' viewing intelligence as changeable in themselves and their students. The written reflections and
video discussions demonstrated that teachers began perceiving students as more capable, which increased the foci on students' thinking. The final convergent finding was that years of experience did not relate to changes in participants' mindsets. The quantitative and qualitative results indicated that teachers' increased experiences did not predict their mindset changes. The written reflections and video discussions showed no evidence that years of experience played a role in how participants engaged with each other when discussing their students' thinking. These convergent and divergent findings provide a richer understanding of the qualitative and quantitative results, while also providing a measure of generalizability to some of these findings.

**Summary of Quantitative Results and Qualitative Findings**

In conclusion, the data results provided a deeper understanding of how the experience of engaging in a video club professional development relates to teachers' mindsets and reflection on instructional practices. Each of the data sources—the Implicit Theories of Intelligence Inventory, reflections on sessions, reflections on instruction, and video club discussions evidence an individual impact, but when taken collectively, they show how instructional practices are impacted by a specific and intentional video club professional development that includes repeated reflective and collaboration practices providing space for teachers to (re)examine their current mathematics beliefs and mindsets (Anderson et al., 2019; Ball & Cohen, 2011; Boaler, 2019).

In this chapter, the results of this study were presented, which were based on an analysis of inventory, written reflections, and videotaped discussions from fourteen
different schools (n=92). The findings were discussed in light of the three main research questions. The first section focused on quantitative results from an inventory using quantitative methods, viz., descriptive statistics, ANOVA, and multiple linear regression. The second section focused on the qualitative results of written reflections. Four major themes emerged from teachers’ written reflections: questioning mindsets, the power of video, new perspectives on teaching and learning mathematics, and the design of the professional development. The next section analyzed the qualitative results for video club discussions using a prior coding of six dimensions, which added another layer of understanding about the effects of engaging in professional development with an apparent increase in focus on students’ thinking and more critical evaluations of instruction. The next chapter will discuss these results in terms of the literature and theoretical framework.
Chapter V Discussion

The purpose of this convergent mixed-methods study is to begin to understand how the experience of actively participating in video club professional development relates to teachers' mindsets, beliefs, and reflection on instructional practices. This study examines how the instructional practices of teachers and instructional coaches are affected by a video club professional development that incorporated multiple opportunities to reflect and collaborate. This chapter is organized into three sections—it will first discuss the results through the lens of the sociocultural theory and situated perspective using the current literature on video clubs and mindsets.

Three main themes emerged as discussion points:

1. How mindsets represent differently
2. How collaborative, reflective practices relate to instruction and mindset
3. How videos relate to instruction and reflective practices

The second section will outline this study’s limitations and suggestions for future research. The final section summarizes this study’s implications for future educators and researchers.

Discussion

The purpose of this section is to discuss the results in the themes and illustrate how the literature, combined with the study's theoretical and conceptual framework, connects to the findings of the three discussion themes.
Professional Development Affects Mindsets in Different Ways

The first theme of the discussion was how this study adds to the field findings that professional development affects participants’ mindsets in different ways. This study’s qualitative written reflections and video club discussions found that many participants were still questioning whether they were "math persons" and which of their students were "math people." This study's findings are in line with the current literature showing that certain mindsets have become so ingrained in our education system that many people consider it a fact that some can do mathematics and others cannot (Boaler, 2020; Esmonde, 2009; Hand, 2012). These findings are important because researchers agree that the differing mindsets teachers hold about mathematics and students can affect planning, instruction, how they view themselves as mathematics teachers, and how they interact with students.

This study provides initial evidence to a very limited research base that adding a mindset component to a video club professional development may assist in changing mindsets. The Implicit Theories of Intelligence Inventory results showed significant changes in the participants' mindset scores over time, indicating that their mindsets improved to a growth mindset throughout the professional development of the video club. While this study identified significant growth in mindsets from the pre-mindset to the post-mindset inventory, there was a one-tenth of a percent decline from the mid-to-post-mindset score. Most of the growth occurred from the pre-mindset to the post-mindset score.

One possible reason for the stagnated scores may be the educators' misunderstanding of the concept of mindsets. Carol Dweck popularized the idea of a
growth mindset in 2008, leading many educators to believe that they needed to change
from a fixed to a growth mindset (Boaler, 2019). Consequently, many teachers may have
started to view two distinct mindsets, fixed and growth. Dweck's (2008) research
identified that about 40% of people have fixed mindsets, 40% have growth mindsets, and
the remaining 20% fluctuate between the two. However, data from 62% of the
participants showed that their mindsets fluctuated. Additionally, this study shows that
almost all teachers' mindsets represent differently, and may fall on a continuum. The
profile patterns are adding to this field’s understanding that veteran teachers and
instructional coaches’ mindsets fluctuate, not as great as preservice teachers, but there are
definite fluctuations. Mindsets research and video club research have heavily focused on
preservice and novice teachers, these ideas need greater exploration with veteran teachers
as well because there is not yet an understanding of how mindsets represent and fall on a
continuum with more experienced educators. This is important because the inventory
may not have accurately measured the many facets of a teacher's mindset in mathematics.
For example, while the inventory showed stagnated growth after mid-inventory, the
written reflections and video club discussions evidenced changes in discussions with
decreases in fixed mindset conversations and positive changes in growth mindset about
instruction and student thinking.

Additionally, this inventory may not have measured effectively due to the ceiling
effect. During this study the inventory was administrator prior to starting the professional
development, and then in the middle after the professional development, and finally at the
end of the last professional development. The timing of the survey may have had an
effect. The teachers and instructional coaches debriefed and reflected on the day’s
experiences prior to completing this inventory. That reflective discussion may have altered some responses to be more positive or negative. The research does show that sometimes participants may have responded with how they think they should respond, not how they truly feel. There may have been a real pressure for participants to conform to what they perceive to be socially desirable.

How Collaborative Reflective Practices Relate to Instruction and Mindset

The second theme that emerged was how reflective practices related to instruction. Video club discussion and written reflection results from this study showed an increased focus on students’ thinking throughout the professional development. This study’s written reflections on instruction evidenced that many teachers were surprised but pleased by the different strategies and approaches students adopted when trying to solve the instructional routines. Over time, this study showed an increased focus on teachers trying to anticipate and understand student thinking, using an evaluative approach, which manifested in different ways. For example, some teachers discussed possible improvements and refinements to instruction. Others made judgment calls about portions of the lesson that were being taught well or not and then discussed possible steps to improve the instruction next time. Finally, some teachers and instructional focus were making sense of students' strategies and evaluating their questions to see whether there were effective in advancing and assessing students’ thinking. This result differs from the literature because many other studies found that participants moved through all three stances-descriptive to evaluation-, finally becoming interpretive (Borko et al., 2008; Santagata, 2021; Sherin & Dyer, 2017). The experience of the participants may explain
this difference in results. Most of the studies in this field use novice and pre-service teachers in small numbers, but this study used veterans and had almost a hundred participants.

