January 2015

Elementary Teachers' Nonverbal Immediacy Behaviors During Math Instruction

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ELEMENTARY TEACHERS' NONVERBAL IMMEDIACY BEHAVIORS DURING MATH INSTRUCTION

by

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A Dissertation

Submitted to the Graduate Faculty

of the

University of North Dakota

in partial fulfillment of the requirement

for the degree of

Doctor of Philosophy

Grand Forks, North Dakota
August
2015

This dissertation, submitted by Sonja Marie Brandt in partial fulfillment of the requirements for the Degree of Doctor of Philosophy from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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Title Elementary Teachers' Nonverbal Immediacy Behaviors During Math Instruction

Department Teaching and Learning

Degree Doctor of Philosophy

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Sonja Marie Brandt
July 17, 2015

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ACKNOWLEDGEMENTS

I cannot begin to list or thank the numerous individuals who have played a significant part in my doctoral journey. This major achievement is not just mine, but has been earned in part by each person who has worked alongside me. First, I would like to thank the six elementary teachers who so graciously agreed to participate in my study. Your willingness to let me into your classrooms and to openly share your thoughts and ideas through our interviews has opened my eyes to the world of nonverbal behaviors. I could not have found these same ideas through reading books and articles or viewing strangers' math lessons. A special thank you also goes to Dr. Jim Torkelson, my principal, whose encouragement from the beginning to pursue my doctoral degree through allowing me to conduct my study at our elementary school has given me encouragement to continue to move forward.

To my doctoral advisor, Dr. Gail Ingwalson – I am forever grateful for the unwavering support, feedback, and expertise you have brought to my doctoral journey. You have been a wonderful constant throughout this process, from your readiness to guide me in my program to sharing your time to help create my study. A special thank you from Callan for letting him visit your office as well!

To my committee members, Dr. Myrna Olson, Dr. Shelby Barrentine, and Dr. Cheryl Halcrow – You all came on board with energy and enthusiasm that encouraged me to pursue my aspirations in this phenomenological study. The years of experience, knowledge, and expertise you have contributed to my study are invaluable! Gail, Myrna, Shelby, and Cheryl – I hope our paths continue to cross in future endeavors!

To my friends, Erin Peterson and Brittany Hagen – You asked me to jump into this program together and I leaped! I did not know what this journey would look like, but in the end I am grateful to have gone step-by-step next to you two. I do not know how I would have made it through to the other side without both of you by my side. You quickly became my best friends when we began teaching together in East Grand Forks and our friendship has grown exponentially ever since. From teachers, to wives, to students, to moms, we have nearly done it all together. I would not have wanted to do this with anyone else! Here is to our futures, whatever God has in store for us next. Love to you both!

To my parents: When I told you I had decided to make yet another leap in my life and attend graduate school for the second time, you were nothing but encouraging. I am blessed to have grown up in such a supportive family with a strong background in education. I also could not have navigated my classes on campus, completed homework, and attended meetings without your on-call daycare pick-ups and weekend activities with Callan! I love you, Mom and Dad! Another thank you to the Vanderpan Clan, the Vadheims, and the Brandt family for cheering me on from the sidelines!

To my husband, Trevor: You have never doubted my abilities to make it through endless hours of homework, classes, writing papers, and still be a teacher, wife, daughter, and mom. I am thankful to have had you as my rock and unwavering support. Thank you for putting in extra hours on our house while I worked into the night on my homework, and for taking Callan on extra fun weekend adventures so I could get work done during daylight hours. I have made it to the end of this journey and cannot wait to get back to making more family memories together! To Callan: I began this program when you were 5 months old, and will graduate when you are

4 ½ years old. Thank you for cheering with me every time I could take a break from homework!

All my love to my two favorite boys.

ABSTRACT

The purpose of this qualitative study was to describe elementary teachers' nonverbal immediacy behaviors during math instruction. The instructional and non-instructional nonverbal behaviors of six female third, fourth, and fifth grade teachers were studied. Methods used included video recording math lessons, conducting one-on-one interviews, and reviewing relevant literature. Data analyses were completed through documenting major nonverbal behaviors displayed and identifying codes, categories, themes, and assertions (utilizing Excel spreadsheet software).

The conceptual framework underlying this study has its foundation in phenomenology. As a research methodology, phenomenology investigates how an experience is lived by its participants. Immediacy was the construct used to describe teachers' nonverbal behaviors during mathematics instruction. This overall framework supported the findings that arose from the data as it came forth from the six teacher participants.

The following four themes emerged from the data analysis, including Classroom Environment and Instructional Elements; Math Nonverbal Immediacy Behaviors, Math Concepts, and Real-life Examples; Student Engagement; and Teachers' Reflections and Realizations. These four themes led to two assertions. The first assertion was: "Student engagement during math lessons is interdependent with teachers' nonverbal behaviors." The second assertion was: "Teachers' perceptions of their nonverbal behaviors are essential to the lesson content and instruction as well as intent to form immediacy with students."

Recommendations for teachers include the addition of nonverbal immediacy behavior training through professional development workshops or integration into preservice teacher courses, as well as the pairing of preservice teachers with in-service teachers who employ nonverbal immediacy behaviors. The impact of teachers' heightened awareness of their nonverbal behaviors might impact current and future lessons and thus, student engagement.

CHAPTER I

INTRODUCTION

Research has shown that words are principally used for communicating information, yet body-language signals disclose the true message being delivered (Pease & Pease, 2004). Burgoon and Hoobler (2002) state that the nonverbal information being relayed in social experiences is often the primary message. Andersen and Andersen (2005) write that immediacy is the core of nonverbal communication, which conveys multifaceted messages through interrelated behaviors. Immediacy produces feelings of warmth, sincerity, approachability, and availability regarding the communicator (Andersen & Andersen, 2005). Immediacy has been defined as the use of behaviors that increase closeness and nonverbal interactions between communicators (Mehrabian, 1969). For example, a communicator may use nonverbal behaviors that encourage the recipient to respond in a way that draws his or her attention to the message being conveyed.

Several studies show benefits of students' use of gestures while learning information in the classroom (Alibali, Flevares, & Goldin-Meadow, 1997; Jancovic, Devoe, & Wiener, 1975; Kim, Roth, & Thom, 2010). Researchers have shown supportive gestures and other nonverbal instructional motions have a direct connection with enhancing student learning, engagement, and interest, especially in mathematics (Baringer & McCroskey, 2009; Benzer, 2012; Chesebro, 2010; Edwards, 2009; Goldin-Meadow, Cook, & Mitchell, 2009; Kim et al., 2010; Sfard, 2009; Williams, 2009; Wilson, 2012). For this study, math instruction was selected as the content area

of focus related to the number of studies that promote the use of gestures, particularly in math classrooms (Edwards; Goldin-Meadow et al.; Kim et al.; Sfard, 2009; Williams; Wilson).

Verbal communication may be in the forefront of educators and students' minds when engaging in learning situations. However, the research cited previously indicates that the inclusion of nonverbal communication impacts teachers' abilities to clearly convey information and foster students' engagement in positive or negative ways. Burgoon and Hoobler (2002) contend a communicator's internal emotional state is revealed through nonverbal actions. Therefore, being aware of and voluntarily controlling immediacy behaviors may also impact feelings exhibited and experienced by teachers and students. Communicators who use nonverbal immediacy behaviors are more easily understood and thus, more engaging. Therefore, incorporating intentional, instructional nonverbal behaviors during math instruction can only lead to a heightened sense of engagement and awareness of the topic being learned.

The goal of most educators is to use the standards and curriculum so that students understand the content. However, first establishing a classroom community where student autonomy, positive self-concept, engagement, and academic growth are fostered through teacher – student interactions can set the stage for ongoing student engagement and thus, student success (Kronenberg & Strahan, 2010; Leflot, Onghena & Colpin, 2010; Roorda, Koomen, Spilt, & Oort, 2011; Stanulis & Manning, 2002). Andersen and Andersen (2005) support this classroom community, where teachers and students know one another and feel a sense of ease or comfort. They write that nonverbal immediacy messages simultaneously convey moods and feelings about the current circumstances, whether it is an academic or a social situation. Andersen and Andersen found the messages created in such environments are seemingly authentic, persuasive, and substantial.

Other literature supports the notion that teachers' nonverbal instructional choices greatly affect student performance and learning (Benzer, 2012; Edwards, 2009; Sfard, 2009; Wilson, 2012). Nonverbal gestures that support student performance and learning are called "immediacy" behaviors (Andersen & Andersen, 2005; Mehrabian, 1969; Richmond, McCroskey, & Johnson, 2003). Immediacy behaviors occur during instruction. Examples of immediacy behaviors include teachers' use of eye contact, intentional instructional gestures, and physical or close proximity (Burgoon & Hoobler, 2002; Richmond et al., 2003; Santilli, Miller, & Katt, 2011). Richmond et al.'s (2003) research found that individuals who used nonverbal immediacy behaviors during face-to-face communication produced more positive feedback than those who did not. In the context of a classroom, Richmond et al.'s research would indicate that the more often nonverbal immediacy behaviors are utilized, the more positive students' impressions and responses to the teacher would be. Any teacher would welcome this positivity, which is felt by students in regard to the environment as well as to academics. In turn, teachers would ultimately experience positive results from their nonverbal immediacy behaviors.

Nonverbal behaviors have been noted and named in various studies, and many are characterized as nonverbal immediacy behaviors (i.e., positively affecting learning). Richmond and McCroskey (2003) indicate that gestures, body posture, eye contact, smiling, body orientation, body movement, touch, and physical proximity are components of nonverbal immediacy behaviors. Burgoon and Hoobler (2002), Richmond et al., and Santilli et al.'s (2011) components of nonverbal immediacy behaviors include gestures, body posture, eye contact, smiling, body orientations (e.g., open body positions and leaning forward, body movement, touch, vocal inflections, and physical or close proximity). Butt, Iqbal, and Farooq (2011) include the use of hands, arms, legs, torso, shoulders and head; sitting versus standing; other body

postures; and facial expressions and eye movements as nonverbal immediacy behaviors. Sfard's (2009) research includes several of these nonverbal behaviors, with the specific addition of instructional gestures and gaze. Hennings and Grant's (2001) and Battersby and Bolton's (2013) description of specific nonverbal mannerisms include using physical motion to orchestrate student involvement, known as conducting, acting, and wielding.

Need for the Study

While several studies show benefits of students' use of gestures while learning information in the classroom (Alibali et al., 1997; Jancovic et al., 1975; Kim et al., 2010), there is currently a gap in the research related to elementary teachers' nonverbal immediacy behaviors during instruction. In addition, a lack of training and self-awareness of nonverbal behaviors for classroom teachers has lent itself to this study on elementary teachers' nonverbal immediacy behaviors during math instruction. Chesebro (2010) noted that immediacy behaviors help facilitate students' attention to the teacher's messages and allows for subsequent messages to be processed. Current research reveals the benefits of students' use of gestures while learning information in the classroom (Alibali et al.; Jancovic et al.; Kim et al.). Furthermore, research also indicates teachers' nonverbal instructional choices greatly affect student performance, and learning (Benzer, 2012; Edwards, 2009; Sfard, 2009; Wilson, 2012).

These findings suggest that instruction must include the knowledge and application of nonverbal immediacy behaviors, in addition to knowledge of students, to effectively present information and to fully engage students in learning. For these reasons, I saw the need for a study that examines the use of potentially impactful nonverbal immediacy behaviors during mathematics instruction in elementary classrooms. Because this study is qualitative and phenomenological in nature, it has the potential to uncover new information in the area of

elementary teachers, elementary students, student engagement, and especially, nonverbal immediacy behaviors during math instruction. Akin to the goal of many teachers in today's classrooms, my study aimed to identify essential elements present in classrooms that positively impact all students' success.

Conceptual Framework

The conceptual framework employed for this study has its foundation in phenomenology. As a research methodology, phenomenology investigates how an experience is lived by its participants (Creswell, 2011). Phenomenology also seeks "to make truth claims from a new perspective" (Sokolowski, 2000, p. 122), because focuses on recognizing the truth and reality of the phenomena that emerge from the data (Sokolowski). This phenomenological research framework is applied to this study, because what would arise from the data and results were not known prior to its implementation.

In this study, immediacy is the construct used to describe teachers' nonverbal behaviors during mathematics instruction. Mehrabian's (1969) immediacy construct design was founded upon his research on the physical and psychological closeness as well as heightened nonverbal interactions between communicators when immediacy behaviors were utilized. Andersen and Andersen (2005) describe immediacy as being at the core of nonverbal communication. Richmond et al. (2003) believe communicators can use immediacy behaviors as tools for influencing the response of their audience. Nonverbal immediacy behaviors are the focus of this study when determining which nonverbal behaviors teachers employ during math instruction, ascertaining teachers' awareness of their own exhibited nonverbal behaviors, and when asking teachers about the effect their nonverbal behaviors have on student engagement. Research

supports the connection between immediacy and each of these areas, as is presented in Chapter II.

Immediacy as a construct is directly connected to the outcomes of this study. Related to a lack of teachers' awareness and current gaps in literature regarding nonverbal immediacy behaviors, this study aimed to ascertain teachers' self-awareness and self-discovery, or realizations, of their use of such behaviors during math instruction. In addition, the link between teachers' perceptions of the impact their nonverbal behaviors have on student engagement was investigated. A conceptual framework for this study can also be found in Figure 1.

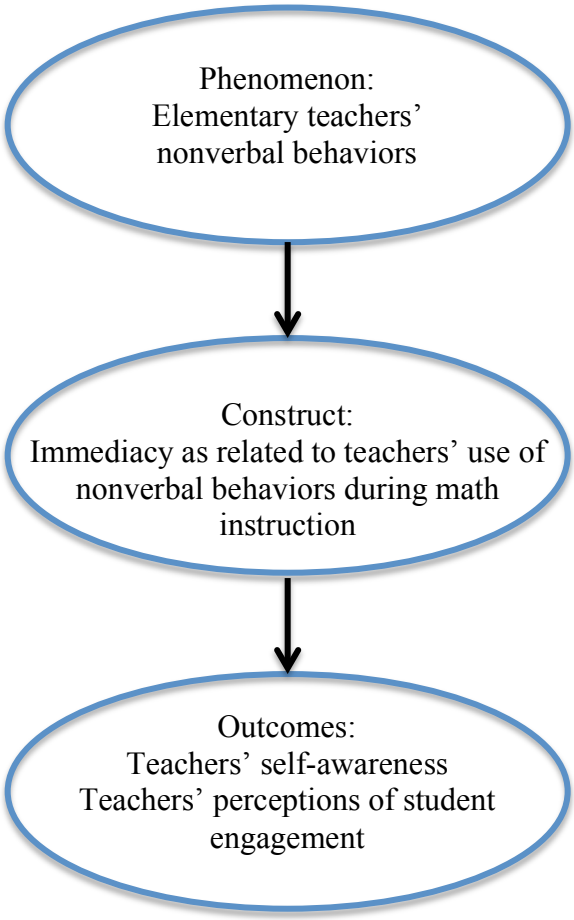

Figure 1. Conceptual framework for this study.