**Feedback Cycle**

Nevertheless, this increased focus on students’ thinking is important because this study found that by focusing on and discussing student thinking more often, teachers’ mindsets about students' capabilities began to change, with their beginning to view more students as mathematically competent. This study’s results add to the small but growing field of research that has found that perceiving students as mathematically competent and capable seems to not only breaks down the fixed mindset that only certain people are “math people”, but also creates a feedback cycle (Aguirre et al., 2013). As teachers begin viewing students in mathematics as competent and capable, it causes teachers to interact and view students with more of a growth mindset (Mason, 2011; Sherin, 2007; Sherin & van Es, 2008; van Es & Sherin, 2009). This result is important because studies have revealed that seeing the strengths of students' thinking can radically change a teacher's mindset about students’ mathematics abilities, how the teacher engages with students during instruction, and plans for instruction (Castro et al., 2019; Hand, 2012; Sherin, 2007; van Es & Sherin, 2009). Swandener implores the field to “reconceptualize all children as ‘at promise’ for success, versus ‘at risk’ for failure” (2012, p. 8). This follows a small but growing field of literature that points to the need for professional development to include a mindset component and a means to accommodate mindsets represented differently to assist teachers in applying the knowledge learned from
professional development programs to improve their instructional practices (Boaler, 2019; Sun, 2018, 2019).

**Long-Term Substantial Support**

Additionally, this study adds evidence to the field that the extended time of this professional development resulted in changes in the video club discussions and the themes of the written reflections. It evidenced the benefits of the extended duration due to the increased evaluative discussions and heightened focus on students' thinking. This is important because researchers agree and cite ample evidence that one-time “sit and get” sessions are generally ineffective in assisting teachers in implementing effective instructional strategies (Ball & Forzani, 2011; Larson & Kanold, 2016; NCTM, 2014, 2018). Researchers also find that the majority of textbooks and teaching materials do provide a means for the teacher to incorporate these practices into daily instruction (Anderson et al., 2019; Boaler, 2019; NCTM, 2014, 2018; Zager, 2017). There is an agreement in the field about the need for extended professional development because many teachers are facing difficulties in implementing these new teaching practices without substantial long-term support (Boaler, 2016; NCTM, 2014, 2018). This is crucial because more extended professional development can provide teachers with the needed clarifications and long-term support to refine instructional practices (Ball et al., 2014; Larson & Kanold, 2016).

**Design of Reflections**

This study is consistent with other research in the finding that the design of the reflective practices can affect what teachers focus on. This study's written reflections and video club discussions had specific questions to assist teachers in focusing on student
thinking and specific teacher moves. This study adds to the literature that the scaffolded design of the reflection can increase teachers’ focus on reflection in substantive ways by attending to the details of the instructional routine and focusing on students’ thinking (Etscheidt et al., 2012; Harford & MacRuiric, 2008; Santagata & Yeh, 2013; Schäfer & Seidel, 2015; Star & Strickland, 2008; Stockero et al., 2015). This is important because the literature finds that the reflection design can affect the teachers' actions of examining student thinking, interpreting student models, asking questions, pressing others' thinking, and critically analyzing instructional moments (Hand, 2012; Jilk, 2016; Mason, 2011; Sherin, 2007).

Many participants appreciated the time to reflect individually on their video and choose the portion to share with peers. This follows the literature that finds when teachers have time to reflect, personally, it enhances their collaborative reflection (Knight, 2014). This is important because many studies found that instructional practices may not change unless participants have a nonjudgmental means to reflect and evaluate their instructional practices on their own, as well as in a community of practice (Knight, 2014; van Es & Sherin, 2010; Zhang et al., 2011).

**Videos Related to Instruction and Reflective Practices**

While many studies in the field point to struggles with teachers not wanting to videotape themselves, this study adds to the field that while many participants expressed initial concerns with video, over time, many found using videos very advantageous. A major theme in the written reflections was that videos are a powerful tool. One prevalent advantage that teachers reported was valuing talking with other teachers and the
instructional coach from their school about their videos and that the conversations got better over time. This is important because the situated learning theory stresses the importance of considering the context and location of learning (Greeno, 2006; Lave & Wenger, 1991). Specifically, Borko (2004) posits that teacher learning should be embedded in situations where teachers will apply the knowledge, such as in the classroom.

The situated learning theory explains this study’s finding that while teachers initially hesitated to engage in video clubs, participation can start with learning from the periphery. Then over an extended period, participation and learning grew as members became more involved and invested in their community of practice (Lave & Wenger, 1991). As the comfort level of teachers and instructional coaches increases in the community of practice, participants feel more ownership and pride in the shared development of artifacts, routines, techniques, stories, and histories (Lave & Wenger, 1991; Wenger, 1998).

**Types of Videos**

Videos constituted a large element of this professional development. This study used two types of videos: teachers' own and stock videos. This study provides initial evidence that this combination overcame the disadvantages of just one type of video and leveraged the advantages of each type of video. Specifically, this study found that observing videos of their instruction and stock videos of others assisted teachers and instructional coaches in seeing an expert model, teachers in "seeing" their teaching in action, increased their motivation, and provided them with insights about their instruction. The written reflections revealed that the stock videos were pivotal for
learning how to orchestrate particular instructional activities in their classrooms, which is one of their main advantages (Superfine & Bragelman, 2018; Zhang, 2011). The study also found that having teachers analyze their videos for professional development overcame the problems encountered in the literature in using stock library videos; specifically, teachers reported that using stock videos left them unconnected to the classroom context (Knight, 2014; Seidel et al., 2011). The addition of using teachers' videos in this study enabled teachers to connect to the classroom context by providing them an opportunity to see an objective, accurate view of their practice in action and a clear picture of the reality of their instruction (Amador et al., 2020; Knight, 2014; van Es & Sherin, 2010). This is important because studies have found that video presents instruction authentically and assists teachers in "seeing" their teaching, and this authenticity can increase teachers' intrinsic motivation (Amador et al., 2020; Christ et al., 2017; Kersting et al., 2021). Additionally, Kersting et al. (2016) found that video is more manageable for teachers to analyze than actual instruction.

**Limitations**

This study used a convergent, parallel mixed methods design to capitalize on the strengths of the quantitative and qualitative methods. The variation in data collection enhanced the study's validity and answered the research questions from several perspectives. However, while the design was methodologically sound and accounted for the complexity of research, the embedded mixed methods approach and the study design had limitations.
One limitation is the generalizability of the findings due to being a single mixed-methods study focusing on one specifically designed video club and mindset professional development. It is unclear whether the observed results would be generalizable, for three main reasons. First, there is limited research in this area, using such a large sample of participants. The large majority of the studies in this field use almost exclusively small numbers of novice and pre-service teachers, but this study used a mix of novice and veteran (n=92) participants. Additionally, this study expanded the type of teachers by including instructional coaches, which also has scarce research due to the addition of mindset components to a video club. This is a new area of research, and it is not yet clear how generalizable this sample is to the general population of teachers receiving professional development. There is evidence that teachers’ long-standing negative beliefs and mindsets affect how they approach professional development, teach mathematics, make instructional decisions, plan mathematics lessons, and interact with students (Boaler, 2016, 2019; Dweck, 2008; Gutiérrez et al., 2018; NCTM, 2014, 2018; Sun, 2018, 2019). Studies aver that teachers’ mindset is so firmly ingrained with old paradigms that it affects how they apply learning acquired from a professional development (Anderson et al., 2018; Boaler, 2016, 2019; Sun, 2019).

Another major limitation is the possible influence of factors external to the study, such as mentoring programs, other professional development, and school-level coaching. Participants came from 14 schools with different interest levels and involvement, from the instructional coaches, teachers, and principal. In addition, there were 5-9 teachers per school, which sometimes meant that a teacher was there without the grade-level team, or they were the only one in their grade level from that school. This may have affected the
planning and classroom implementation. While this study had a large n-size in compared to other studies, it is relatively small, compared to the size of the district with 43 elementary schools.