Purpose of the Study

The purpose of the current qualitative phenomenological study was to investigate elementary teachers' use of instructional and non-instructional nonverbal behaviors, namely nonverbal immediacy behaviors, during mathematics instruction. First, I sought to determine the types of nonverbal behaviors each teacher exhibited during one math lesson. Next, I explored teachers' views of their own communication methods, followed by their realizations of displayed nonverbal behaviors. Further, I pursued teachers' perceptions of the impact their nonverbal behaviors had on students' engagement.

Research Questions

The questions guiding my research study were:

1. What do teachers' nonverbal immediacy behaviors look like in the classroom during academic instruction in math?
2. How do teachers describe their own nonverbal immediacy behaviors?
3. What are teachers' perceptions of their nonverbal behaviors on student engagement?

Assumptions

The study was based on these assumptions:

- The implementation of nonverbal immediacy behaviors during mathematics instruction, or other content areas benefits student engagement.
- I assumed my physical absence during the video recording of each teacher's math lesson would help teachers and students behave in a typical fashion during recording.
- I assumed teacher participants would answer interview questions honestly, despite my prior professional relationship with each teacher and any feelings of invasion or self-consciousness they may have felt during video recordings or audio recorded interviews.

Delimitations

The first delimitation for this study was the selection of this topic. I have great interest in the language choices teachers employ during instructional and non-instructional interactions with students. Concurrently, research shows teachers' nonverbal behaviors align with their verbal choices. Although these two areas are of great interest to me and are interconnected, I have selected the former. This choice of one area allowed me to go into greater depth with the research.

A second delimitation was not fully informing the participants of the study's specific focus on nonverbal behaviors. When asking the participants to join my study, I informed them that I was looking for communication methods during math lessons. I anticipated that sharing more information (i.e., namely that my central focus was on teachers' nonverbal behaviors), would affect their lesson planning, lesson implementation, as well as their raw self-perceptions of their nonverbal behaviors. Therefore, teachers were not informed of the study's emphasis until after being asked, "How do you think you communicated during this lesson?"

A third delimitation was the fact that this study was conducted in the school in which I currently teach. The participants were colleagues of mine, and rapport with them was already established. However, it is possible that each teacher's lessons and interview were influenced by our collegial relationships. To ensure validity and the integrity of this study, my biases were set aside. I informed the participants that my role was to observe one lesson and have a conversation with each of them regarding their communication methods. Therefore, it was my intention that they understood I was not there to critique their lesson or presentation styles.

A fourth delimitation was the presence of the video camera during each math lesson. I knew the camera might affect teachers' performance during their video recorded math lesson. It

was presumed that the length of the lesson would allow teachers to fall into their natural teaching rhythms regardless of the camera's presence.

A fifth delimitation was the gender and number of participants in this study. Drawing from a pool of 18 general education classroom teachers available at the research site, two teachers from each grade level were selected to participate. This group of six teachers was selected with the hope that they would represent a variety of nonverbal behaviors. As all of the teachers in this study were female, it must be noted that nonverbal behaviors represented in this study may not be generalizable to male teachers.

A sixth delimitation was the focus of the research questions. They were designed for this study and are not to be generalized for other content areas of teaching, other grade levels, or larger teaching populations. These described factors set boundaries on what the findings uncovered.

Organization of the Study

This study is organized into five chapters: introduction, literature review, methodology, findings, and discussion. In Chapter I the background of the study was provided, outlining its significance and purpose. A review of literature related to teachers' nonverbal behaviors during instruction in the area of math is presented in Chapter II. The study design, along with the methods and procedures used to collect and analyze the data are examined in Chapter III. In Chapter IV, an analysis of the data and presentation of the results are provided. Finally, a summary of the research, along with implications for educators and future directions for the use of nonverbal behaviors during instruction are described in Chapter V.

Definitions

Body Language or *Gestures:* exhibiting conceptual knowledge through bodily

movements (Kim et al., 2010).

Classroom Environment: the structure provided by the classroom teacher through showing involvement, supporting freedom of choice, and showing interest in students' activities (Roorda et al., 2011).

Elementary Teacher: a person whose job is to teach students about certain subjects; one who instructs young children (http://www.merriam-webster.com/).

Immediacy: feelings of warmth, sincerity, approachability, and availability regarding the communicator (Andersen & Andersen, 2005).

Immediacy Behaviors: communication behaviors that "enhance closeness to and nonverbal interaction with another" (Mehrabian, 1969, p. 203).

Self-Perceptions: feelings or thoughts towards oneself (Leflot et al., 2010).

Student Engagement: a student's involvement or connection with school events or activities, and likewise, the people, goals, values, and events that take place at school (Roorda et al., 2011).

Teacher – Student Relationship: a relationship between students and teachers fostered by teacher involvement, structure, and autonomy support (Leflot et al., 2010); also promoted by ongoing personal support, candid feedback, and dialogue regarding academic and personal choices (Kronenberg & Strahan, 2010).

Nonverbal Communication or *Nonverbal Behaviors:* the correlation of multifaceted messages and behaviors, or conducts, of a communicator (Andersen and Andersen, 2005).

Whiteboard (classroom; dry erase): a white, plastic, dry erase board used in classrooms in the manner of a blackboard mounted on the classroom wall as well as small, individual boards for student and small group use (http://dictionary.reference.com/browse/interactive+whiteboard).

Whiteboard (interactive): "an interactive display screen that is connected to a computer and allows for viewing, input, and collaboration by multiple users" (http://dictionary.reference.com/browse/interactive+whiteboard).

CHAPTER II

LITERATURE REVIEW

The purpose of the current study was to explore elementary teachers' nonverbal immediacy behaviors during mathematics instruction and ascertain teachers' views of their own nonverbal behaviors and the impact on student engagement. In Chapter II the literature related to the research questions in this study is examined. Nonverbal behaviors and immediacy (including descriptions, examples, and the impact of nonverbal immediacy behaviors on children) are addressed. Next, the impact of teacher behaviors on student engagement is examined. This section encompasses teachers' awareness and self-perceptions, positive learning environments, teacher – student interactions, and student engagement. Finally, the use of gestures in mathematics instruction (i.e., math nonverbal gestures and math gestures in the classroom) are described.

Nonverbal Behaviors and Immediacy

Pease and Pease (2004) assert that words are principally used for communicating information, but body-language signals disclose the true message being delivered. Pease and Pease also indicate that body language can be used in a variety of situations. Examples include: showing a person's current emotional state; revealing attitudes and underlying tones not spoken verbally; and conveying deeper meanings of verbal messages. Their research has found that nonverbal communication is five times more impactful than verbal messages (Pease & Pease, p. 23). McCann and Higgins (1988) indicate that social goals have an influence upon individual

recipients of communication. They conclude that the attitudes, social behaviors, and social-cognitive processes are greatly affected by the social context of a situation. Thus, the individual's impressions, information received, memory, and evaluations are based upon the verbal and nonverbal material presented by the communicator as well as judgments made in a specific context (McCann & Higgins). Burgoon and Hoobler (2002) indicate that in social experiences, the nonverbal content being relayed often is the primary message. Communicators who use nonverbal immediacy behaviors are more easily understood and thus, more engaging.

Pease and Pease (2004) also comment that many people believe speech is our main form of communication, adding that body language has only been studied empirically since the 1960's. Verbal communication may be in the forefront of educators' and students' minds when engaging in learning situations, yet research indicates that nonverbal communication impacts the abilities of teachers to clearly convey information and influences students' engagement. Pease and Pease promote studying clusters of gestures, rather than individual motions, to better understand the overall context of the message. This practice should be implemented in the same way that words in a sentence are comprehended as a whole entity. The multifaceted realm of instruction must include the knowledge and application of nonverbal immediacy behaviors to effectively present information and to fully engage students in learning. Examples and descriptions of nonverbal immediacy behaviors, teachers' self-perceptions, the impact of teacher behaviors on student engagement, teachers' awareness, and the use of nonverbal behaviors during mathematics instruction are examined in the following sections.

Nonverbal Immediacy Descriptions

Terms and definitions surrounding nonverbal communication vary greatly (Burgoon & Hoobler, 2002). The line between nonverbal communication and other human behavior is

blurred; included in the definition is the intentionality of a communicative event (Burgoon & Hoobler). For example, when a person is communicating with another, his or her purpose for sending a message can affect the nonverbal signals that are either intentionally or unintentionally included. Chesebro (2010) assert that immediacy behaviors help facilitate students' attention to the teacher's messages and allow for subsequent message to be processed.

For the purpose of this study, behaviors that have clear communication potential, such as nonverbal immediacy behaviors, are in the forefront. The range of behaviors a teacher exhibits falls under instructional and non-instructional motions, all of which are considered nonverbal behaviors. Instructional and non-instructional motions are not always clearly defined. The teacher's intent behind his or her use of a specific nonverbal behavior, immediate or non-immediate, can lend itself to being instructional or non-instructional. It is also possible that a teacher has not planned to use, or is not aware of, immediacy behaviors that are directly correlated with the instructional material. Likewise, nonverbal behaviors exhibited during instruction may not be directly linked with the topic, but may or may not be considered useful for student engagement during the lesson.

Mehrabian (1969) defines immediacy as the use of behaviors that increase closeness and nonverbal interactions between communicators. Andersen and Andersen (2005) indicate that immediacy is the core of nonverbal communication, which conveys multifaceted messages through correlated behaviors. Immediacy produces feelings of warmth, sincerity, approachability, and availability regarding the communicator. Furthermore, Andersen and Andersen note that nonverbal immediacy messages simultaneously convey these moods and feelings about the current circumstances. The messages created are seemingly authentic, persuasive, and substantial. Burgoon and Hoobler (2002) describe the use of nonverbal

immediacy behaviors as the deepening or reducing of feelings in communicative situations. A communicator's internal emotional state is revealed through nonverbal actions; voluntarily controlling immediacy behaviors can also impact feelings exhibited and experienced by communicators and receivers (Burgoon & Hoobler).

Hennings and Grant (2001) and Battersby and Bolton (2013) indicate that instructional nonverbal motions include conducting, acting, and wielding. Conducting employs physical motion to control and encourage student participation and engagement (Hennings & Grant). Large and small hand movements are typically used in conducting motions. Battersby and Bolton include the example of a teacher using a clapping pattern to gain the attention of his or her class.

Through acting, the teacher uses nonverbal motions to clarify and put emphasis on meanings (Hennings & Grant, 2001). Hennings and Grant describe three elements included in acting. Emphasizing includes moving a portion of one's body while speaking. Examples given include tapping of a foot, pointing to or moving a hand while emphasizing key words, or other movements that show students something is important. In illustrating, a teacher clarifies a word or its meaning through gestures. In role playing, the teacher physically mimics something or someone he or she is describing.

Finally, wielding is when teachers use classroom materials and objects to prepare for a lesson (Hennings & Grant, 2001). The teacher is not necessarily requiring students' attention, but is using these actions and objects as a means for lesson readiness, which in turn, affects the overall tone and mood of the classroom during a lesson. Opening or closing the blinds, placing papers on students' desks, or readying an interactive whiteboard and projector to display lesson information are all examples of wielding objects in the classroom. Hennings and Grant indicate

that instructional motions include emphasizing and clarifying meanings through acting and interacting with objects in the environment. While instructional and non-instructional motions are included in this study, those behaviors that exhibit nonverbal immediacy are of particular interest.

Burgoon and Hoobler's (2002) research also shows that nonverbal cues can display independent messages, while also being essential to the encoding and decoding of verbal messages. The communicator's tone of voice, facial expressions, and body movements greatly affect the recipient's interpretation of his or her verbal statements (Mehrabian, 1969). Such studies on immediacy behaviors align with Butt et al.'s (2011) research on nonverbal communication, which is said to deliver meaningful information through eye contact, body language, and tone of voice. According to Mehrabian, immediacy increases in contexts with the communicator's use of proximity and perceptual availability. Richmond et al. (2003) view immediacy behaviors as tools which communicators can use to influence the response of their audience. Their research found that individuals who employ nonverbal immediacy behaviors during face-to-face communication were viewed more positively than those who do not. The more often these behaviors are utilized also impacts the impressions and responses of the receivers.

Mehrabian (1969) found that the extent of immediacy included in the verbal expression of a communicator's interaction with a recipient is positively correlated with the communicator's positive reactions and affective experiences of the recipient. Therefore, it can also be said that a lack of the use of immediacy behaviors shows negative feelings and attitudes towards recipients. Santilli et al. (2011) describe non-immediacy behaviors as sending messages of dislike, indifference, and distance between the communicator and recipients. This communication

exchange may cause individuals to avoid and negatively evaluate the communicator. As a result, through cognizance of and working to regulate one's nonverbal immediacy behaviors, communicators can influence the manner in which messages are delivered and interpreted.

Examples of Nonverbal Immediacy Behaviors

Various empirical sources list a range of nonverbal immediacy behaviors. Figure 2 represents a combination of various nonverbal behaviors found in the literature. Burgoon and Hoobler (2002); Richmond et al. (2003); and Santilli et al. (2011) write that components of nonverbal immediacy behaviors include gestures, body posture, eye contact, smiling, body orientations (e.g., open body positions and leaning forward, body movement, touch, vocal inflections, and physical or close proximity). The pairing of these, and other nonverbal immediacy behaviors with verbal messages, strengthens the meaning of the message being sent, as well as the relationship between the communicator and recipients (Butt et al., 2011). Butt et al. suggest that pairing these features can lead to impressive and effective communication.