This study was year-long and there were no other professional developments focusing on mindsets or using video during this year. Some researchers point to the positive effects of incorporating mindset interventions on students (Boaler, 2019; Dweck, 2006; Trzesniewski & Dweck, 2007). The interventions vary, but a common finding was that intervention, to be successful, needs to be tied to providing an extended time for teachers to reflect on how these new practices and mindsets fit in with their current practices. Anderson et al. (2018) also adds that unless teacher professional development begins to incorporate ways to explore and examine minds and beliefs, teachers’ instructional practices are unlikely to change (Anderson et al., 2018; Sun, 2018, 2019).

**Future Research**

Video clubs provide a platform for collaborating, reflecting, and refining practices in a safe environment (Rosaen et al., 2008; Sherin, 2007; Sherin & van Es, 2007), as well as for deep reflection and analysis to help strengthen teachers' in-the-moment decision-making skills (Castro et al., 2005; Hand, 2012; Sherin, 2007; van Es & Sherin, 2009). It is necessary to explore these relationships in more depth and understand how the video club experience relates to teachers' mindsets, beliefs, and reflections on instructional practices. There are many different avenues that future research can build on from design to scaling up to examining student achievement levels. Future research could investigate
this video club design with mindsets on a larger scale in multiple settings to ascertain whether the positive effects can be replicated. This study had a large n-size of 92 but focused on third-to sixth-grade teachers. Additionally, while it involved 14 schools, they were all from the same suburban district. Future research should include studies in different settings, grade levels, and locations. The design would remain the same, but the content would need to be shifted to be grade level appropriate.

In the study's district, I will expand video clubs due to popular demand from teachers and instructional coaches. The biggest reason for the request is that teachers and instructional coaches found this to be an empowering experience. The reasons given for why it was empowering were:

1. Providing an engaging way to learn how to teach mathematics in an engaging way.
2. The focus is on short instructional routines teachers could quickly refine over time.
3. The collaboration between teachers, coaches, and other schools.

Video clubs professional development will now have sections for K-3 teachers, 4-6 teachers, and 7-9 teachers. There is also a desire for the study's participants to continue the work with the original group and have follow-up sessions. Additionally, I have shared the results of my research with many other district leaders across mountain west and national levels; many leaders have reached out to me for more details and on how to implement a similar idea in their district. Many districts have found that the design of the video club professional development package could easily be replicated in their district due to the Canvas course and the detailed description of the professional development
provided by this study. This collaboration with other districts on implementing this kind of professional learning experience has enriched the district’s vision for video clubs going forward.

Another future research possibility is measuring student achievement. Student achievement was not measure for this study, due it being the first introduction of video in professional development. Video can be frightening in the beginning, but overtime it as this study has shown becomes a powerful tool. While the overall goal in professional development is to increase student achievement, the main focus for video clubs is on (re)examining mindsets in relation to instructional practices. It would be interesting to see if mindset change occurs more quickly if teachers also see changes in student achievement levels.

An additional future line of research might be to modify the study and add a mindset instrument more directly tied to instruction. The mindset inventory used in this study focused on general mindsets. However, it raised concerns about how answers might tend to be socially desirable and the inability to measure mindsets on a continuum. Additionally, due to the inventory being tied to mindsets in general, it might be advantageous to have a rubric like the one used by Anderson and colleagues (2018) that highlights mathematical mindset practices in instruction. That study identified five large categories of mathematical mindset practices: (1) growth mindset culture, (2) nature of mathematics, (3) challenge and struggle, (4) connections and collaboration, and (5) assessment. The researchers created a rubric that provides insight into different mathematical mindset practices that affect planning, teaching, assessing, and reflecting. This allows teachers to self-assess and reflect on where they are on this mindset practice
and use the rubric criteria to increase their use of mathematical mindsets. This may further clarify mindsets and assist teachers in understanding mindsets directly connected to instruction. The situated learning theory stresses the importance of considering the context and location of learning (Brown et al., 1989). Specifically, Borko (2004) posits that teacher learning should be embedded in situations where they will apply the knowledge, such as in the classroom.

Another area of research is how to build on literature understanding of the effects using a combination of video sources. While research reports the benefits of both types (Borko et al., 2008; 2017; MacDonald, 2011; Seidel et al., 2011; Zhang et al., 2011), there also needs to be a better understanding of the considerations of which characteristics in the videos are most beneficial, e.g., rigorous content, ability to hear students' thinking and demonstrations of in-depth thinking.

Another area of research is to examine the reflection process. There may be a need to modify the reflection questions and the timing of the reflection questions to get more variety in responses. Additionally, the reflection form that focuses on instruction and finding timestamps created an increased focus on this idea. A future line of research may be examining the reflections more in-depth and determining the impact on teachers being able to see themselves doing these practices. The possible additional of interviews to future research may help in understanding how the reflective process related to their mindsets and instruction. Additionally, it would be interesting to understand what assists and deters teachers and instructional coaches when trying to implement new instructional practices. The reflective process is a definite area that needs more exploration.
Finally, one last area of suggested future research is to explore some of the fixed mindsets that may inadvertently lead some teachers to employ handicapping strategies supposed to be "kind" and "caring" yet have the opposite effects on students by sending damaging mindset messages. Understanding how to dispel myths like only certain people are "math people" and other negative mindset messages about instruction is crucial. More work is needed in the field to understand how to assist teachers in recognizing handicapping teaching strategies and how to have them examine these beliefs and mindsets safely and positively.

Nevertheless, this approach to professional development in mathematics is something future research should include to evaluate the benefits of such video club professional development. If additional studies show that this design of video club professional development benefits instructional coaches and teachers, this practice should be more widely used.

**Summary of Video Club Mathematics Professional Development and Mindsets**

This study has both practical and theoretical significance for two major areas of research: video club mathematics professional development (e.g., Borko et al., 2008, 2017; Sherin & van Es, 2009; Sherin et al., 2011, van Es, 2009) and mindsets (Anderson et al., 2018; Boaler, 2019; Sun, 2018). This study will further these fields with insight into in-service practice, teacher preparation, theory, and research.

Many teachers struggle with changing instructional practices and long-standing mindsets and beliefs about the teaching and learning of mathematics. This study
identifies a promising new type of video club professional development that can support and promote specific changes in instructional practices in mathematics. It extends the current video club research by including established teachers and instructional coaches and increasing the n-size to 92 participants and by adding a mindset component. While video club research is well established as an effective practice with teacher preparation, the addition of (re)examining mindsets provides an element that could assist in strengthening the relationship between reflecting on practice and orchestrating instruction using instructional routines.

Video club also adds to the understanding of the sociocultural and situated learning theories by providing evidence of how engaging in a year-long professional development relates to adults reflecting and debriefing with peers in a learning community. This also adds to the field of situated learning the importance of the context and location of learning. Specifically, this adds to understanding the effect of professional learning being grounded in classroom practice, where teachers will apply the knowledge (Borko, 2004). Finally, this study contributed to the situated perspective findings that the reflections and discussions of teachers and instructional coaches focus increasingly on student thinking and pedagogy, as their participation became more meaningful in a community of practice, creating a positive feedback loop (Greeno, 2006; Lave & Wenger, 1991).

Patterns and trends emerging from this study indicate that engaging in video club professional development designed with repeated opportunities to (re)examine mindsets, reflect on instructional practices, and collaborate with peers causes changes in teachers' mindsets, reflections, and collaborative discussions about the teaching and learning of
mathematics. This study adds to our current knowledge that changes in mindsets and instruction are more likely to occur if teachers can collaboratively reconcile how new instructional strategies align with their current mathematical beliefs and mindsets (Boaler, 2020; Donaldson et al., 2018, NCTM, 2014).

In this study, identifiable mindset change often occurred mid-way through professional development. Teachers' reflections suggest growth in focusing instructional practices on effective teaching methods for mathematics and increased attention on students' thinking. The need, for critically examining the barriers to a change in instructional practice and working to design professional development strategies to overcome them, is well known. This study provides evidence that video club professional development can change mindsets and important instructional practice shifts.

Several studies, including this one, suggest that mindsets and beliefs may play a more significant role than previously thought in the hesitance of teachers to apply knowledge learned from professional development programs to improve their instructional practices (Anderson et al., 2019; Boaler, 2019; Sun, 2018; 2019). Additionally, while it is common for teachers to attend sessions focusing on mindset, improve instructional practices, or use video, it is less common for them to experience all these ideas integrated into the construct of one program. If this combination approach is used in future research and indicates similar patterns and trends, video club professional development may be a promising approach to assist teachers in refining their instructional practices, while examining and resetting their mindsets and beliefs.
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Appendices
### Appendix A. Building A Collegial Atmosphere

#### Fav Five Form

<table>
<thead>
<tr>
<th>What is your favorite math topic to teach?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>What is your favorite math that you liked to do in school?</td>
<td></td>
</tr>
<tr>
<td>What is your favorite math lesson?</td>
<td></td>
</tr>
<tr>
<td>What is your favorite number? And why?</td>
<td></td>
</tr>
<tr>
<td>What is your favorite way to use math in the real world?</td>
<td></td>
</tr>
</tbody>
</table>

#### Pick Your Mathematical Conversation

<table>
<thead>
<tr>
<th>Pick Your Mathematical Conversation (10 minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers will select a conversation topic from a container on their table. Teachers will discuss that topic until that conversation has been exhausted and then choose a new topic. Teachers can have as many different or few conversations as they want for ten minutes.</td>
</tr>
</tbody>
</table>

#### Topics to Choose From

<table>
<thead>
<tr>
<th>Describe your experiences with learning how to teach mathematics.</th>
<th>Describe your childhood experiences learning mathematics.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe a successful mathematics lesson.</td>
<td>Describe a mathematics lesson that was an epic failure.</td>
</tr>
<tr>
<td>Describe how you handle mistakes in the classroom.</td>
<td>Describe something you learned that improved your mathematics teaching from a colleague or professional development.</td>
</tr>
<tr>
<td>Describe how you get students to share their mathematics thinking.</td>
<td>Describe how you help students who feel like they will never be good at math.</td>
</tr>
</tbody>
</table>
Appendix B. Lesson Planning for Instructional Routines

**Engage in the routine first as an adult learner.**

**Focus on making thinking visible.**

**Watch a video clip of the teacher orchestrating the routine.**

**Have a short discussion about the teacher moves observed, their effects, and what kinds of student thinking were shared. Discuss if there are any other students' thoughts that could be shared.**

**Focus as a grade-level team on planning the routine.**
- Preplanning questions and actions to assist in orchestrating the routine, the preplanning teacher moves to provide opportunities for students to justify, prove, and explain their reasoning.
- Preplanning tools will be used to assist students in making their thinking visible (Flynn, 2017; Zager, 2017)

**Utilize the lesson planning toolbox to strengthen the lesson planning.**

**Example Lesson Planning Kit for Instructional Routine**
All the planning kits on Canvas

*Lesson Planning Kit for Instructional Routine: Number Talks and Visual Images*

<table>
<thead>
<tr>
<th>Number Talks and Visual Images</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All About the Routine</strong></td>
</tr>
<tr>
<td>• Explanation of the routine</td>
</tr>
<tr>
<td>• Research on the routine</td>
</tr>
<tr>
<td><strong>Implementation Steps</strong></td>
</tr>
<tr>
<td>• Sample Lesson Plan</td>
</tr>
<tr>
<td>• Sample Lesson Planning Template</td>
</tr>
<tr>
<td>• Two Videos of Teachers Implementing the Routine</td>
</tr>
<tr>
<td>• Tech Tools that Support Implementation</td>
</tr>
</tbody>
</table>
### Appendix C. Mindset Session and Video Club Discussions Facilitation Guide

#### Chapter 1: The Brain and Mathematics Learning

<table>
<thead>
<tr>
<th>Mindset Lesson Components</th>
<th>Video Club Discussion Prompts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have the teachers read Chapter 1 in Mathematical Mindsets to set the stage for the discussion.</td>
<td><strong>Open Discussion Questions</strong></td>
</tr>
<tr>
<td>Review over norms.</td>
<td>To facilitate the discussion, use the article as a guiding tool. <a href="#">It is linked here.</a> Use the questions for open discussion. If appropriate you can use the content or practice questions as well. It would be great to give each teacher a copy of the questions again.</td>
</tr>
<tr>
<td>Watch two short video clips. Video Clip #1 Mindsets Video Clip #2 Brain Plasticity</td>
<td>1. What did you notice?</td>
</tr>
<tr>
<td>Facilitate the Mindset Discussion with Facilitation Questions.</td>
<td>2. What are some questions you have about the clip?</td>
</tr>
</tbody>
</table>
**Mindset Facilitation Questions** | 3. You said ______. Can you tell us more about that? What evidence can you state that shows that? |
| 1. What are your thoughts on the latest brain research? | Teachers can share by using the discussion questions from the reflection form. |
| 2. What is learning about brain plasticity important? | **Video Discussion Questions** |
| 3. How does this apply to teaching mathematics? Planning for mathematics? | * Students discussing and interacting with peers to justify, prove, and explain their reasoning |
| 4. How does this mathematical mindset idea fit into your current beliefs about teaching mathematics? | * Students making their thinking visible through models, showing thought processes, etc. |
| | * Teacher is guiding and strategically orchestrating the discussion by using math talk and other conversation tools. (Revoicing, Restating, Wait Time, Prompting, Applying Reasoning) |
| | *What questions does the teacher ask to help students focus on the mathematics in the task?|

#### Final Reflection Questions

1. How did video club discussions challenge or align with your current beliefs and mindset about teaching mathematics?
2. What did you learn from today’s Math Mindsets chapter?
3. What did you learn from collaboratively planning instructional routines?
4. Which part of this day did you find most impactful and why?
### Chapter 2: The Power of Mistakes and Struggle

**Mindset Lesson Components**
Have the teachers read Chapter 2 in Mathematical Mindsets to set the stage for the discussion.

- Review over norms.
- Watch two short video clips.
  - Video Clip #1 Jo Boaler Struggle
  - Video Clip #2 Watch the first until 7:30.

Facilitate the Mindset Discussion with Facilitation Questions.

**Mindset Discussion Questions**
- Why should students struggle in mathematics?
- How do we balance struggle with frustration?
- How does this apply to teaching mathematics? planning for mathematics?
- How does this mathematical mindset idea fit into your current beliefs about teaching mathematics?

**Video Club Discussion Prompts**

**Open Discussion Questions**
To facilitate the discussion, use the article as a guiding tool. It is linked here. Use the questions for open discussion. If appropriate you can use the content or practice questions as well. It would be great to give each teacher a copy of the questions again.

1. What did you notice?
2. What are some questions you have about the clip?
3. You said . Can you tell us more about that? What evidence can you state that shows that?

Teachers can share by using the discussion questions from the reflection form.