Butt et al. (2011) also note that nonverbal behaviors oftentimes occur unconsciously. Because of this factor, the use of nonverbal immediacy behaviors is essential to clearly convey the communicator's intended message. Information can also be sent and received by means of nonverbal immediacy behaviors without the inclusion of verbal phrases (Benzer, 2012; Butt et al.). Benzer indicates that individuals communicate by way of body language to show their inner thoughts, needs or desires, attitudes, and feelings, even when they are not talking. Butt et al. include the communication context, objects, and actions that lead to direct verbal and nonverbal communication or facilitated communication without words. Benzer's article identifies several

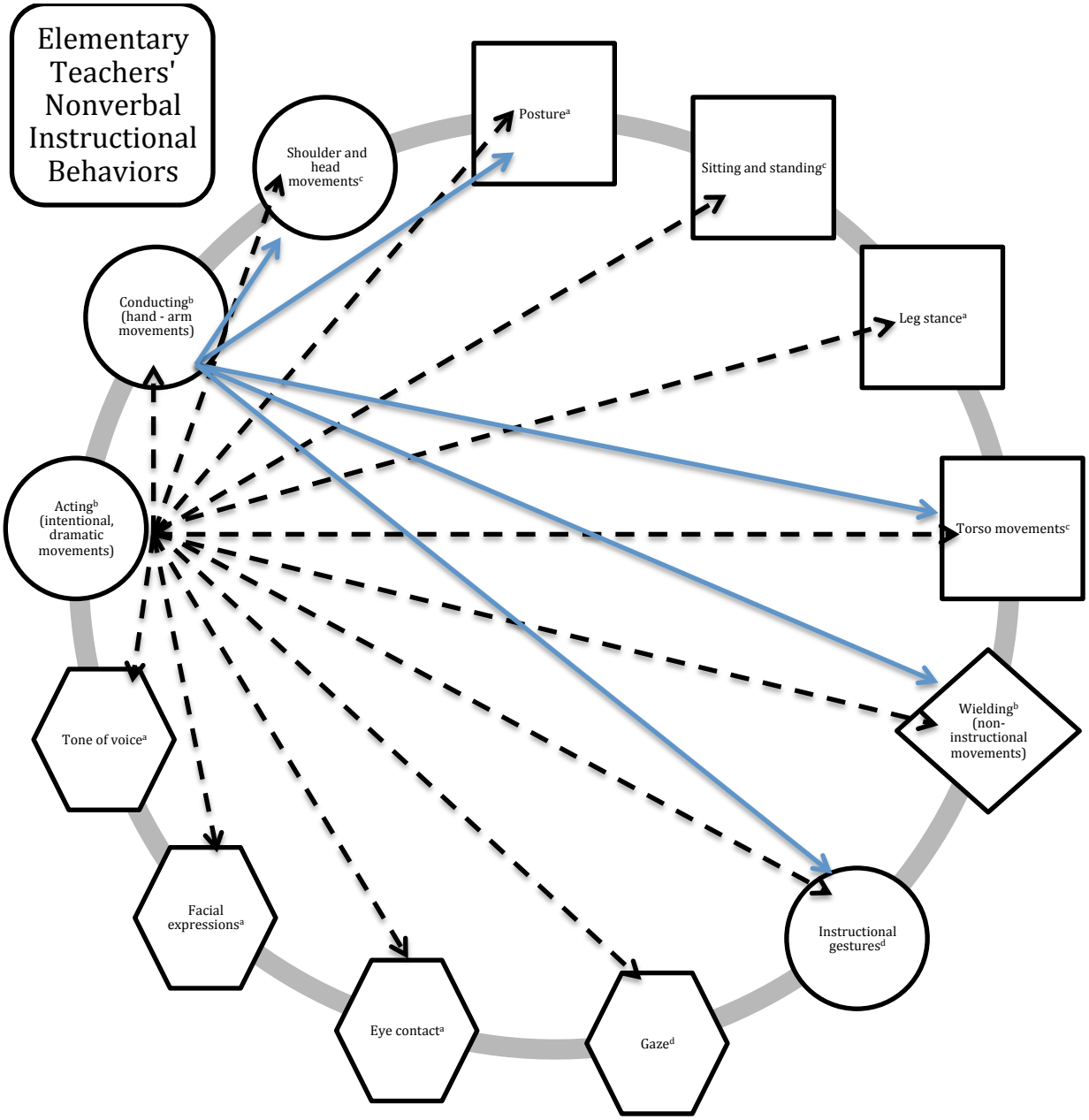

Figure 2. Relationships among nonverbal behaviors. Solid arrow lines indicate connections between conducting and other nonverbal behaviors. Dashed arrow lines indicate connections between acting and other nonverbal behaviors. This figure credits [a]Stanulis and Manning (2002), [b]Hennings and Grant (2001), [c]Butt, Iqbal, and Farooq (2011), and [d]Sfard (2009).

immediacy behaviors that are efficient in terms of conveying information unaccompanied by spoken communication. Significant nonverbal behaviors that indicate affirmative or negative responses include the use of eye contact, facial expressions (e.g., raising the eyebrows), hand signs, touching, approaching a student, and head shaking (Benzer). Sfard's (2009) research includes several of the aforementioned nonverbal behaviors with the specific addition of instructional gestures and gaze.

Butt et al. (2011) discuss the use of hands, arms, legs, torso, shoulders and head; sitting versus standing; other body postures; and facial expressions and eye movements. Several of the nonverbal immediacy behaviors described in this chapter can have different meanings in different contexts, are determined by the intended audience and message, and also depend upon the communicator himself. Benzer (2012) adds that examining nonverbal cues is essential when assessing and understanding ourselves as communicators and other people as well. Butt et al.'s research shows that people have confidence in the reliability of nonverbal cues and place more faith in nonverbal communication than in verbal messages alone.

Hennings and Grant's (2001) and Battersby and Bolton's (2013) examination of specific nonverbal mannerisms include using physical motion to orchestrate student involvement known as conducting, acting, and wielding, as previously described. These physical movements are similar to Burgoon and Hoobler's (2002), Richmond et al.'s (2003), and Santilli et al.'s (2011) research. Non-instructional motions, also referred to as personal motions, are nonverbal behaviors exhibited without the intent of aiding in the instructional process (Hennings & Grant). Hennings and Grant contend that these nonverbal behaviors help demonstrate verbal explanations through emphasizing or stressing certain words or phrases, illustrating a shape or

symbol in the air or on the board, and even role-playing animal movements or character personalities.

Impact of Nonverbal Behaviors on Children

The literature on effective communication between elementary teachers and students provides a range of ideas, which consider how teachers use both verbal and nonverbal behaviors. The ways elementary teachers meet the academic, behavioral, and social needs of each student have been explored, as well as the role that teachers play in establishing effective classroom environments that foster student autonomy, positive self-concept, and engagement through their interactions (Kronenberg & Strahan, 2010; Leflot et al., 2010; Roorda et al., 2011; Stanulis & Manning, 2002). Researchers have shown that supportive gestures and other nonverbal instructional motions have a direct relationship with enhancing student engagement and interest, especially in mathematics (Baringer & McCroskey, 2009; Benzer; Chesebro, 2010; Edwards, 2009; Goldin-Meadow et al., 2009; Kim et al., 2010; Sfard, 2001, 2009; Williams, 2009; Wilson, 2012).

Dick, Goldin-Meadow, Solodkin, and Small's (2012) investigations into children's developing brains shows a difference in specific areas of their brains and how they develop according to auditory and visual stimulation. Their work found that young children simultaneously develop the abilities to comprehend and produce gestures that accompany spoken words, such as narrative comprehension. Dick et al.'s study used magnetic resonance imaging (MRI) to examine regions of the brain that are stimulated when words and gestures are presented. In this experiment, children ages eight to 11 and adults were exposed to stories accompanied by either hand gestures that were or were not meaningfully related to the dialogue.

One aspect of Dick et al.'s (2012) analysis showed that the children in the study displayed more brain activity for hand movements that were meaningfully related to speech. Dick et al. suggest that children may not integrate unrelated hand movements with speech because their focus tends to be on the message itself, and not self-adaptors. Teachers' opinions of the impact their instructional and non-instructional nonverbal behaviors showed that their self-awareness did not allow for definite speculations on their students' engagement. However, each teacher surmised that their non-instructional behaviors might have a negative impact on their students' engagement, whereas instructionally connected nonverbal immediacy behaviors would provide greater positive impact in the classroom.

The work of Frymier and Houser (2009) indicates that the inclusion of nonverbal immediacy behaviors can positively impact student motivation and learning, which impact overall student engagement. Richmond et al.'s (2003) work affirms the same outcome and indicates that educators who employ nonverbal immediacy have the means to greatly influence how others, particularly students, respond. Hennings and Grant (2001) encourage teachers to analyze their own use of nonverbal instructional and non-instructional behaviors during lesson preparation and while teaching lessons. This awareness can lead to more effective communication and greater student engagement (Frymier & Houser, 2009; Hennings & Grant).

Impact of Teacher Behaviors on Student Engagement

Considering the communication needs of teachers and students is essential for student growth as well as teacher effectiveness. Research and reports on related literature show that characteristics of successful teachers include the use of nonverbal behaviors (Battersby, 2009; Battersby & Bolton, 2013; Benzer, 2012; Butt et al., 2011; Hennings & Grant, 2001; Kronenberg & Strahan, 2010; Özmen, 2010; Sfard, 2009; Stanulis & Manning, 2002; Steele, 2010).

Battersby and Bolton suggest that teachers must first recognize that nonverbal language exists before implementing positive, intentional nonverbal communication.

Teachers' Awareness and Self-Perceptions

The awareness Battersby and Bolton (2013) describe may guide teachers to consciously perform nonverbal instructional behaviors as a means of adding to, rather than detracting from, their verbal instructions. Battersby and Bolton add that teachers' awareness of nonverbal output provides more effective, consistent communication and helps create positive, exciting learning environments. Steele (2010) contends that teachers must appreciate and feel open to use their bodies and voice to express meanings. While some teachers may be currently unaware that they are pairing gestures with verbal instructions, others may purposefully use gestures (Battersby & Bolton). According to Battersby and Bolton and Steele, an awareness of current nonverbal immediacy behaviors must first exist before teachers can effectively utilize such forms of communication.

Butt et al.'s (2011) inquiry on nonverbal behaviors found that people are influenced by a speaker's words, as well as their actions. These researchers also emphasize that it is impossible not to communicate, because we are continuously sending messages through our bodily postures, breathing or pausing, entering or exiting a room, or other gestures. The internal emotional state of the person is revealed with or without the pairing of verbal language. It seems logical that teachers already do everything they can to personalize each student's academic, social, and personal experiences at school (Kronenberg & Strahan, 2010). An essential component to the equation must also be the manner in which teachers' nonverbal behaviors impact each situation. Positive classroom climate and interactions begin with teacher awareness (Kronenberg & Strahan).

While Butt et al. (2011) emphasize that teachers with negative nonverbal behaviors should be aware of and avoid such habits, it can be said that all teachers would benefit from a sense of self-awareness. Butt et al. remark that people are not aware of the messages being sent through nonverbal gestures because most of these behaviors occur unconsciously. Their research also found that feelings such as fatigue and boredom or energy and excitement are plainly discernible to students, regardless of the teacher's verbal message. Özmen's (2010) findings state that most communication in the classroom is unconsciously facilitated, and consequently, is influential upon the social dynamics and nature of the interactional processes that take place. The teaching and learning process can, therefore, be greatly and positively impacted through the deliberate use of positive nonverbal communication.

Hennings and Grant (2001) and Battersby (2009) include questions teachers can ask themselves to ascertain their levels and types of nonverbal instructional and non-instructional motions. Including one or two of these self-checks during a lesson has the potential to increase teacher awareness and improve the instructional and non-instructional motions that already are, or can be, included in future lessons (Hennings & Grant). Selected questions influenced the focus of my research questions:

1. "How are we communicating to our students, and do they really see us?" (Battersby, 2009, p. 14).

2. "Where do I tend to position myself when I conduct the total class?" (Hennings & Grant, 2001, p. 43).

3. "Do I tend to rely on verbal means to get my message across?" (Hennings & Grant, pp. 43-44).

4. “What specific motions tend to predominate my teaching?” (Hennings & Grant, p. 44).

5. “Do certain personal motions occur so frequently that they have become mannerisms?” (Hennings & Grant, p. 44).

Complementary to teachers’ awareness of their instructional and non-instructional nonverbal behaviors is the idea of teachers’ self-perceptions. According to Bem (1967), self-perception is an individual’s ability to examine his or her own behaviors and their controlling variables. Self-perception theory (Bem) suggests that individuals do so in the same manner as an outside observer. This self-analysis leads to explanations as to why one is motivated to do what he or she does. Bem also writes that one’s own emotions, attitudes, and internal states are inferred from observing one’s own behaviors, especially in the context in which they arise. To successfully ascertain one’s own behaviors, internal cues must be strong enough to garner interpretation. If they are not, the individual is in the same position as an outside observer. This theory also reveals “the existence of the proposed inferential process” (Bem & McConnell, 1970, p. 23).

Self-perception theory arose from Bem’s (1967) work to find an alternative theory to cognitive dissonance theory, in which the underlying dependent variable is the subject’s “self-descriptive statement of an attitude or belief,” (p. 184). Bem defines cognitive dissonance theory as the following:

> If a person holds two cognitions that are inconsistent with one another, he will experience the pressure of an aversive motivational state called cognitive dissonance, a pressure which he will seek to remove, among other ways, by altering one of the two “dissonant” cognitions (p. 183).

To find the origin of these self-descriptive behaviors, researchers turn to self-perception

theory. Bem (1967) describes social interactions as the foundation for individuals to learn society's beliefs and expectations of internal and external feelings and behaviors. Emotional meanings and individuals' attitudes are connected and derived from these social experiences. In the elementary classroom, teachers' inherent beliefs and attitudes from their own cultures, combined with learned and practiced teaching methods, contribute to their self-perceptions.

Positive Learning Environments

Verbal language is a communication tool, whereas gestures themselves are communicational actions where meanings and ideas are expressed (Sfard, 2009). Benzer (2012) writes that nonverbal motions can aid in gaining student attention, increasing student interest, and increasing motivation. For example, Hennings and Grant (2001) name conducting, acting, or wielding objects as other powerful nonverbal actions, as described previously. Mehrabian and Reed (1968) note that face-to-face interactions provide nonverbal cues not present during phone conversations and especially in written communication. Communicators' existing attitudes present during such exchanges affects the recipients' decoding of the message (Mehrabian & Reed). Such research indicates that if teachers are aware of their nonverbal immediacy behaviors, steps can be taken to promote positive and effective learning environments. Therefore, being aware of the nonverbal messages that are sent to students has an impact on student interpretation of information, behaviors, and performance in classrooms.

Preiss and Wheeless' (2014) review of research strategies in communication over the past few decades shows a movement toward student-centered instruction. Conclusions of the review led Preiss and Wheeless to urge educators to consider the impacts of their actions, interactions, as well as transactions that occur in the classroom environment, rather than a linear model of teacher relaying information to students. Preiss and Wheeless also conclude that learning is

facilitated through interactions and that a teacher's communication style affects students' learning outcomes. Connecting this knowledge with teacher self-awareness and then applying it to the notion of nonverbal immediacy behaviors would support these findings.

Teacher–Student Interactions

To engage students in learning, their basic academic, social, and behavioral needs must be met (Roorda et al., 2011). The research of Frymier and Houser (2009) specifically studies nonverbal immediacy behaviors in teacher–student interactions. Examples of immediacy behaviors employed by teachers can include using a variety of vocal expressions, making eye contact with and smiling at students, calling students by name, asking for student feedback and responses, and moving around the classroom. Roorda et al.'s (2011) research states that teacher–student relationships are more significant for children who are from low socioeconomic backgrounds, are academically at risk, and those with learning difficulties. Davis (2001) addresses students' social self-concept beliefs, the value they place on their relationship with the teacher, and nonverbal communication skills, which all help determine the success of teacher–student relationships. Therefore, the role of an educator in a K-12 classroom plays a significant part in student success.

Other existing data for teacher–student interactions show that consistency, predictability, and routines (Avni-Babad, 2010), meaningful interactions (Meier, DiPerna, & Oster, 2006), and teacher feedback (Wray, Medwell, Fox, & Poulson, 2000) lend themselves to positive student self-concepts (Leflot et al., 2010). Leflot et al.'s study in 15 second-grade classrooms "showed that children's social self-concept was nourished by warm, accepting, respecting, and stimulating teachers, who did not negatively structure the child's environment" (p. 397). This positive self-concept is further supported by Baringer & McCroskey's (2009) research, which shows that

teachers' immediate interactions with students increases their motivation, as well as affective and cognitive learning.

In Frymier and Houser's (2009) two-part study with college-aged students (*N*=93 and *N*=257), results indicated that teacher–student communication is relational as well as content driven. Davis (2001) adds that the teacher–student relationship contributes to students' development of their schema; nonverbal communication skills are directly related as well. Sfard (2001) echoes this view as people have a humanistic need for communication, interaction with others, and continuous growth; each affects how we, in turn, learn and interact with others. Educators are shaping students' lives in more ways than they know through their actions and words.