**Video Discussion Questions**

- Students discussing and interacting with peers to justify, prove, and explain their reasoning
- Students making their thinking visible through models, showing thought processes, etc.
- Teacher is guiding and strategically orchestrating the discussion by using math talk and other conversation tools. (Revoicing, Restating, Wait Time, Prompting, Applying Reasoning)

*What questions does the teacher ask to help students focus on the mathematics in the task?*

**Final Reflection Questions**

1. How did video club discussions challenge or align with your current beliefs and mindset about teaching mathematics?
2. What did you learn from today’s Math Mindsets chapter?
3. What did you learn from collaboratively planning instructional routines?
4. Which part of this day did you find most impactful and why?
Chapter 9: Teaching Math for a Growth Mindset

Mindset Lesson Components
Have the teachers read Chapter 2 in Mathematical Mindsets to set the stage for the discussion.

Review over norms.

Jigsaw the article “When Nice Won’t Suffix” There are 5 parts.

Facilitate the Mindset Discussion with Facilitation Questions.

Mindset Discussion Questions
- What was interesting about the article? What surprised you? What rang true?
- How does the article relate to our professional learning community at the school?
- How does this apply to teaching mathematics? planning for mathematics?
- How does this mathematical mindset idea fit into your current beliefs about teaching mathematics?

Video Club Discussion Prompts

Open Discussion Questions
To facilitate the discussion, use the article as a guiding tool. It is linked here. Use the questions for open discussion. If appropriate you can use the content or practice questions as well. It would be great to give each teacher a copy of the questions again.
1. What did you notice?
2. What are some questions you have about the clip?
3. You said . Can you tell us more about that? What evidence can you state that shows that? ____________

Teachers can share by using the discussion questions from the reflection form.

Video Discussion Questions
* Students discussing and interacting with peers to justify, prove, and explain their reasoning
* Students making their thinking visible through models, showing thought processes, etc.
* Teacher is guiding and strategically orchestrating the discussion by using math talk and other conversation tools. (Revoicing, Restating, Wait Time, Prompting, Applying Reasoning)
* What questions does the teacher ask to help students focus on the mathematics in the task?

Final Reflection Questions
1. How did video club discussions challenge or align with your current beliefs and mindset about teaching mathematics?
2. What did you learn from today’s Math Mindsets chapter?
3. What did you learn from collaboratively planning instructional routines?
4. Which part of this day did you find most impactful and why?
Appendix D. Written Reflective Practices

Session Reflection Questions

- How did today’s session challenge or align with your current beliefs and mindset about teaching mathematics?
- What did you learn from today’s Math Mindsets session?
- What did you learn from collaboratively planning instructional routines?
- Which part of this day did you find most impactful and why?

Video Club Reflection Form

<table>
<thead>
<tr>
<th>Name:</th>
<th>Instruction Strategy/Focus:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lesson objective:</th>
<th>Standard:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

First Time Viewing: Determine Timestamps of Meaningful Moments

<table>
<thead>
<tr>
<th>Students discussing and interacting with peers to justify, prove, and explain their reasoning.</th>
<th>Time Stamp(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students making their thinking visible through models, showing thought process, etc.</td>
<td>Time Stamp(s):</td>
</tr>
<tr>
<td>Teacher is guiding and strategically orchestrating the discussion by using math talk and other conversation tools. (Revoicing, Restating, Wait Time, Prompting, Applying Reasoning)</td>
<td>Time Stamp(s):</td>
</tr>
<tr>
<td>What questions does the teacher ask to help students focus on the mathematics in the task?</td>
<td>Time Stamp(s):</td>
</tr>
</tbody>
</table>
### Second Time Viewing

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>What pleased you?</td>
<td></td>
</tr>
<tr>
<td>What surprised you?</td>
<td></td>
</tr>
<tr>
<td>What concerned you?</td>
<td></td>
</tr>
<tr>
<td>How did the facilitation of the instructional strategy enhance or reveal student mathematical thinking?</td>
<td></td>
</tr>
</tbody>
</table>

### Last Time Viewing: Going Forward

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>What portion of your video would you like to share at video club discussions?</td>
<td></td>
</tr>
<tr>
<td>What are your next steps with students?</td>
<td></td>
</tr>
</tbody>
</table>
Appendix E. Consent Email to Participants

Informed Consent IRB Protocol #12434 IRB

A MIXED-METHODS STUDY INVESTIGATING HOW A VIDEO CLUB PROFESSIONAL DEVELOPMENT RELATES TO TEACHERS’ MINDSETS, BELIEFS, AND REFLECTIONS ON INSTRUCTIONAL PRACTICES

Dear Awesome Teachers,

You are cordially invited to participate in a research study conducted by Amy Kinder, a doctoral student in TEAL department at Utah State University. The purpose of this mixed-methods study is to provide a deeper understanding of how the experience of engaging in a video club professional development relates to teachers' mindsets, beliefs, and reflection on instructional practices.

These are the Research Questions that I am exploring

1. Which teacher mindsets and beliefs change after engaging in repeated video club cycles with multiple opportunities to reflect and collaborate?

2. What is the focus of the teachers’ written reflections during the video club professional development and how does it change over time?

3. When teachers reflect with their peers using video clips of their instruction, what are the discussion patterns and trends?

Voluntary Nature of the Study

Your participation is entirely voluntary. If you decide to share your data, you are free to change your mind at any time. If you have any questions about this study, don't hesitate to contact me at (801)349-7261 or email me at amykinderilovemath@gmail.com.

Procedures

Your participation will involve giving permission to use three existing pieces of data that were collected during the 2021-22 Video Club Professional Development.

All data will be deidentified.

1. The results from the pre, mid, and post Implicit Theories of Intelligence Inventory (Dweck, 2008)

2. Your written reflections from video club sessions (six total)
3. Video recordings of your collaborative discussions (3 times)

**Risks**
This is a minimal risk research study. That means that the risks of participating are no more likely or serious than those you encounter in everyday activities. In order to minimize those risks and discomforts, I will deidentify the data.

**Benefits**
Although you will not directly benefit from this study, it has been designed to learn more about how the experience of engaging in a video club professional development relates to teachers' mindsets, beliefs, and reflection on instructional practices.

**Confidentiality**
I will make every effort to ensure that the information you provide as part of this study remains confidential. Your identity will not be revealed in any publications, presentations, or reports resulting from this research study.

**Data Retrieval and Storage**
I will collect your information through by requesting permission to access video recordings, reflections, and survey results from the 2021-22 Video Club Professional Development. Online activities always carry a risk of a data breach, but we will use systems and processes that minimize breach opportunities. This Data will be securely stored in a restricted-access folder on Box.com, an encrypted, cloud-based storage system. This form will be kept for three years after the study is complete, and then it will be destroyed.

It is unlikely, but possible, that Utah State University may require us to share the information you give us from the study to ensure that the research was conducted safely and appropriately. I will only share your information if law or policy requires us to do so.

**Voluntary Participation & Withdrawal**
Your participation in this research is completely voluntary. If you agree to participate now and change your mind later, you may withdraw at any time by contacting me. If you choose to withdraw after we have already collected information about you, your information will be removed from the study. If you decide not to participate, your position will not be affected in any way.
Compensation
If you agree to share the three sources of data, you will be compensated $100. I understand the personal nature of the discussions and reflections all data sources will be have names and identifying information removed.