Roorda et al.'s (2011) study on the effects of teacher–student relationships and engagement reveals that primary students are affected the most when negative relationships exist. Their research indicates that a positive teacher–student relationship supports the student and stimulates learning behaviors, whereas a negative relationship interferes with a student's feelings of security and attempts to manage demands in school. Steele (2010) reports that students are greatly impacted by the relationships between teachers' nonverbal teaching behaviors and their perceptions of students as well as the complex forms of communication that take place with verbal and nonverbal behaviors. Miller et al. (2014) assert that immediacy is "most highly associated with affective learning . . . it promotes a communicative connection that enhances the teacher – student relationship" (p. 6). A connection between teacher immediacy and positive student affect is echoed by Chesebro (2010), Özmen (2010), and Pogue and Ahyun (2006). Chesebro's study found that nonverbal immediacy increased students' affect for the instructor as well as the course material.

Keeley (2005) reports that individuals feel a sense of security and control when their nonverbal behaviors are coordinated with those with whom they communicate. As a result, the perspectives of individuals, such as students, in a communicative relationship are important in understanding the role nonverbal behaviors play in quality communication interactions. Preiss and Wheeless' (2014) research asserts that caring messages promote teacher credibility and clarity of information being expressed, as well as student understanding and learning. Miller et al. (2014) indicate that warm, interactive classroom environments result in fewer instances of negative student behaviors. Thus, more than information is being transferred between teachers and students; clarity and engagement increase student receptivity to understandings and information (Preiss & Wheeless). It was also found that teachers whose instructional strategies make content pertinent bring about student empowerment, which lends itself to increased engagement, inquiry, and connections to their daily lives (Preiss & Wheeless).

Kronenberg and Strahan (2010) describe responsive teaching, where teachers provide candid feedback, one-on-one support, and ongoing dialogue regarding students' personal and academic choices. They indicate this approach especially affects reluctant and struggling students. "Students who reported the most positive levels of support from teachers demonstrated higher levels of effort, attention, and persistence" (Kronenberg & Strahan, p. 78). If the relationship between the teacher and student is open and communicative, students will be more likely to respond well to verbal and nonverbal interactions they have with the teacher.

When the two types of messages (verbal and nonverbal) are contrasting, people tend to rely on the nonverbal content, while disregarding the verbal (Keeley, 2005). Keeley reports that perceptions of actual behaviors portrayed have the greatest consequence upon people's interactions and relationships. According to Keeley, communicator–recipient relationships are

impacted presently and in the future, because recipients naturally label and assign meaning to others' behaviors. This idea is echoed by Mehrabian and Reed's (1968) findings that a person tends to accept the intended approach of someone whose viewpoint seems close to his or her own way of thinking. A contrasting message to one's own perspective can, therefore, be decoded in a manner much more divergent than the original goal (Mehrabian & Reed). The intended meanings and feelings of a message must then be clearly conveyed with a sense of awareness and understanding of the audience. It can then be said that the experiences of a student through interactions with a teacher are greatly impacted by the nature of the nonverbal messages being relayed.

According to Sfard (2001), humans' need for communication and interaction with others is driven by our innate needs and desires to be part of a community. McCann and Higgins (1988) refer to the term "social goals", which are goals pursued through interactions with others. These objectives have been found to link social and cognitive effects with outcomes of interpersonal relationships. Miller et al. (2014) indicate that instructors' willingness to be candid about expected classroom behaviors, promote a caring classroom environment, and foster relationships with students can lead to fewer behavior issues. Nonverbal immediacy aligns with these positive communicative methods that establish a foundation for positive teacher–student interactions.

When examining nonverbal behaviors in communicator–recipient relationships, it can be valuable to take the recipient's viewpoint into consideration (Keeley, 2005). Being able to research students' perceptions of communicators' nonverbal behaviors has allowed some researchers' insight into the sometimes hidden perspectives and understandings that are created over time in teacher–student relationships. Ambady and Rosenthal's (1993) research on "thin

slices" of nonverbal behavior used people's judgments of strangers' nonverbal behavior during 10-second video clips. They found that people are surprisingly accurate in assessing others' personality attributes in these non-interactive situations. If strangers are precise, then implications for teacher–student interactions and relationships show how crucial awareness and taking steps toward positive interactions can be.

Student Engagement

Stanulis & Manning (2002) assert that student attentiveness is promoted through positive, negative, or neutral tone of voice, in addition to touching behaviors, facial expressions, and eye contact. According to Mehrabian & Reed (1968), in situations where verbal communication, tone of voice, and facial expressions are employed, the recipient weighs the latter most heavily. Teachers' development of nonverbal communication is important because it reveals that teachers' perceptions of students (Steele, 2010) can have an accumulating effect on students' attitudes and a great influence on their learning environment (Battersby, 2009), and can affect students' motivation and sense of self-worth (Stanulis & Manning). Chesebro (2010) adds that clear and immediate teaching methods to improve students' perceptions of learning and lower students' feelings of apprehension. Other researchers cite that voice characteristics, gestures, and body movements have the same influences on student engagement (Dick et al., 2012; Goldin-Meadow et al., 2009; Kim et al., 2010; McNeill, 2005; Özmen, 2010; Sfard, 2001, 2009; Whitaker, 2011).

Roorda et al. (2011) define students' engagement as the quality of a child's connection and involvement in school settings, including the goals, values, people, and activities associated with it. Their research found three essential components for examining students' engagement, including the behavioral participation in academic and social activities; positive and negative

emotional reactions and feelings towards teachers, other students, and school as a whole; and cognitive aspects that include willingness and the ability to become proficient at complex skills and ideas. Included in these three are the categories of teacher affect and behavior, student learning behaviors, and student affect (Roorda et al.). Taking into consideration the existing overlap between each of these areas, Roorda et al.'s study refers to all categories when using the term student engagement. Teacher involvement through modeling, autonomy support, and structure have also been found to lead to greater student engagement, achievement, learning, and motivation through the work of other researchers (Frymier & Houser, 2009; Houser & Frymier, 2009; Wray et al., 2000). Goldin-Meadow et al.'s (2009) research found that teachers who modeled and encouraged students to apply specific hand movements during a math lesson enabled the students to focus on the information, take meaning from it and, therefore facilitate their learning.

Goldin-Meadow et al.'s (2009) study also suggests that body movements are a natural part of how people learn. These gestures connect prior knowledge with new ideas through their learning activities. In Goldin-Meadow et al.'s research, the use of content-related or unrelated hand motions helped all children focus their attention on the math problem they solved. Their findings also recommend that engaging students in their learning through the use of specific hand gestures will help establish a foundation for new knowledge. Kim et al. (2010) study indicates that students' use of gestures during lessons expresses the interactive framework of learning environments paired with nonverbal motions. Making opportunities available for students to make these types of connections between what they learn and ways to demonstrate their learning leads to greater student engagement. Goldin-Meadow at al. and Kim et al. report that students' use of gestures aids in their understanding and engagement with mathematics instruction and

learning. The available research on the pairing of teachers' nonverbal behaviors and the teaching of mathematics demonstrates a strong relationship between the two as well as a positive impact on student engagement.

The Use of Gestures in Mathematics Instruction

Math Nonverbal Gestures

In Edwards' (2009) observations and interviews of preservice elementary teachers' knowledge of fractions, teachers' use of gestures were found to be one significant way they could heighten students' thinking and learning. In Kim et al.'s (2010) research on geometry learned by elementary students, the use of gestures by teachers and children showed an evident link between thinking, learning, and processing of information, even without or prior to the use of verbal expressions. Sfard (2009) contends that the use of gestures is crucial to effectively communicating mathematical ideas. The use of such gestures, especially paired with verbal explanations, is invaluable in allowing all teachers and students to examine the same concept with the same understanding (Sfard, 2009). It has been discussed that gestures can aid in meaning making for verbal messages (Edwards; Kim et al.; Sfard, 2001, 2009), as a physical equivalent to a word or idea is created (Sfard, 2009). Sfard's (2009) research also mentions the opposite relationship, where the word will then refer to the gesture, aiding in meaning making, recall, and transfer.

Sfard (2001) describes communication in mathematics as almost an equal to the thinking or process of learning about mathematics. Sfard (2001) states "putting communication in the heart of mathematics education is likely to change not only the way we teach but also the way we think about learning about what is being learned" (p. 13). This pairing of learning and understanding, alongside the use of gestures, is a concept that Sfard (2001) stresses can lead to

transferrable knowledge. Students can thus become participants in their learning through the acquisition and use of gestures in mathematics and other subjects.

Alibali et al.'s (1997) study was designed to determine whether teachers and other adults were sensitive to students' mismatch between their speech and gestures while explaining their solutions to mathematical equations. The adults were also studied to see if they could discern the children's explanations and knowledge of the mathematical task. Alibali et al. report that gestures reveal important information about a child, especially when a teacher or other adult is trying to determine readiness and information learned. Alibali et al.'s study found that adults with no training in identifying children's nonverbal motions were able to gather information from their speech and gestures, even when a mismatch was present.

Math Gestures in the Classroom

Several other studies found students' understandings of mathematical concepts are greatly heightened by teachers' and students' encouraged use of hand gestures (Edwards, 2009; Goldin-Meadow et al., 2009; Kim et al., 2010; Wilson, 2012). Goldin-Meadow et al. studied teachers who modeled correct, partially correct, or no gestures when teaching students a math concept on grouping numbers during one-on-one math instruction. The teachers did not mention the word "grouping" in the lesson, as related to the content or the gestures used. Nine- and 10-year-old students were then encouraged to solve a problem using the same type of gestures modeled by the instructor, including correct, partially correct, or the absence of gestures. The only reference to grouping was therefore evident from the gestures produced by the children themselves. Students who were instructed to move their hands using the correct gesture strategy produced more correct math problems than those who used partially correct gestures, which suggests a relationship between the gestures and their learning. However, students who used any

type of gesture solved more problems than students whose lesson and work time did not involve any hand motions. Goldin-Meadow et al. concluded that the use of gestures, either modeled by a teacher in the right context, or encouraged but without specific connection to the topic, leads to greater student understanding and application.

In Wilson's (2012) study, an elementary classroom teacher known as Mr. Martin incorporated American Sign Language (ASL) elements into his math lessons, encouraging students to do the same. Wilson notes that mathematics teaching oftentimes incorporates pictures and words, such as geometric figures and number sentences. The use of gestures, which Wilson states is an everyday part of communication, has the potential to greatly heighten the teachings and understandings of math. Students' recall of math concepts was improved by the inclusion of kinesthetic elements in lessons and practice in this first grade classroom. Mr. Martin and his students intentionally used gestures, alongside images and words, to enhance conversations and meanings surrounding their learning. Wilson adds that with the introduction of ASL elements in his math class, Mr. Martin found his students recreating and reinterpreting some of the signs to make them more understandable for themselves.

The teacher education students who were interviewed in Edwards' (2009) study were not taught to use gestures, such as ASL, while describing the concept of fractions; they were observed using gestures as a natural form of their personal teaching styles. These movements were also referred to as spontaneous gestures, which are synchronized with a person's speech. The teacher education students in Edwards' study produced a range of gestures that mimicked hands-on manipulatives oftentimes used in elementary classrooms, therefore relaying precise gestures directly related to the understanding of fractions. Edwards concludes that teachers' use of gestures during mathematics instruction can only deepen their students' thinking. He adds

that gestures, along with verbal, written, and visual ideas, can show instructors how students think about and learn mathematics. Other research done by Edwards indicates that the coupling of speech and gestures supports a learner's problem solving and thinking abilities.

Kim et al. (2010) writes of the abstract nature of mathematics, and that bodily presentation is one type of activity that can help teachers go beyond the conventional verbal and written means for teaching and assessing mathematics. Kim et al.'s study on second grade students' learning in geometry focused on the bodily actions and expressions used by students. The authors emphasize that students' knowledge of geometry emerges from touching, holding, and relating gestures to mathematical objects (Kim et al.). Kim et al.'s findings illustrate that often students' gestures emerge when they are working alone and at other times when working with others. Through observations alone, it cannot be definitively said if students have understood an abstract math concept. Nonetheless, these gestures certainly provide information that students are processing the information provided.

Summary

Teachers' nonverbal behaviors create a sense of immediacy in the classroom. Burgoon and Hoobler (2002) and Mehrabian and Reed (1968) assert that interpretations for displayed immediacy behaviors are controlled by the context in which something occurs. Keeley (2005) reports that individuals act and react according to their perceptions of a person's nonverbal immediacy behaviors. The inclusion of direct, purposeful nonverbal behaviors, such as immediacy behaviors, can influence a student's decoding and thus, interpretation of a situation. The teacher participants in Benzer's (2012) study agreed that body language is important in education because it supports communication, draws students' attention, and increases student interest in the topic.

Immediacy is a construct that describes and encourages the closeness between communicator and recipient (Mehrabian, 1969). Communicators' use of nonverbal immediacy behaviors leads to greater understanding and engagement by the receiver (Burgoon & Hoobler, 2002) and can facilitate students' attention to the teachers' messages (Chesebro, 2010). Andersen & Andersen (2005) affirm that immediacy can lead to feelings of warmth, sincerity, approachability, and availability regarding the communicator. Immediacy behaviors facilitate students' attention, positive self-concept, affect, and overall engagement (Baringer & McCroskey, 2009; Benzer, 2012; Chesebro, 2010; Edwards, 2009; Goldin-Meadow et al., 2009; Kim et al., 2010; Kronenberg & Strahan, 2010; Leflot et al., 2010; Miller et al., 2014; Özmen, 2010; Pogue & Ahyun, 2006; Roorda et al., 2011; Sfard, 2001, 2009; Stanulis & Manning, 2002; Williams, 2009; Wilson, 2012).

Various types of nonverbal behaviors encompass many physical displays in the communicative process. Stanulis and Manning's (2002) nonverbal behaviors include tone of voice, posture, facial expressions, eye contact, and touching or physical contact with students. Hennings and Grant's (2001) primary nonverbal behaviors include conducting, acting, and wielding. Butt et al. (2011) give emphasis to leg stance, torso movements, shoulder and head movements, and sitting or standing. Teachers' intentional use of nonverbal immediacy behaviors, especially during mathematics instruction, can aid in students' interpretation of the information being relayed, positive teacher–student interactions, and student engagement.

The studies on gestures in the mathematics classroom address movement to improve student engagement and learning. Examples of such studies were examined in this chapter. Research on immediacy aspects of nonverbal behaviors by teachers during math instruction is largely unstudied.

CHAPTER III

METHODOLOGY

The purpose of this study was to describe teachers' instructional and non-instructional nonverbal behaviors. Nonverbal behaviors were explored through the lens of the construct, immediacy, which is defined by Mehrabian (1969) as the use of behaviors that encourage the closeness and nonverbal interactions between communicator and recipient. The goal was to analyze immediacy behaviors for their influence during mathematics instruction.

The rationale for conducting this study was that teachers are generally unaware of their nonverbal behaviors, although research indicates that teachers' nonverbal behaviors impact student engagement (Kronenberg & Strahan, 2010; Leflot et al., 2010; Roorda et al., 2011; Stanulis & Manning, 2002). Immediacy, in particular, can positively enhance the learning environment (Baringer & McCroskey, 2009; Benzer, 2012; Chesebro, 2010; Edwards, 2009; Goldin-Meadow at al., 2009; Kim et al., 2010; Sfard, 2001, 2009; Williams, 2009; Wilson, 2012). Moreover, there is a lack of existing research in the area of elementary teachers' nonverbal immediacy behaviors and on the potential impact of nonverbal teaching behaviors on elementary student engagement.

In this chapter the methods and procedures used in the design of the study are presented. This design is presented in Figure 3. I use the information in Figure 3 to organize this chapter. First, I explain the research paradigm: phenomenology. Then, I address the research topic and research questions. Next, I describe project approvals and consent of participation, followed by

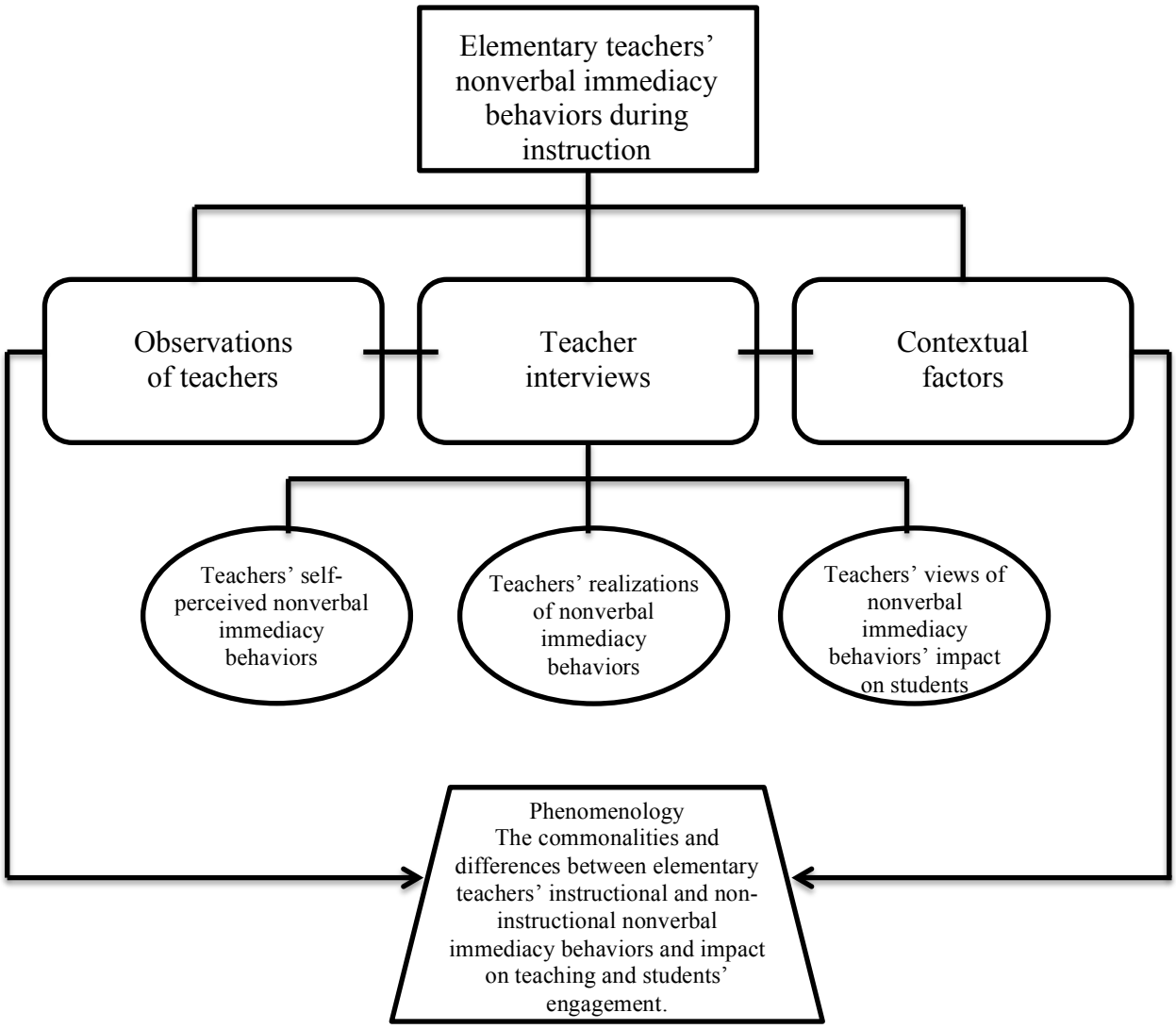

Figure 3. Phenomenological approach using teachers' nonverbal immediacy behaviors during instruction.

a description of the participants, the research site, as well as my role as researcher. Following, I describe data collection methods and procedures. I conclude with the methods and procedures for data analysis and methods used to evaluate trustworthiness of the findings.

Design of the Study

Phenomenology as a Methodology

A qualitative, phenomenological research design was utilized for this study. Creswell (2007) describes phenomenology as the lived experience of several individuals. Through his research, Husserl (1965) writes that phenomenology's task is to bring about the secrets, or the essences, of phenomena. Wertz (2011) describes phenomenology as a "descriptive, qualitative study of human experience" (p. 124), which allows a closer examination of the ways in which situations are presented through the participants' experiences. Spiegelberg (1984) writes that, "the first objective of the phenomenological approach is the enlarging and deepening of the range of our immediate experience," (p. 656).

There are two methods of utilizing phenomenology, descriptive and interpretive (Creswell, 2007). The descriptive method is used in the current study. Wertz (2011) writes that the descriptive method involves putting aside all theories and hypotheses prior to researching the current subject. Husserl's method of "bracketing" prior knowledge of the topic allows the researcher to "freshly reflect on concrete examples of the phenomena under investigation" and attend to the *lebenswelt*, or "lifeworld" of the subject (Wertz, p. 125, italics in original). This psychological phenomenological reduction requires the researcher to focus on and closely examine how situations are presented through the experience. The researcher must also refrain from incorporating his or her personal assumptions, feelings, inferences, and preferences (Creswell, 2007). Through this reduction, the experiences of the participants are used to "encompass all the complexities and intricacies of psychological life that come into view" (Wertz, p. 125).

In this study, six elementary teachers in grades three, four, and five who teach

mathematics were identified. The nonverbal immediacy behaviors present during six elementary teachers' math lessons were explored as a phenomenon. Using immediacy as a construct, teachers' self-perceptions of their own nonverbal immediacy behaviors were also investigated. The experiences of an elementary teacher include a wide array of components such as planning for content and student learning styles, employing management techniques, continuous informal and formal assessments of student learning, and instructional delivery. With a large emphasis on the content and student needs, teachers may not be conscious of their nonverbal immediacy behaviors during whole group, small group, and individual academic times in the classroom.

Sokolowski (2000) describes intentionality and its mental or cognitive connection with phenomenology. When researching and analyzing data, researchers' awareness must be directed at the "conscious relationship we have to an object" (p. 8). In this study, my outside perspective as researcher allowed me to objectively find commonalities between participants. Having said that, I was also a part of the research process, having an intimate perspective on the findings that develop across participants. Observing these six teachers' math lessons through the lens of a video camera and then having face-to-face conversations with each allowed me new perspectives on the world of elementary mathematics as well as broader views on teachers' self-perceptions and realizations of their instructional and non-instructional nonverbal behaviors.

Research Questions

The research questions, as stated previously, are as follows:

1. What do teachers' nonverbal immediacy behaviors look like in the classroom during academic instruction in math?
2. How do teachers describe their own nonverbal immediacy behaviors?
3. What are teachers' perceptions of their nonverbal behaviors on student engagement?

These questions were developed because of my initial interest in how teachers talk to and interact with their students. Upon further research into verbal selections made by teachers, I became intrigued by the closely-related topic of nonverbal behaviors that teachers exhibit during instruction. This research caused me to reflect upon my own teaching practices. As a fifth grade teacher, I implement various songs, rhymes, actions, and dances in my math lessons to give students a physical break during a lesson and to engage their minds in a way other than writing examples, solving problems, or viewing lesson videos. Most of all, I create these activities so they have a new way of learning, reviewing, and later recalling information as compared to repeated practice and rote memorization alone. I also know that students have varied learning styles and needs, so it is my hope that these active elements will enable students to hone their current learning strengths and grow in new areas.

Participant Selection, Consent, and Confidentiality

Purposeful sampling was utilized to identify prospective participants. According to Patton (2002), this type of sampling is the process of selecting participants *purposefully*, which leads to *information-rich cases* for in-depth study (italics in original). This form of sampling allows the investigator to select individuals, because they can purposely offer insight into the phenomenon under investigation (Creswell, 2007). Purposeful sampling was employed to identify prospective study participants. This form of sampling allows the researcher to select individuals who can offer purposeful insight into the phenomenon under investigation (Creswell, 2007).

After approval from the appropriate institutional review boards (IRBs), I contacted the building principal for approval of the study being conducted in his school. After potential participants were identified, an in-person verbal invitation was given. A description of teachers'

part in the study was given and participants were able to ask questions. After this face-to-face meeting, an email was sent to all potential participants who expressed an interest in participating (Appendix A). This email explained the study's design of observations of one math instructional lesson and one to three follow-up interviews each lasting approximately 30 to 45 minutes.

Upon agreeing to participate, teachers who participated in the study signed a consent form, which described the purpose of the study and involvement required on their part. The form clearly stated that participants could withdraw from the study at any time without penalty. Participants were also given the option to not participate if selected; an alternate teacher would have then been chosen. After consent forms were signed, copies were emailed to participants within 24 hours. Although students were not a focal point in this study, parents were notified that a video camera would be present for one math lesson in their child's classroom. A parent letter was then sent home with the students in each classroom whose teachers were participating (Appendix B). The letter stated, if parents did not wish for their child to be within range of the video camera during taping, a separate space in the back of the classroom would be provided. Following informed consent, teachers were contacted to arrange dates and times for observations and later, interviews. Interviews were conducted in a quiet, private setting chosen by each participant.

Six female elementary teachers from grades three, four, and five participated in this study. Two teachers from each grade level were selected as participants. Each teacher was video recorded during one math lesson. Due to the great number of commonalities as well as differences in instructional and non-instructional nonverbal behaviors, along with initial reflections and later self-realizations of the teachers, this number of participants enabled saturation to be reached. Saturation can be defined as reaching a point in which no new

information is found (Seidman, 2006); saturation was therefore reached when similar behaviors and self-perceptions were found across teachers, math topics, and grade levels.

Site

The teachers were selected from an elementary school in a city of approximately 8,000 residents in the upper Midwest. In this school there are 18 general education teachers in grades three, four, and five, in addition to three special education teachers and one full-time Title One reading teacher. The student population is approximately 400 pupils; the students' race and ethnicities are primarily white non-Hispanic and Hispanic with very small African American and Somalian populations. The free and reduced-lunch students, which equate to 38% of the student body, show that less than half of the student population lies within or below the poverty line. This particular school was ideal for the research, because of its proximity to the university where I am completing my doctoral program and because I am also a teacher at this school. As a result, I already had an existing rapport with the participants, and I was able to gather data from observations and interviews at times that were convenient for the participants.

Role of the Researcher

I have been an elementary classroom teacher for 11 years and currently teach fifth grade at an upper Midwest elementary school. I am currently in a Teacher Education Doctoral program at a large research university in the same area. Through my teaching experiences, continuing education credits and workshops, as well as graduate studies, I have personally explored verbal and nonverbal behaviors as related to instructors and their students. This study explored the relationship between elementary teachers' instructional and non-instructional nonverbal immediacy behaviors in mathematics instruction. Results from this study are expected to create an awareness of teachers' immediacy behaviors while teaching and potential effects

these behaviors can have upon student learning, engagement, and on the student-teacher relationship. My biases, assumptions, and preconceptions were identified and set-aside prior to the start of the study because of my teaching experience in the area of investigation.

Jacob and Furgerson (2012) write, "Researchers may use many different techniques, but at the heart of qualitative research is the desire to expose the human part of a story" (p. 1). In this phenomenological study, my role as researcher was to observe and interview. In doing this, I sought to gather information to tell the story of the teacher participants in my study. This is stated as well by Creswell (2007):

> Qualitative research is an inquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem. The researcher builds a complex, holistic picture, analyzes words, reports detailed views of informants, and conducts the study in a natural setting (p. 15).

I informed each teacher participant the focus of my study was to see how teachers communicate during mathematics instruction. I did not share any additional information regarding nonverbal behaviors to alter or otherwise affect how they presented their lesson information, interactions with students, or the manner in which they used their instructional materials. I was not present during the video recorded observations to allow as close to a natural classroom environment as possible. I also informed my participants my role was to observe one lesson and have a conversation with them about their communication methods. I assured each teacher I was not there to critique her teaching or lesson presentation styles.

Data Collection Method

Observations

In this study, I observed one math lesson for each of the six elementary classroom

teachers in grades three, four, and five that was involved in this study. In this study, each teacher participant was female. After obtaining informed consent from teachers and passive consent from parents, one math lesson was video recorded in each teacher's classroom. According to Maxwell (2005), observations can "provide important contextual information, a different perspective from the interviews, and a check on your interview data" (pp. 79-80). To allow as close to a natural teaching environment as possible, I was not present in the classroom during each lesson observation. Shortly before each math lesson was to take place, I set up the video camera at the back of each classroom. A wide-angle lens was employed in video recording to capture teachers' nonverbal gestures, bodily movements around the room, and facial expressions. I discussed with each teacher her preference in how the video recording would begin. Teachers were asked if they would like me to be present in the classroom to begin taping and then promptly exit the room, if they would like to press the "record" button at the start and end of their own lesson, or if they would like to choose a student of theirs to assist.

Following each observation, I viewed the video recordings to record the types of nonverbal actions or expressions observed, such as sitting or standing, tone of voice, and facial expressions. A checklist of nonverbal behaviors, compiled from available literature, was utilized as a means of collecting the types and frequencies of nonverbal behaviors demonstrated in each lesson (see Table 4 in Chapter IV). Participants were informed that, following each interview, video recordings were taken off-site and kept in a locked cabinet in the principal investigator's home office. Video recordings and all other recorded or collected information will be kept for five years following the conclusion of the study and will then be destroyed.

Interviews

In this study, interviews allowed insight into the participants' thoughts, feelings, self-perceptions, and reflections regarding their video recorded math lesson. Maxwell (2005) writes that interviews can be used by the researcher to check the accuracy of his or her observations. Interviews are also essential for providing information not presented in an observation. In phenomenology, elements such as observations and interviews allow the researcher to establish significant statements, codes, and common themes to create units of meaning (Creswell, 2011).

Within one week of each video recorded lesson, I conducted semistructured interviews. Audiotaped interviews took place at a location chosen by the participants. All video recorded lessons and interviews were completed within a three-week timeframe (see Table 1). With the

Teacher Name and Grade Level	Week 1	Week 2	Week 3
Mrs. Zale - 3	V	I	
Mrs. Kimball - 3		V	I
Mrs. Owens - 4	V	I	
Mrs. Randall - 4		V	I
Mrs. Paxton - 5	V	I	
Mrs. Tanavo - 5	V	I	

Table 1. Schedule of Video Recorded Math Lessons (V) and Interviews (I).

permission of each participant, interviews were audio recorded and later transcribed verbatim for further analysis. At the time of each interview, teachers were instructed to not disclose any information regarding the nature of the study or the interview questions with other teachers in the building, namely the other participants in the study. This direction provided to protect the

integrity of the study and its findings. To maintain anonymity, participants were given a pseudonym to be used in the interview and throughout all transcriptions, data analysis, and final reports. Only I have access to the master list, which will be kept separate from the data collected in a locked file cabinet at my home. All data, consent forms, and participants' personal data will be kept private to the extent permitted by law. Following each transcribed interview, a copy was sent to each participant to employ member checking so data could be clarified, added, and confirmed (Creswell, 2007).