IRB Review
Please contact Amy Kinder at (801)349-7261 if you have any questions or concerns. Please be aware that the Institutional Review Board (IRB) for the protection of human research participants at Utah State University has reviewed and approved this study. If you have questions about the research study itself, please contact the Principal Investigator Beth.MacDonald@usu.edu. If you have questions about your rights or would simply like to speak with someone other than the research team about questions or concerns, please contact the IRB Director at (435) 797-0567 or irb@usu.edu.
Sincerely,

Amy Kinder,
Student Investigator
(801)349-7261
amykinderilovemath@gmail.com

Dr. Beth MacDonald
Principal Investigator
(435) 797-1097
Beth.MacDonald@usu.edu
Verbal Script for Consent

Since you participated in the 2020-21 Video Club Professional Development Package, you are invited to participate in a research study conducted by Amy Kinder, a doctoral student in TEAL department at Utah State University. I have an exciting opportunity for you to add to the growing field of research on using videos to improve instruction. The purpose of this mixed-methods study is to provide a deeper understanding of how the experience of engaging in a video club professional development relates to teachers' mindsets, beliefs, and reflection on instructional practices. This study inspires to critically investigate how instructional practices are impacted by specific and intentional video club professional development that includes repeated reflective and collaboration practices that allow teachers opportunities to (re)examine their current mathematics beliefs and mindsets.

Research Questions

1. Which teacher mindsets and beliefs change after engaging in repeated video club cycles with multiple opportunities to reflect and collaborate?

2. What is the focus of the teachers’ written reflections during the video club professional development and how does it change over time?

3. When teachers reflect with their peers using video clips of their instruction, what are the discussion patterns and trends?

Your participation will involve giving permission to use three pieces of data that were collected during the 2021-22 Video Club Professional Development. This research has no known risks. All data will be deidentified.
1. The results from the pre, mid, and post Implicit Theories of Intelligence Inventory (Dweck, 2008)

2. Your written reflections from video club sessions (six total)

3. Video recordings of your collaborative discussions (3 times)

If you agree to share the three sources of data, you will be compensated $100. As a researcher, I understand the personal nature of the discussions and reflections all data sources will be have names and identifying information removed. I will make every effort to ensure that the information you provide as part of this study remains confidential. Your identity will not be revealed in any publications, presentations, or reports resulting from this research study. Your privacy will be protected to the maximum extent; therefore, all identifiers, such as teacher names and school names will be removed for collected work that will be analyzed by me. I will assign you a pseudonym when referring to your data sources.

This study intends to add to current research that suggests changes in instruction are likely to occur if teachers are able to reconcile how the new instructional strategies align with their current mathematics beliefs and mindsets.

A link to the consent form will be found in Qualtrics. You have one week to decide if the study is a good fit for you. If you have questions about the research study itself, please contact the Principal Investigator Beth.MacDonald@usu.edu. If you have questions about your rights or would simply like to speak with someone other than the research team about questions or concerns, please contact the IRB Director at (435) 797-0567 or irb@usu.edu.
Recruiting Flyer

Video Club Research OPPORTUNITY

You are cordially invited to participate in a research study conducted by Amy Kinder, a doctoral student in TEAL department at Utah State University. The purpose of this mixed-methods study is to provide a deeper understanding of how the experience of engaging in a video club professional development relates to teachers’ mindsets, beliefs, and reflection on instructional practices.

Your Participation is Voluntary

Your participation will involve giving permission to use three existing pieces of data that were collected during the 2021-22 Video Club Professional Development.

1. The results from the pre, mid, and post Implicit Theories of Intelligence Inventory (Dweck, 2008)
2. Your written reflections from video club sessions (six total)
3. Video recordings of your collaborative discussions (three times)

Your Data is Confidential

The researchers will make every effort to ensure that the information you provide as part of this study remains confidential. Your identity will not be revealed in any publications, presentations, or reports resulting from this research study.

Compensation

If you agree to share the three sources of data, you will be compensated $100. The researcher understands the personal nature of the discussions and reflections all data sources will be have names and identifying information removed.

Use the link in Canvas under "Interested in Participating in a Research Project". You will find a link to a Qualtrics Survey.

Amy Kinder, Researcher
AmyKinderlovemath@gmail.com
(801) 349-7261

Pl, Dr. Beth MacDonald
Utah State University
(801) 797-1097
Appendix F. District Permission for the Study

August 10, 2021
Jordan School District
RE: Permission to Conduct Research Study
Dear Jordan School District Administration:

I am writing to request permission to conduct a research study at Jordan School District. I am currently enrolled in the TEAL program at Utah State University in Logan, Utah, and am writing my Doctoral Dissertation. The study is entitled:

A MIXED-METHODS STUDY INVESTIGATING HOW A VIDEO CLUB PROFESSIONAL DEVELOPMENT RELATES TO TEACHERS’ MINDSETS, BELIEFS, AND REFLECTIONS ON INSTRUCTIONAL PRACTICES

I hope that the district administration will allow me to use three existing data sources from 2021-22 video club mathematics professional development: video club videos, surveys, and written reflections. Interested teachers, who volunteer to share their data after the completion of the professional development will be given a consent form to be signed (copy enclosed) and returned to the primary researcher.

The study's results will be pooled for the project, and individual results of this study will remain confidential and anonymous. However, should this study be published, only pooled results will be documented.

I will greatly appreciate your approval to conduct this study. I will follow up with a telephone call next week and would be happy to answer any questions or concerns that you may have at that time. In addition, you may contact me at my email address at Amy.Kinder@jordandistrict.org. If you agree, kindly sign below and return the signed form in the enclosed self-addressed envelope. Alternatively, kindly submit a signed letter of permission on your institution's letterhead acknowledging your consent and authorization for me to conduct this survey/study at your institution.

Sincerely,
Amy Kinder
K-12 Mathematics Consultant
Doctoral Student at Utah State University
Enclosures
cc: Dr. MacDonald, Research Advisor, USU
August 20, 2021

Dear Amy Kinder:

Your request to conduct a research project in the Jordan School District concerning "A Mixed Methods Study Investigating How a Video Club Professional Development Infused with Mindset Practices Relates to Teachers’ Mindsets, Beliefs and Reflections on Instructional Practices" has been given district-level approval by the District Research Review Committee according to the parameters of the study listed in your application.

Although you have received Research Review Committee approval, this decision does not obligate a school or its staff to participate if circumstances or events are such that the research would create problems or would be overly burdensome. You will now need to contact the principals of the elementary schools that have participants in your study to obtain their approval to conduct your research project in their school.

Please send a copy of your final findings, conclusions, and recommendations from the study to the Evaluation, Research & Accountability Department. Thank you for your interest in conducting research in Jordan School District.

Sincerely,

Ben Jameson

Evaluation, Research & Accountability
Ben Jameson, M.Ed. Director 801-567-8243 Office
801-567-8017 Fax
ben.jameson@jordandistrict.org
Appendix G. Implicit Theories of Intelligence Inventory

Thank you for taking the time to complete this survey. All responses are confidential and anonymous. By clicking on an answer to the question below, you agree to the terms of data use as outlined above and to be part of my research study. Your participation is voluntary. The survey takes about eight minutes to complete.

Demographic Data
What grade level do you teach?
What gender do you identify with?
How many years have you been teaching?

Implicit Theories of Intelligence Inventory (Dweck, 2008)

<table>
<thead>
<tr>
<th>Six Point Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = strongly agree; 2 = agree; 3 = mostly agree; 4 = mostly disagree; 5 = disagree; 6 = strongly disagree.</td>
</tr>
</tbody>
</table>

1. You have a certain amount of intelligence, and you can't really do much to change it.

2. Your intelligence is something about you that you can’t change very much.

3. No matter who you are, you can significantly change your intelligence level.

4. To be honest, you can't really change how intelligent you are.

5. You can always substantially change how intelligent you are.

6. You can learn new things, but you can't really change your basic intelligence level.

7. No matter how much intelligence you have, you can always change it quite a bit.

8. You can change even your basic intelligence level considerably.
Appendix I. Quantitative Analysis Results

ANOVA Analysis

Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total #1</td>
<td>36.49</td>
<td>5.853</td>
<td>92</td>
</tr>
<tr>
<td>Total #2</td>
<td>40.93</td>
<td>5.349</td>
<td>92</td>
</tr>
<tr>
<td>Y = Mindset Final Score</td>
<td>41.03</td>
<td>6.222</td>
<td>92</td>
</tr>
</tbody>
</table>

Multivariate Tests

<table>
<thead>
<tr>
<th>Effect</th>
<th>Value</th>
<th>F</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Pillai’s Trace</td>
<td>.332</td>
<td>22.402</td>
<td>2.000</td>
<td>90.000</td>
<td>&lt;.001</td>
<td>.332</td>
</tr>
<tr>
<td>Wilks’ Lambda</td>
<td>.668</td>
<td>22.402</td>
<td>2.000</td>
<td>90.000</td>
<td>&lt;.001</td>
<td>.332</td>
</tr>
<tr>
<td>Hotelling’s Trace</td>
<td>.498</td>
<td>22.402</td>
<td>2.000</td>
<td>90.000</td>
<td>&lt;.001</td>
<td>.332</td>
</tr>
<tr>
<td>Roy’s Largest Root</td>
<td>.498</td>
<td>22.402</td>
<td>2.000</td>
<td>90.000</td>
<td>&lt;.001</td>
<td>.332</td>
</tr>
</tbody>
</table>

b.  Design: Intercept
Within Subjects Design: Time
b.  Exact statistic

Mauchly’s Test of Sphericity

<table>
<thead>
<tr>
<th>Within Subjects Effect</th>
<th>Mauchly’s W</th>
<th>Approx. Chi-Square</th>
<th>df</th>
<th>Sig.</th>
<th>Greenhouse-Geisser</th>
<th>Epsilonb</th>
<th>Huynh-Feldt</th>
<th>Lower-bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>.967</td>
<td>3.002</td>
<td>2</td>
<td>.223</td>
<td>.968</td>
<td>.989</td>
<td>.500</td>
<td></td>
</tr>
</tbody>
</table>

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

b.  Design: Intercept
Within Subjects Design: Time
b.  May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.
### Tests of Within-Subjects Effects

**Measure:** Mindset

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>1239.442</td>
<td>2</td>
<td>619.721</td>
<td>24.235</td>
<td>&lt;.001</td>
<td>.210</td>
</tr>
<tr>
<td></td>
<td>Greenhouse-Geisser</td>
<td>1.936</td>
<td>640.052</td>
<td>24.235</td>
<td>&lt;.001</td>
<td>.210</td>
</tr>
<tr>
<td></td>
<td>Huynh-Feldt</td>
<td>1.978</td>
<td>626.657</td>
<td>24.235</td>
<td>&lt;.001</td>
<td>.210</td>
</tr>
<tr>
<td></td>
<td>Lower-bound</td>
<td>1.000</td>
<td>1239.442</td>
<td>24.235</td>
<td>&lt;.001</td>
<td>.210</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Error (Time)</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sphericity Assumed</td>
<td>4653.891</td>
<td>182</td>
<td>25.571</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greenhouse-Geisser</td>
<td>4653.891</td>
<td>176.219</td>
<td>26.410</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Huynh-Feldt</td>
<td>4653.891</td>
<td>179.985</td>
<td>25.857</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower-bound</td>
<td>4653.891</td>
<td>91.000</td>
<td>51.142</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Tests of Within-Subjects Contrasts

**Measure:** Mindset

<table>
<thead>
<tr>
<th>Source</th>
<th>Time</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Linear</td>
<td>949.587</td>
<td>1</td>
<td>949.587</td>
<td>31.441</td>
<td>&lt;.001</td>
<td>.257</td>
</tr>
<tr>
<td></td>
<td>Quadratic</td>
<td>289.855</td>
<td>1</td>
<td>289.855</td>
<td>13.843</td>
<td>&lt;.001</td>
<td>.132</td>
</tr>
<tr>
<td>Error (Time)</td>
<td>Linear</td>
<td>2748.413</td>
<td>91</td>
<td>30.202</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Quadratic</td>
<td>1905.478</td>
<td>91</td>
<td>20.939</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Tests of Between-Subjects Effects

**Measure:** Mindset

**Transformed Variable:** Average

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
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</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>430313.058</td>
<td>1</td>
<td>430313.058</td>
<td>8531.988</td>
<td>&lt;.001</td>
<td>.989</td>
</tr>
<tr>
<td>Error</td>
<td>4589.609</td>
<td>91</td>
<td>50.435</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Estimates

Measure: Mindset

<table>
<thead>
<tr>
<th>Time</th>
<th>Mean</th>
<th>Std. Error</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>36.489</td>
<td>.610</td>
<td>35.277</td>
<td>37.701</td>
</tr>
<tr>
<td>2</td>
<td>40.935</td>
<td>.558</td>
<td>39.827</td>
<td>42.043</td>
</tr>
<tr>
<td>3</td>
<td>41.033</td>
<td>.649</td>
<td>39.744</td>
<td>42.321</td>
</tr>
</tbody>
</table>

### Pairwise Comparisons

Measure: Mindset

<table>
<thead>
<tr>
<th>(I) Time</th>
<th>(J) Time</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval for Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>-4.446*</td>
<td>.711</td>
<td>&lt;.001</td>
<td>(-5.858, -3.034)</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>-4.543*</td>
<td>.810</td>
<td>&lt;.001</td>
<td>(-6.153, -2.934)</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>4.446*</td>
<td>.711</td>
<td>&lt;.001</td>
<td>(3.034, 5.858)</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>-.098</td>
<td>.711</td>
<td>.891</td>
<td>(-1.510, 1.315)</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>4.543*</td>
<td>.810</td>
<td>&lt;.001</td>
<td>(2.934, 6.153)</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>.098</td>
<td>.711</td>
<td>.891</td>
<td>(-1.315, 1.510)</td>
</tr>
</tbody>
</table>

Based on estimated marginal means

* The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

### Multivariate Tests

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>F</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pillai's trace</td>
<td>.332</td>
<td>22.402*</td>
<td>2.000</td>
<td>90.000</td>
<td>&lt;.001</td>
<td>.332</td>
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<tr>
<td>Wilks' lambda</td>
<td>.668</td>
<td>22.402*</td>
<td>2.000</td>
<td>90.000</td>
<td>&lt;.001</td>
<td>.332</td>
</tr>
<tr>
<td>Hotelling's trace</td>
<td>.498</td>
<td>22.402*</td>
<td>2.000</td>
<td>90.000</td>
<td>&lt;.001</td>
<td>.332</td>
</tr>
<tr>
<td>Roy's largest root</td>
<td>.498</td>
<td>22.402*</td>
<td>2.000</td>
<td>90.000</td>
<td>&lt;.001</td>
<td>.332</td>
</tr>
</tbody>
</table>

Each F tests the multivariate effect of Time. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic
Regression Analysis
### Correlations