These audiotaped interviews included information from the observation and video recording analysis with each teacher. For the interviews, I developed open-ended questions and phrases that would allow each participant to reflect upon her lessons and self-perceived nonverbal behaviors. The foundational interview questions used to facilitate teachers' self-reflections are included in Table 2. These questions have been drawn from related literature and are correlated with examples of nonverbal behaviors exhibited by the group of teachers during the lessons. Creswell (2011) writes about open-ended interview formats, where interviews and questions are designed to allow each participant to expand and reflect upon questions guided by the researcher. Participants' responses and follow-up questions shaped the direction of each interview.

During the interviews, teachers were first asked to describe their math lesson and ways in which they communicated with students. Next, teachers were informed about the purpose of my study and were asked if they exhibited specific nonverbal behaviors during their math lesson. At this point, the teachers were given a list of nonverbal behaviors as a guide, but they did not see my notes of their observed lessons. After their initial self-perceptions of their nonverbal

Table 2. Interview Questions.

1. Tell me about your video recorded math lesson. Was this a typical math lesson for you and your class?
a. What went well? Is there anything you would do differently next time?
b. What can you tell me about how you communicated during this lesson?
2. What types of nonverbal motions do you frequently use while teaching? (After initial response, a list of nonverbal immediacy behaviors given. See Table 1.)
a. Especially: hand gestures (large or small hand movements), hand-arm motions, proximity, making or avoiding eye contact, facial expressions, tone of voice, vocal variety, avoiding gesturing, maintaining eye contact, smiling or modeling thinking while talking, explaining a mathematical concept while using intentional gestures or motions).
3. I have selected several segments from your video recorded math lesson. Let's examine each one.
a. After viewing each segment: What can you tell me about how you communicated during this lesson?
b. Are the nonverbal behaviors you used in this/these segment(s) typical of your math lessons? Can you explain or describe such behaviors?
4. How do you feel your nonverbal behaviors affect student engagement? Why do you think that?
a. Can you give me examples of times your nonverbal immediacy behaviors may have impacted student engagement?
5. What types of intentional, instructional motions do you see yourself using in future lessons?
6. What non-teaching actions do you find yourself using repeatedly while you are teaching math?
7. How might your awareness of your instructional and non-instructional nonverbal behaviors affect how you will teach now or in the future?

Note. Questions 2, 5, 6, and 7 adapted from Hennings, D. G., and Grant, B. M. (2001). Non-verbal teacher activity in the classroom. *Education*, *93*(1), 42-44.

behaviors, short segments of the video recordings were played to allow the participants to view their actual instructional and non-instructional nonverbal behaviors. Teachers' reactions to their observed nonverbal behaviors were also recorded.

Also included in the analysis was a narrative description of each lesson to allow for consideration of contextual factors such as student interactions, non-instructional teacher and student interactions, and external influences such as telephone interruptions that may have influenced the classroom environment and lesson. The final pieces of analysis were themes and assertions that arose from analyzing the teachers' math lessons and especially from the one-on-one interviews with each teacher.

Data Analysis

Data from the nonverbal immediacy behaviors exhibited by each teacher during math instructional time were examined and analyzed. From this, three layers of analysis emerged. First, video recordings were analyzed for nonverbal behaviors exhibited by each teacher during her respective math lesson. Next, these nonverbal behaviors and segments of each lesson were used in conjunction with interviews to address the research questions for this study. Finally, analysis of these interviews with elements of the video recorded lessons revealed four themes. Each of these layers of analyis is described in the following section.

Coding and Analysis

After video recording one math lesson for each teacher participant, I transcribed and color-coded the instructional and non-instructional verbal and nonverbal elements (see example in Appendix D) for pure description. The nonverbal behaviors selected from available research were used in obtaining exhibited behaviors and frequency of each. These nonverbal behaviors are described as following. Butt et al. (2011) list the use of hands, arms, legs, torso, shoulders

and head; sitting versus standing; other body postures; and facial expressions and eye movements. Hennings and Grant (2001) describe conducting, acting, and wielding as physical motions to orchestrate student involvement. Sfard's (2009) nonverbal behaviors includes instructional gestures and gaze, while Stanulis & Manning (2002) designate tone of voice, posture, facial expressions, eye contact, and touching or physical contact with students as nonverbal behaviors.

Relationships were then found across and between participants to determine individualistic behaviors and commonalities. This second layer of analysis resulted in narrative descriptions of the specific nonverbal behaviors displayed by teachers as well as descriptions of each teacher's math lesson. Individual teacher's math lesson depictions included the types of instructional and noninstructional nonverbal behaviors exhibited. This analysis addressed research question one, which asks what teachers' nonverbal immediacy behaviors look like during mathematics instruction. These narratives were included in this study to exemplify the wide range, as well as commonalities, in nonverbal behaviors exhibited by the teachers. These descriptions strengthen the overall findings of this study as well as lend themselves to thematic findings, which resulted from the interviews.

Transcription notes from teachers' math lessons, a list of nonverbal behaviors drawn from the literature, as well as semi-structured interview questions (see Table 2) guided each conversation. Following these interviews, the audiotapes were transcribed verbatim. I read these transcriptions several times to ensure that each participant's meaning and ideas were fully understood. After transcribing, thematic analysis followed when the teachers' conversations were assigned to two levels of significant statements, followed by codes, categories, themes, and finally, two main assertions. Within each theme and for the two assertions, significant

statements from teachers' interviews were gathered (see examples in Appendix E) to be included in the descriptive accounts of teachers' instructional and non-instructional nonverbal behaviors. Patterns within teachers' perceptions of their nonverbal behaviors arose from the coding, which addressed each research question, but mainly research questions two and three. The previous analyses of teachers' video recorded math lessons and descriptions of nonverbal behaviors exhibited fed into this thematic analysis through a partnership between teachers' perceptions of their nonverbal behaviors during math instruction and actual nonverbal behaviors displayed. Thus, the themes arise from both the observational and interview data.

Comparative analysis was employed to move data collected from observations and interviews through organization of content and identification of significant statements, coding, categories, and themes, before the culmination of two final assertions. For these stages of comparative analysis, two teachers' interview data were analyzed using an Excel spreadsheet, with each column representing a particular set of the organized data. Later, the other four teachers' interview data was cross referenced to the categories and themes to assure that themes were accurately representative of the overall findings.

Maxwell (2005) defines coding as the primary categorizing strategy in qualitative research. He indicates coding involves breaking down data and rearranging it into categories in order to compare ideas within the same category, as well as across all categories. Initially, I reviewed the two selected teachers' interviews to identify a basis for my organizational codes. Examples of codes found included lesson structure, teacher presence, knowledge of students, math concepts, verbal examples, and nonverbal examples. Appendix F includes examples of teachers' significant statements and codes. In order to identify commonalities among codes, they were sorted alphabetically and then grouped according to potential categories. Similar to the

steps of the coding process, I compared each code and category and followed each element with the interviews for each teacher to ensure consistency across and between all participants.

After coding and organizing, I began the process of categorizing the codes to find relationships among groups of codes. See an example of this process in Table 3. Maxwell (2005) describes categorizing as a means for developing an understanding of the data as well as to generate themes. According to Maxwell's definition of theoretical categories, my coded data were placed into a more general or abstract framework. As is also true with phenomenological research, my categories were derived from an inductively developed theory that represented my concepts (i.e., "etic" categories) rather than participants' own concepts (i.e., "emic" concepts).

Theme Two Codes		Theme Two Categories		Theme Two
Math concepts - Lesson structure - Nonverbal example - Real-life examples - Student struggles - Student engagement - Verbal examples Nonverbal examples - Lesson structure - Math concepts - Reflection - Small group - Student engagement Real-life examples - Lesson structure - Reflection - Student engagement	→	Math concepts Math real-life examples Math immediacy	→	Math Nonverbal Immediacy Behaviors, Math Concepts, and Real-life Examples

Table 3. Codes and Categories that Comprise Theme Two.

The categories that arose from the codes include examples such as: classroom setup,

classroom atmosphere, instructional phrases, lesson elements, math concepts, math real-life examples, math immediacy, nonverbal communication, and reflections. Similar to the process I undertook with the codes, the categories were then sorted alphabetically and grouped according to potential themes. Analysis of this list of categories and themes allowed me to identify patterns within various categories. I color coded each teacher's significant statements, along with using the first letter of her last name and a number to align with each statement. This strategy allowed me to ensure that each category included a proportionate amount of material from each teacher.

During analysis, I examined the potential themes for their relevance to the research questions. After finding connections between the interviews and elements of the math lessons for each theme, several interrelationships were discovered. Four themes were selected for the findings of my research. This listing of my four themes, as well as definitions that include relevant categories, are also listed in Appendix G. Appendix G contains a listing of each theme alongside portions of each teacher's interview that align with said themes.

Peer debriefing with my advisor and other colleagues as well as participant member checking were employed to ensure internal content validity. Empirical and other related literature in the areas of nonverbal immediacy, nonverbal behaviors, and teacher and student communication (as well as phenomenology) were used to support findings that arose from the study. Findings from the observations were portrayed through narratives and were used following the interviews to compare each teacher's self-perceptions of her nonverbal immediacy teaching behaviors to those observed. Interview findings for individuals as well as relationships across participants were described within the four themes.

Researcher Reflexivity

To explore one's own biases, perspectives, and subjectivity, the researcher must apply

reflexivity (Glesne, 2011). Glesne states that the goals of researcher reflexivity are to make the research more valid, accurate, or legitimate. My reflexive process entailed the following:

1. Transcribing my own data resulted in familiarity with the material, leading to in-depth, accurate analysis. For example, similar behaviors across teachers were revealed and thus, coded together.
2. Additionally, the data collection and analysis process successfully determined the relationship between teachers' self-awareness or lack thereof and actual demonstrated nonverbal immediacy behaviors. Color-coding and grouping of the data throughout analysis enabled me to find relationships and patterns.
3. I employed bracketing prior to observing and interviewing participants who teach the same subjects and similar grade levels that I currently teach. Wertz (2011) writes that bracketing requires the researcher to unreflexively focus on and closely examine how situations are presented through the experience.
4. Finally, a key reflexive tool was cross checking within and across the data on participants. For example, reflexively using a participant's video and interview to find overlapping immediacy behaviors supports valid interpretation of the data. Similarly, reflexively studying data across teachers led to valid alignment and naming of immediacy behaviors and patterns. The phenomenological qualitative research method successfully identified nonverbal immediacy behaviors exhibited by each study participant while teaching whole group, small group, or individual students.

Validity

Research validity was ensured throughout the research process. These techniques were through video recordings of each teacher's math lesson, analysis of the video recordings to

ascertain nonverbal immediacy behaviors exhibited during each lesson, and one-on-one audiotaped interviews with each participant. Interviews were transcribed verbatim to find themes across all participants during their respective math lessons. Glesne (2011) describes moving from organization to meaning in the data as a transformative process. This process is completed to make meaningful connections among the data, researcher, participants, and the overall research questions.

Member checking and peer debriefing were also employed to ensure accuracy and clarity of data gathered. Crotty (1998) describes this type of feedback as calling upon others to establish one's research as valid and generalizable. Member checking included sharing of the interview transcriptions with each teacher and asking participants for feedback regarding the content or intentionality of their conversations. Peer debriefing was done in conjunction with my university supervisor to ensure my biases were in check and not a hindrance to my data analysis. Through these analysis techniques, triangulation among video recorded lessons, field notes on each lesson, and interviews showed further validity. Merriam (2009) writes that triangulation can be utilized to deepen the researcher's knowledge of the subject and maximize confidence in the study's findings.

Summary

In this chapter, I reviewed the purpose for my study with reasoning for using a phenomenological, qualitative research design to explore the nonverbal immediacy behaviors of elementary teachers in grades three, four, and five during math instruction. An overall design of the study (Figure 3) was presented followed by the central features of the study. They included: the study's research questions, conceptual framework, research design, data collection methods, and data analysis.

The study was approved by the IRB, my current academic institution, and by the principal at the school where participants were employed. Recruitment consisted of face-to-face invitations to participate in the study. The purposive sample had a total of six participants. After informed consent was given, math lessons were video recorded for analysis and individual, audiotaped, semi-structured interviews were conducted. Data analysis consisted of comparative analysis through organization of content, significant statements, coding, categories, themes, and final assertions.

CHAPTER IV

FINDINGS OF THE STUDY

In this chapter key findings from this study of elementary teachers' nonverbal immediacy behaviors during mathematics instruction are described. Through examination of the data, three layers of analysis emerged. First, the findings resulted from video recorded math lesson observations and color-coded analysis and narrative descriptions of each lesson. Second, video recording analyses were included in one-on-one interviews with each teacher participant. Finally, coding of each interview established common themes. This chapter includes descriptions of elements found in each video recorded math lesson according to the observed instructional and non-instructional nonverbal behaviors. The categories are as follows: small and large hand-arm movements; whole body movements; facial expressions; changes in voice level or pitch; wielding of objects; non-instructional elements such as head scratching, itching, or touching of the hair or face; and especially math nonverbal immediacy behaviors. Narratives of each teacher's nonverbal behaviors and descriptions of each theme are included as well. The three research questions for this study are connected with the narrative descriptions of teachers' nonverbal behaviors as well as the four major themes that arose from the data.

Research Questions

The purpose of this study was to describe teachers' instructional and non-instructional nonverbal behaviors as well as teachers' perceptions of the impact of such nonverbal behaviors on student engagement. My study also had three research questions, which asked:

1. What do teachers' nonverbal immediacy behaviors look like in the classroom during academic instruction in math?
2. How do teachers describe their own nonverbal immediacy behaviors?
3. What are teachers' perceptions of their nonverbal behaviors on student engagement?

Descriptions of Teachers' Nonverbal Immediacy Behaviors During Math Instruction

Similarities and differences were found among the nonverbal behaviors of each third, fourth, and fifth grade teacher who participated in this study. Two teachers from each grade level were video recorded during one math lesson in their respective classrooms. Each lesson was on a different math topic, such as fractions and geometry, or subtopics of a larger area in math, such as division with fact families or division with numbers zero and one. Assorted materials and resources were used to deliver each lesson's content in each classroom. The instructional and non-instructional nonverbal behaviors exhibited varied as well. These are attributed to teachers' individual styles of lesson delivery, personalities, lesson content, as well as established routines for teaching and learning math in each classroom. The following section describes nonverbal behaviors found during teachers' video recorded instruction in relation to one another. Examples of each type of nonverbal behavior can be found in Table 4, which illustrates the frequency of each type of nonverbal behavior each teacher exemplified during her respective video recorded math lesson.

Large and Small Hand-Arm Movements

Each teacher in this study used a combination of large and small hand-arm movements, referred to as conducting by Hennings and Grant (2001). The six teachers also employed the use of various objects in the room to aid in the lesson as instructional tools as well as non-instructional devices. When not used instructionally, this type of movement with objects is

referred to as wielding (Hennings & Grant). At times, an object was used in combination with a gesture or other item to bring attention to something in the lesson. This movement is considered instructionally utilizing an object, such as a drawing on a piece of paper or the interactive whiteboard screen, or using a marker to draw a shape in the air. Non-instructional wielding can include handling a marker or glasses; straightening a pile of papers; glancing at the door or clock; or touching one's face, hair, or shirt while teaching.

Whole Body Movements

Five of the six teachers stood at the front of the classroom and walked amongst students' desks during instruction and lesson work time. The use of proximity was found across all six lessons. Examples included whole-body movements such as walking around and amongst students for classroom management purposes, as well as looking closely at student work. Stanulis and Manning's (2002) touching or physical contact with students is likely to occur in this type of situation where teachers are moving about students' desks, although no instances were observed in these six math lessons.

Whole-body dramatic movements, termed acting (Hennings & Grant, 2001), were not as prevalent as other nonverbal behaviors; it was present in two of the six lessons. One teacher who used dramatic acting motions during her lesson also took a few wide leg stances and bent her knees several times while talking and moving to emphasize the math story problems and other key factors from her lesson. Butt et al. (2011) include nonverbal behavior examples such as leg movements as part of their research, which was shown by this teacher to be connected with Hennings and Grant's acting movements. This teacher also verbally shared the division math story problems she wanted her students to solve on their individual whiteboards versus other

Table 4. Frequency of Teachers' Nonverbal Immediacy Behaviors.

Nonverbal Behaviors	Teacher: Zale 3rd	Teacher: Kimball 3rd	Teacher: Owens 4th	Teacher: Randall 4th	Teacher: Tanavo 5th	Teacher: Paxton 5th
Stanulis & Manning (2002)						
Tone of voice (friendly versus stern, or neutral, phrases)	Friendly Neutral	Friendly Neutral	Friendly Stern Neutral	Friendly Stern Neutral	Friendly Stern Neutral	Friendly Stern Neutral
Posture (straight back, slouching, leaning)	Straight Slouch Lean 2	Straight Slouch Lean	Straight Slouch Lean 13	Straight Slouch Lean 1	Straight Slouch Lean 4	Straight Slouch Lean
Facial expressions (smile, modeling thinking, raise eyebrows/forehead)	Smile 6 Thinking 4 Forehead 13 (always)	Smile 34 Thinking 34 Forehead 62	Smile 20 Thinking 16 Forehead 39	Smile 37 Thinking 8 Forehead 74 (always)	Smile 1 Thinking 11 Forehead 1	Frown87 Smile 20 Forehead 32
Eye contact (number of times/student)	36	11	33	74	27	86
Touching/physical contact with student(s) (number of times/student)	1	0	0	0	0	0
Hennings & Grant (2001)						
Conducting (hand – arm movements)	Large 21 Small 64	Large 3 Small 27	Large 10 Small 47	Large 14 Small 155	Large 31 Small 27	Large 55 Small 124
Acting (whole body, dramatic movements)	12 Necklace 1 Papers 2	11	0	0 Paper 6 Chart 12 Screen 26	0 Elmo 1 Game ws 18	0 Watch 4
Wielding (non-instructional movements)	Marker 40 Stool 1 Eraser 5 Manual 2	Glasses 4 Marker 23 Manual 1 Wksheet 3	Papers 32 Marker 27 Screen 29	Marker 16 Shapes 8 Glasses 51 TchrPlan2	Marker 72 Eraser 8 Phone 1 Computer 23	Marker 61 Eraser 15 Lotion 1

Table 4 cont.

Nonverbal Behaviors	Teacher: Zale 3rd	Teacher: Kimball 3rd	Teacher: Owens 4th	Teacher: Randall 4th	Teacher: Tanavo 5th	Teacher: Paxton 5th
Butt, Iqbal, & Farooq (2011)						
Legs (crossed, wide stance, narrow stance)	Cross 1 Wide Narrow	Cross Wide 2 Narrow Bent knees 6	Cross Wide Narrow	Cross 2 Wide 2 Narrow	Cross 1 Wide Narrow	Cross Wide Narrow
Torso movements (bend, twist, turn)	Bend Twist Turn	Bend 2 Twist Turn	Bend 6 Twist Turn	Bend 3 Twist Turn	Bend 2 Twist Turn	Bend 1 Twist Turn
Shoulder and head movements	Shoulder 4 Head nod 15	Shoulder Head nod 4	Shoulder Head nod 30	Shoulder 6 Head nod 42	Shoulder 2 Head nod 41	Shoulder Head nod 6
Sitting or standing	Sit No Stand Yes	Sit No Stand Yes	Sit 5 Stand 6	Sit No Stand Yes	Sit No Stand Yes	Sit No Stand Yes
Sfard (2009)						
Instructional gestures	Math 106	Math 44	Math 71	Math 79	Math 203	Math 192
Gaze (non-eye contact)	At Student Non-stud	At Student Non-stud	At Student Non-stud	At Student Non-stud	At Student Non-stud	At Student Non-stud
Length of video	25:28 min	13:15 min	19:06 min	40:11 min	35:50 min	1 hr 8:55 min

teachers who wrote or displayed similar information on the whiteboard or interactive whiteboard. Large, whole-body movements may not be as common in classrooms where teachers' use of whiteboards and interactive whiteboards occupy the majority of their physical presence and energy. Teachers' personalities and efforts to maintain a calm classroom environment might be factors for not employing acting as well.

Head and Shoulder Movements

Stanulis and Manning's (2002) eye contact with students at their desks or on the floor during these work moments was unobservable due to camera placement as well as the teacher, not the students, being the primary focus of the video recording. Head shaking or nodding, which were displayed in each teacher's lesson, are included in Butt et al.'s (2011) head and shoulder movements. These head movements mainly included nodding "yes" to agree with student responses and "no" to indicate a wrong answer or to show students they should stop misbehaviors. These head movements, combined with a few teachers' shoulder shrug motions (Butt et al.), were observed during the lesson and teacher movement portions for these six teachers. For example, one teacher nodded her head in agreement while students shared correct responses.

Many of these head and shoulder movements were accompanied by facial expressions. For example, a teacher would make eye contact, smile, and nod her head while a student shared an answer aloud. Three of the participants used head nodding a larger number of times than the other three. This finding is attributed to this same connection with facial expressions, which these three teachers employed when agreeing with a student or encouraging the class to engage in the lesson.

Facial Expressions

The facial expressions of all the teachers showed three predominant elements. The first included furrowing of the forehead and eyebrows to primarily model thinking and also displeasure with a student behavior. The second element also included raising of the eyebrows and forehead, but this facial expression was displayed when talking expressively or asking questions. Two teachers' foreheads and eyebrows were continuously raised, indicating they

either naturally show or work to present animated facial expressions when teaching. Smiling when listening to students' responses showing agreement with a stated answer was the third component found in this study.

Vocal Variety

Although all teachers needed to speak to at least one student during their respective lessons about putting non-lesson-related materials away or to follow along with the lesson, their tone of voice did not vary much from their instructional voices. Stanulis and Manning's (2002) use of the voice in terms of immediate nonverbal behaviors also includes vocal variety. Each teacher showed some instances of this vocal variety when saying phrases louder or softer than their typical teaching voice. One teacher had a class that was repeatedly laughing about the combination of letters used to name lines, line segments, and rays. This teacher's tone of voice became more firm as the number of incidences increased. Stanulis and Manning contend that friendly, stern, or neutral phrases are included in tone of voice. It must be noted that it is difficult to ascertain an individual's particular tone of voice due to differences in intended meaning, her personality, and context as well as content of the lesson. Vocal variety was not easy to distinguish in these lessons, because each teacher's tone of voice was mainly constant.

Posture and Torso Movements

Only one teacher sat and stood during her lesson; the students were seated on the floor in front of the classroom during the lesson, instead of in desks like the students in the other five lessons. While sitting, this teacher leaned forward toward her students, who were seated on the floor in front of her throughout the lesson. While standing, she bent her body forward while talking and explaining the math concepts in the lesson. Specific nonverbal terms for these are Stanulis and Manning's (2002) posture, which includes leaning, and Butt et al.'s (2011) torso

movements, which include bending. Stanulis and Manning's posture positions also include straight and slouching positions; no teachers in this study were deemed to be slouching; therefore, straight postures with minimal leaning on a table, desk, or the board, were found throughout the teachers' lessons. Butt et al.'s torso movements also included twisting and turning, which were either not found, too subtle to define, or part of each teacher's continuous movements and, therefore, not recorded.

Physical Contact

Physical contact (Stanulis & Manning, 2002) with students was only seen once in the six math lesson video recordings. This contact occurred when a third grade teacher had five students come to the front to act out division problems. This teacher reached out and moved a student into position while these students were participating in this activity. Although physical contact was not observed, the five teachers who taught (while standing) walked around the classroom looking at students' work on their desks and otherwise interacting through conversations and asking questions regarding the lesson.

Eye Contact

As previously noted, all instances of eye contact were likely not observed, because students were not the main focus of these video recordings. The shortest math lesson had the fewest number of students being called on and thus, the fewest number of noted one-on-one eye contacts; the longest math lesson had the largest number of eye contacts being made. Another lesson had a high number of student eye contacts as well, although the length of time was nearly half that of the longest lesson. The teacher calling upon more students to share their ideas is attributed to the lesson's mode of interactive discovery, partner work, and sharing while working with polygon shapes. All six teachers visually looked at students' work being done throughout

the lesson in notebooks or on individual whiteboards. Calculating the number of times a teacher made eye contact with individual students (Stanulis & Manning, 2002) was determined by teachers calling a student's name or gesturing to a student and waiting for him or her to speak.

Math Nonverbal Immediacy Behaviors

Math instructional gestures varied greatly according to teachers' lesson plans and math content delivered. The length of math lessons varied from 13 minutes to more than an hour, with a mean of 33 minutes. This, too, affected the number of nonverbal behaviors displayed by each teacher. When recruiting teachers for this study, core math instructional time was stated as the focus. Each teacher's lesson topic for that particular day, as well as the lesson format, affected the length of videos as well.

Each of the teachers used nonverbal immediacy behaviors to express math content by writing and then pointing to math words and other examples on the whiteboard and interactive whiteboard. In addition, some displayed numbers on their fingers while saying the number aloud. Each teacher also used her hands in various ways to demonstrate a math concept from that day's lesson. For example, teachers demonstrated the length and width of objects such as three-dimensional shapes or patio tiles, lines or rays in geometry, modeling the idea of putting toys in or out of an imaginary bag, and gestures in the air and referencing models on the board to show numerators and denominators of fractions. Three of the teachers in this study mentioned that they "talk with their hands" as part of their personality. Some of these gestures displayed specific math concepts, while others were non-instructional movements that accompanied teachers' speech.

Other math nonverbal immediacy examples included teaching a math concept while incorporating multiple nonverbal elements, such as facial expressions alongside vocal variety

and hand gestures, or even large whole-body movements. One teacher took large steps across the front of her classroom while emphasizing every few words while she told a math story problem to her students. Repeating vocabulary or other essential words was common as well, as some teachers used vocal variety and raised their foreheads to indicate importance of information. The fewest number of math instructional nonverbal behaviors displayed was 44, and the largest number was 203 (see Table 4). Teachers' knowledge of using such math and other nonverbal immediacy behaviors as well as their impact on student engagement will be discussed in the section on interviews. Following are brief narratives of each teacher's lesson as well as noted nonverbal immediacy behaviors from each video recorded math lesson.

Math Lessons Narratives

The following sections include a narrative description of each teacher's classroom, lesson format for that day, as well as nonverbal behaviors exhibited during the video recorded math lesson.

Mrs. Zale

Mrs. Zale's third graders were seated at their desks in rows facing the front of the classroom. Mrs. Zale began her lesson by asking students to share key words they had previously learned for multiplying and dividing. She then wrote students' ideas on the whiteboard. The next part of the lesson enabled students to understand division using fact families as well as the numbers zero and one as divisors. In an activity used to teach these concepts, six students were invited to assemble in front of the class and divide themselves into various groups using zero or one as the divisor. Mrs. Zale returned to the whiteboard to show relationships between multiplication and division fact families when dividing by zero and

one. At the end of the lesson, students received slips of paper to show their numerical and pictorial understandings of division by zero and one.

Large hand-arm movements, called conducting (Hennings & Grant, 2001), as well as various facial expressions (Stanulis & Manning, 2002), were the nonverbal instructional behaviors used the most throughout Mrs. Zale's lesson. Large conducting motions were used when pointing to math terminology written on the board with her fingers outstretched and arm extended. Other large, sweeping arm motions were used to show the size of things as in a whole group of students, individual items, and dividing items into groups. At other times, her arms were outstretched to draw students' attention to and emphasize something new she was teaching.

Mrs. Zale's facial expressions (Stanulis & Manning, 2002) were most often exemplified by raising her eyebrows and furrowing her brow to emphasize words and phrases. These nonverbal facial cues also included smiling and opening her mouth as in "aha" or showing surprise, which indicated interest in students' ideas while showing she was listening to their verbal responses. These types of facial expressions were also shown when Mrs. Zale was asking questions or indicating that students should remember specific words and terms, such as a "secret code word" used for multiplying and dividing and emphasizing words such as "it means something" when discussing math terms for multiplying and dividing.

This modeling of thinking was also shown when combining facial expressions and small conducting motions while wielding objects (Hennings & Grant, 2001). Wielding was exemplified when furrowing her brow and using an object such as a whiteboard marker to tap her hand or point to her head to instruct students to recall or think about something. Mrs. Zale's use of an object, such as a marker, was typically to write on the board and to instructionally wield

it. At times she opened the marker or held it clasped in both hands while talking. It did not become a noticeable non-instructional or distracting device, even though she held it throughout the lesson.

Eye contact (Stanulis & Manning, 2002) was also utilized by Mrs. Zale in conjunction with listening to students' verbal responses and when calling upon them to answer. Smaller conducting motions (Hennings & Grant, 2001) were touching her nose with her index finger while saying, "let's see" or "who remembers" to model thinking and pointing to a student to answer a question or share his or her idea. Small hand-arm motions such as these included pointing to math terms and phrases written on the board while standing next to it and standing with both hands palms facing upward while repeating a student's answer aloud. Mrs. Zale's change in tone of voice (Stanulis & Manning), or vocal variety, was used to gain and keep students' attention. It was employed when modeling thinking with her facial expressions and small conducting motions, as previously described, especially when telling students that they were going to learn a secret or a trick for doing division.

Mrs. Zale's nonverbal math immediacy behaviors consisted of verbalizing a math phrase while writing it on the board or pointing to it while reading it aloud, as well as large and small conducting motions (Hennings & Grant, 2001). The latter was used in several different ways to indicate the size or quantity of something, as well as showing with her arms and hands ways to divide a number of objects into groups. For example, Mrs. Zale used a flat hand moving from above her head downward as if making a list in the air to indicate repeated subtraction. While doing this motion she said, "subtracting over and over again". Another example included her hands coming together in front of her body, as if holding something and then moving outward while saying to "share so many groups". A similar example was shown when asking, "But what

other word can we use instead of divide?" Mrs. Zale's hands came apart, moving upwards, and then back together as if holding something between her hands. Other times, numbers were displayed on her fingers while saying them aloud, as in "there are two different ways to do that" or when counting aloud using her fingers.