<table>
<thead>
<tr>
<th></th>
<th>Y= Mindset Final Score</th>
<th>Years of Experience</th>
<th>Total #1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y= Mindset Final Score</td>
<td>1.000</td>
<td>.078</td>
<td>.172</td>
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<tr>
<td>Years of Experience</td>
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<td>.064</td>
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<td>Total #1</td>
<td>.172</td>
<td>.064</td>
<td>1.000</td>
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<tr>
<td>Sig. (1-tailed)</td>
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<tr>
<td>Y= Mindset Final Score</td>
<td>.</td>
<td>.229</td>
<td>.050</td>
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<tr>
<td>Years of Experience</td>
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<td>.273</td>
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<td>Total #1</td>
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<td>.273</td>
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<tr>
<td>N</td>
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<tr>
<td>Y= Mindset Final Score</td>
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<td>92</td>
<td>92</td>
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<tr>
<td>Years of Experience</td>
<td>92</td>
<td>92</td>
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<tr>
<td>Total #1</td>
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### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
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<tbody>
<tr>
<td>1</td>
<td>.185a</td>
<td>.034</td>
<td>.013</td>
<td>6.183</td>
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</table>

a. Predictors: (Constant), Total #1, Years of Experience
b. Dependent Variable: Y= Mindset Final Score
### ANOVA

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
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<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
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<tbody>
<tr>
<td>Regression</td>
<td>120.872</td>
<td>2</td>
<td>60.436</td>
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<td>.211b</td>
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<td>Residual</td>
<td>3402.030</td>
<td>89</td>
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<td>Total</td>
<td>3522.902</td>
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</table>

a. Dependent Variable: Y= Mindset Final Score  
b. Predictors: (Constant), Total #1, Years of Experience

### Collinearity Diagnostics

<table>
<thead>
<tr>
<th>Model</th>
<th>Dimension</th>
<th>Eigenvalue</th>
<th>Condition Index</th>
<th>(Constant)</th>
<th>Years of Experience</th>
<th>Total #1</th>
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<tr>
<td>1</td>
<td>1</td>
<td>2.769</td>
<td>1.000</td>
<td>.00</td>
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a. Dependent Variable: Y= Mindset Final Score

### Residuals Statistics

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<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
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<td>Predicted Value</td>
<td>37.14</td>
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<td>Std. Predicted Value</td>
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<td>.989</td>
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</table>

a. Dependent Variable: Y= Mindset Final Score
Curriculum Vitae

Amy Lynn Kinder, NBCT
K-12 Mathematics Administrator Jordan School District
1354 West Nectarine Circle
South Jordan, Utah 84095
Tel: 801-349-7261 | Email: amykinderilovemath@gmail.com
www.AmyKinder.com

EDUCATION

Ph.D., Education (Curriculum & Instruction Specialization) 2022
Area of Concentration: Mathematics Education and Leadership
Utah State University, Logan, UT

M.Ed., Educational Leadership Master’s in Education 2016
Southern Utah University
Thesis: The Shifts that Empower and Build Teacher Capacity
In a Professional Learning Community

License Credentials

National Board Certification
Bilingual Endorsement
English as a Second Language Endorsement
Spanish Endorsement
Mathematics Endorsement
Level 2 Tech Endorsement
Level 3 Teaching License

Administrator License 2016
Southern Utah University

National Board Certified
Specialized in Middle Childhood 2012

M.Ed., Science and Mathematics Education 2005
Fresno Pacific University, Fresno California
Thesis Title: Putting Power in Mathematic Problem Solving

B.A., Elementary Education 1998
Weber State University, Ogden Utah
Minor in Spanish
PROFESSIONAL HISTORY

K-12 Mathematics Consultant 2020-Present
Jordan School District Office, Jordan School District

Administrator on Special Assignment in Mathematics K-12 2019-2020
Jordan School District Office, Jordan School District

Title I Achievement Coach/Building Leadership 2014-2019
Union Middle School, Canyon School District

President, Utah Council of Teachers of Mathematics 2018-2022
Utah Council of Teachers of Mathematics,
Salt Lake City, Utah 84105

Secondary Administrative Internship 2014-2015
Science Center for Education, Grades 6-12, Title I,
Salt Lake School District
Project: Developing a Plan for 100% Graduation Rate

Elementary Administrative Internship 2014-2015
Meadowlark Elementary, Grades K-6th, Title I,
Salt Lake School District
Project: Increasing Quality Feedback to Teachers

Mathematics Endorsement Facilitator 2008-2014
Salt Lake School District
in Collaboration with Southern Utah University

Title I Mathematics Coach,
Specializing in Low Performing Title I Schools 2007-2014
Salt Lake School District
Backman Elementary, Edison Elementary, Rose Park Elementary,
Meadowlark Elementary, Franklin Elementary, Jackson Elementary,
Mountain View Elementary, Parkview Elementary, Riley Elementary

Vice President, Utah Council of Teachers of Mathematics 2016-2018
Utah Council of Teachers of Mathematics,
Salt Lake City, Utah

SAGE/CRT Test Writer & Reviewer 2008-2018
Utah State Board of Education, State of Utah
AIR Research
4th-6th UCTM Representative, Utah Council of Teachers of Mathematics 2009-2015
Utah Council of Teachers of Mathematics, Salt Lake City, Utah

Utah State Core Academy Statewide Presenter 2005-2007
Utah State Science Core Academy
Collaboration between Utah State University & Utah State Department of Education

Sixth Grade Teacher 2006-2007
Mountain View Elementary, Salt Lake School District
Salt Lake City, Utah

Multi-Grade Teacher (5th & 6th) 2005-2006
Meadowlark Elementary, Salt Lake School District
Salt Lake City, Utah

Teacher for “Special Needs” Students in Fresno County Foster Care System 2000-2005
Fresno County, California

Sixth Grade Teacher 2001-2005
Lincoln Elementary School, Madera Unified School District
Salt Lake City, Utah

Master Teacher Trainer and Coordinator 2002-2005
Fresno State University
Fresno, California

Mathematics Project Statewide Facilitator 2001-2005
San Joaquin Valley Mathematics Project
Collaboration between California State Department of Education & Fresno County Office of Education

Third Grade Teacher 1999-2001
Pacific Union School, Pacific Union Unified School District
Fresno, California

Third/Fourth Grade Bilingual Teacher 1998-1999
Backman Elementary School, Salt Lake School District
Salt Lake City, Utah

Bilingual/ESOL School-Wide Title I Coordinator 1993-1997
Riley Elementary, Salt Lake School District
Salt Lake City, Utah
At-Risk Title I Reading Teaching Assistant 1992-1994
Riley Elementary, Salt Lake School District
Salt Lake City, Utah

RESEARCH
Research Interests

• How to effectively use inquiry-based mathematics tasks and hands-on manipulatives to develop deep conceptual understanding with students

• Interested in exploring the ways in which “whiteness” in math education reproduces racial advantages for white students and disadvantages historically marginalized students of color.

• Interested in focusing on coaching interactions, requisite coaching knowledge, and impact of mathematics coaching.

PROFESSIONAL PRESENTATIONS

2019


2018

2017


2016


2015

2014

2013

2013

2012
2011

2010
Kinder, A. L. (2010, November). Energize with Math Notebooks and Games Presentation for 4-8 Teachers, Utah Council of Teachers of Mathematics (UCTM) Conference, Bountiful, Utah

2009


2009

2009

2007

2006

2005
Kinder, A. L. (2005, November). Interactive Math Journals are so AWESOME! Presentation for 3-6 Teachers, Utah Council of Teachers of Mathematics (UCTM) Conference, Clearfield, Utah
PUBLICATIONS

AWARDS

2011  Distinguished Mathematics Coach Salt Lake School District

2005  California Teacher of the Year Lincoln Elementary, Madera Unified School District Madera, California

PROFESSIONAL MEMBERSHIPS


LANGUAGE FLUENCY


Bilingual Endorsement BCLAD Endorsement CLAD Endorsement Spanish Endorsement Spanish Minor