Finally, as was found with each teacher in this study, Mrs. Zale nodded her head in agreement with students' responses when verbally sharing ideas and the student volunteer group dividing themselves correctly. Another of Mrs. Zale's key nonverbal immediacy behaviors was her body stopping all movement after turning to face each student who spoke. The combination of her body and arms being still, and her expressive facial features let the students know she was attentive.

Mrs. Kimball

Mrs. Kimball's third grade students were also at their desks to review fact families leading into their lesson on using multiplication facts to solve division story problems. She had two sets of number sentences written on the board at the start of the lesson to review these fact families and to later bring students' new knowledge of division back to their understanding of multiplication and division as inverse operations. Mrs. Kimball's students had whiteboards on their desks to show their work throughout the lesson. She verbally stated each math division problem and wrote a few examples on the whiteboard to show different ways to write and solve division stories. At the end of the lesson, students were given a worksheet to work on a few practice problems as a class and then to independently show what they had learned.

One of the most noticeable nonverbal immediacy behaviors exhibited by Mrs. Kimball was her enunciation of syllables and great emphasis placed on her words. One such excerpt from the video of the math lesson, played during the interview: "Max has 14 toys. He wants to *divide*

them into *two bags*. How many *toys* … will be in *each bag*?" These elements are part of one's tone of voice, or vocal variety (Stanulis & Manning, 2002). This enunciating and emphasizing occurred in nearly every sentence, sometimes multiple words in a sentence, throughout her math lesson. These instances were found while Mrs. Kimball delivered math story problems verbally, stated instructions for students to show their work on whiteboards or their worksheet, and when drawing attention to math terms or fact family examples written on the board. This change in how the words were delivered was to draw students' attention to key words and phrases while they worked to solve each division problem on their own.

Math story problems were then repeated in the same manner before Mrs. Kimball shared the answers. Voice fluctuations also included changing from a louder teaching voice to a much quieter tone of voice to gain students' attention and to emphasize key words. For example, Mrs. Kimball said, "Today you are going to use that knowledge to solve division problems with 2, 3, 5, and . . . 6." Following that statement, Mrs. Kimball's voice level dropped while pausing and gesturing with her outstretched arm and hand and saying, "I would like you to pay . . . close attention to the board." In partnership with her vocal variety, Mrs. Kimball's forehead was often raised as an additional measure of delivering the lesson. Mrs. Kimball's facial expressions (Stanulis & Manning, 2002) typically involve a raised forehead, but it was also noted that it was specifically raised at different times when emphasizing words and phrases.

Whole-body acting (Hennings & Grant, 2001) was also prominent in this math lesson. Mrs. Kimball took large, deliberate steps across the front of the classroom while moving her body forward by bending (Butt et al., 2011) or leaning (Stanulis & Manning, 2002) and using large hand-arm conducting motions (Hennings & Grant). This combination of nonverbal immediacy behaviors mainly took place while verbally stating the math story problems. In

connection with her vocal variety, these acting and conducting motions set the stage for getting and keeping students' attention and contributing to student engagement and participation. Continuously moving across the front of the room, with moments of standing still while allowing students to think and work before moving again, also contributed to the lesson. Mrs. Kimball walked from the left to the right side of the room while saying, "We are going to *practice* some *problems* together." This instructional statement, alongside a variety of nonverbal immediacy behaviors, prepared students for the upcoming math elements of the lesson.

In another example of instructional nonverbal immediacy, Mrs. Kimball crossed and uncrossed her right and left arms while saying, "Multiplication and division are *opposites* of one another!" Her forehead raised and her mouth opened wide while saying, "opposites." She crossed and uncrossed them again to say, "They were *inverse* of one another." These actions are considered instructional and not math because they are not specific to the words or ideas of opposite and inverse; they were used to emphasize and show a change in the relationship between the math concepts of multiplication and division. Similar to this strategy is the example of using her hands to invisibly scoop up and inwards toward her body while explaining "backwards" in the sentence, "Then, if we want to work division, we can work the problem . . . *backwards*." Mrs. Kimball's left hand ended palm facing down and her right hand palm facing upward.

A range of nonverbal immediacy behaviors were also exhibited while Mrs. Kimball stated, "Use your strategies for multiplication if it's not coming automatically. I see a lot of good *strategies* taking place on the whiteboards." Mrs. Kimball's right hand raised with her fingers folded in and palm facing outward while saying, "Use your strategies" and then her knees bent, another form of emphasizing without using her voice, when saying "multiplication". Her

left hand held a marker, but it was not utilized as an instructional aid nor was wielding this object (Hennings & Grant, 2001), a distraction during the lesson.

Mrs. Kimball's forehead raised, and she snapped her fingers while saying "if it's not coming automatically." Her right index finger pointed briefly and then this hand continued to move and gesture while finishing with, "I see a lot of good strategies taking place on the whiteboards." None of these nonverbal behaviors were directly related to math, which was commonplace across teachers in this study. The instructional nonverbal immediacy behaviors are just as essential to delivering the content as direct, mathematical nonverbal immediacy behaviors, as is illustrated in the next paragraph.

Mrs. Kimball's math nonverbal immediacy behaviors were intertwined with all of the instructional nonverbal behaviors described previously. If Mrs. Kimball were to repeat the exact same motions again in subsequent lessons, while using terms such as "opposite" and "backwards," these motions would become math nonverbal immediacy behaviors. At this stage, they were instructional motions that are aiding her spoken instruction. A more specific math example was while Mrs. Kimball stated the first math story problem aloud, and then walked across the room holding the teacher's manual and said, "*Kara* . . . is putting *30 toys* . . . into *five* party bags." She held up five fingers on her right hand while emphasizing "five party bags." This small hand gesture, accompanied by her matching verbal description of "five" is considered a math nonverbal immediacy behavior. Then, leaning forward, Mrs. Kimball's hand dropped to her side as she continued, "She wants to put the *same amount of toys* in *each party bag*." During the latter part of the sentence, her right hand came up with her fingers closed as she emphasized "*each party bag*." Mrs. Kimball then stepped to the left towards the whiteboard, looked at the class, and said, "First we need to know that . . . *Kara* has *how many toys* in all? *30 toys*." She

then wrote the number 30 on the board, tying the verbal and the written numbers together. A division symbol was added to the number 30 while asking a student, "Divide them up, into how many bags, Sarah?" After Sarah responded with an answer of five, Mrs. Kimball wrote this answer while repeating aloud, "Five bags." These three examples of writing examples of math symbols and numbers that reiterate the lesson elements are also math nonverbal immediacy behaviors. To connect this final answer of "five bags" with students' work, Mrs. Kimball then tapped the written equation while telling the class: "I saw a lot of this come up on whiteboards immediately." The coupling of vocal emphasis, hand gestures, and written examples supports meaning-making and engagement for students.

Mrs. Owens

Mrs. Owens' fourth grade students were seated on the floor at the front of the room with whiteboards and markers for this lesson on three-dimensional geometric solids and nets, which were flattened three-dimensional solids that can be cut out and folded to make the three-dimensional shape. Mrs. Owens moved from sitting on a chair in front of the students to standing next to the interactive whiteboard and back multiple times during the lesson to draw attention to the faces, edges, and vertices of the three-dimensional nets shown on paper examples as well as the interactive whiteboard math lesson video. Students were asked to draw pictorial examples of given nets as well as write the names of each figure on their individual whiteboards. After returning from lunch, students were going to assemble their paper nets to make these three-dimensional solids, paying close attention to each figure's faces, edges, and vertices.

Mrs. Owens showed two major tones of voice throughout her lesson: using a loud, clear speaking voice and a softer, much quieter tone (Stanulis and Manning, 2002). This vocal variety

was used to gain and keep students' attention throughout the lesson. The change from loud to soft tones indicated to students each change in the lesson format, such as time to think, listen, or answer a question. It also signaled a change in the subject matter, when moving from nets to three-dimensional objects or moving from looking at a paper model to one displayed on the interactive whiteboard. Emphasizing math terminology but especially phrases she wanted the students to pay close attention to was also part of her vocal variety. Two examples include saying, "A *net* is a pattern that can be used to make a solid," and "You just said it, Devin. Each of these figures is a square. That's exactly right." While saying, "each of these figures is a square," Mrs. Owens' voice dropped in volume and pitch to emphasize the student's correct answer. This example also demonstrates a combination of instructional nonverbal immediacy behaviors such as pointing to a picture of a net that's being discussed, a change in her tone of voice, and showing facial expressions, such as her eyebrows and forehead moving upward to gain students' attention and emphasize a point.

Eye contact (Stanulis & Manning, 2002) was easier to determine in Mrs. Owens' math lesson, because students were seated on the floor in front of her instead of further away at their desks. She also called students by name and kept her body turned toward them and her face focused on each student while each spoke. Mrs. Owens indicated agreement or approval by nodding her head (Butt et al., 2011) during students' verbal responses, while students showed work on their whiteboards. As students displayed their answers, Mrs. Owens illustrated her own examples on pieces of paper held in her hands. Mrs. Owens' wielding of objects (Hennings & Grant, 2001) also included manipulating the interactive whiteboard screen with her hands as well as writing on it with a marker.

Another way Mrs. Owens interacted with students was to lean and bend toward the class while sitting and standing (Butt et al., 2011). Leaning (Stanulis & Manning, 2002) and bending of one's body or torso (Butt et al.) are also nonverbal immediacy behaviors that indicate to students they should pay attention, because the teacher is moving nearer to share new or other pertinent information. These movements of closeness toward students, regardless of standing or sitting, showed that these nonverbal behaviors are part of Mrs. Owens' typical teaching methods. Continuously used signals such as these have the potential to nonverbally let students know, in any content area, that this is a time to pay closer attention to what is being delivered in the lesson.

Although the majority of Mrs. Owens' facial expressions were varied throughout the lesson, it was noted that she looked at students with no marked expression and lips closed when waiting for a response, waiting for students to raise their hands, or listening to students talk. Stanulis and Manning's (2002) facial expressions, which include but are not limited to, smiling, frowning, and raising one's forehead, were all exemplified in this lesson at other times. Mrs. Owens frequently raised her forehead and eyebrows when listening to students' ideas and answers. This same expression was made when she asked a question or showed an element of surprise or pleasure in students discovering an answer. Furrowing of the forehead and eyebrows to model thinking as well as smiling to show happiness in students' participation were also portrayed throughout the lesson.

Hennings and Grant's (2001) small and large hand-arm conducting motions were observed as well. More small than large movements were observed in this particular lesson. Small hand-arm motions included examples such as pointing to students' whiteboards and the papers in her lap. Motions became larger when she was standing and gesturing at the

interactive whiteboard screen. The distance of objects from Mrs. Owens' body lent themselves to small or large conducting motions. When standing to one side of the interactive whiteboard, Mrs. Owens used extended hand-arm motions to gesture to the top, bottom, and sides of the large screen. While sitting and holding pictures of nets in front of her body, she only needed limited pointing to indicate which part of a net she was describing.

A combination of differing nonverbal immediacy behaviors was observed in various parts of the lesson. While asking the class, 'What's one corner? Vertex. You got it," Mrs. Owens used her right index finger to show "one" while saying "one corner," leaning forward with her upper body while seated, and then pointing to the class as she repeated their answer of "vertex" and saying, "you got it." Another example was emphasizing words while making a circular motion around the net of a cube with her index finger while looking at and asking a student, "Okay, so what would we *say* about those shapes?" In a third instance, Mrs. Owens said, "You gotta think. If it has *one* base, it's a pyramid. If it has *two* bases, it's a prism, but what kind?" The right fingers of her hand curled inward to touch her thumb while saying "one base," followed by her hand moving from the left to the right while her upper body mimicked this motion. Mrs. Owens' forehead crinkled while emphasizing certain words in this phrase. She then held up two fingers and rocked her body from left to right while saying, "two bases", then her fingers curled inward again when asking, "but what kind?" Mrs. Owens' hands then went back to holding the papers in front of her body as she continued with her lesson.

Mrs. Owens' math nonverbal immediacy behaviors centered upon the math terminology she used to describe each three-dimensional figure as well as each figure's net. Faces, edges, and vertices, in addition to terms such as length and width of an object, were verbally spoken and physically demonstrated by Mrs. Owens with her hands and arms. Even describing the flat sides

of such shapes was shown by extending her hands, palm to palm with her right hand on top, toward the class. She then slid her right hand from the top outward toward the class to demonstrate the idea of flat and smooth. In addition, Mrs. Owens used her hands to make the sides of a box to get students to think and imagine the dimensions of a plane shape. She then held her hands a distance apart in front of her body to show length and moved her right hand forward and back to show the width of a possible plane figure. The same motions were repeated for length and width when describing these features further, in a way that reinforced the term as well as the physical aspect of measuring each. When describing the features of a net for a cube, Mrs. Owens pointed to and counted each of the six squares aloud. This pairing of describing, gesturing, and counting are examples of math nonverbal immediacy behaviors that enable students to build understanding by helping them connect key concepts.

Mrs. Randall

Mrs. Randall's fourth graders, seated at their desks in rows facing the whiteboard and interactive whiteboard, started their math lesson by verbally sharing what they knew about classifying polygons. Next, they worked with desk partners to sort paper polygon shapes to classify them according to sides and angles. This discovery time was the introduction to classifying triangles by their angles, which was a new concept for the class. During this time, Mrs. Randall spoke from the front of the room, calling on students to share their findings. Throughout this partner work and sharing time, Mrs. Randall also moved amongst students working at their desks, guiding students in their discoveries.

Next, the teacher spoke from her desk, while displaying a chart on the interactive whiteboard screen. Students filled in their own charts while the class worked together to name each triangle according to its sides and angles. Mrs. Randall then presented the math video

lesson from the curriculum, stating that the students were going to know the vocabulary words in the video very well because of their work in class that day. Students kept their math notebooks open to the triangles chart to check their work and understanding, while the teacher went through the video lesson with the class. Mrs. Randall drew students' attention through her verbal explanations as to how each triangle is named according to its sides and angles.

Mrs. Randall's nonverbal behaviors were varied and continuous throughout each aspect of her math lesson. While many of her gestures were not specifically math-related, they are considered nonverbal immediacy behaviors because of their use and pairing with the words and content. The majority of Mrs. Randall's hand gestures, known as small hand-arm conducting motions (Hennings & Grant, 2001), were used to emphasize points and words that were also stressed; these motions were not specifically tied to the meaning of the words themselves. Often, Mrs. Randall's hands and arms held the position or gesture after using it instructionally, which would then turn into non-instructional motions.

A noticeable nonverbal behavior happened when Mrs. Randall would turn toward or move her upper body toward students she was looking at or talking to. Such bodily movements fall under Butt et al.'s (2011) research findings, which show students that the teacher's attention is focused upon them. Other ways Mrs. Randall showed students her attentiveness was gazing out across the room (Butt et al.), scanning from left to right and back again, while waiting for student volunteers to answer a question and while students were working independently at their desks. Eye contact (Stanulis & Manning, 2002) was made whenever she would call upon a student or look at students who were sharing their answers with her and the class.

In conjunction with her gaze, eye contact, and bodily movements (which showed focus and attention), was the continual raising of her forehead and eyebrows. This type of facial

expression (Stanulis & Manning, 2002) was especially presented when asking the class to think about a question and when repeating a student's correct answer. Mrs. Randall shrugged her shoulders at times when asking questions, such as, "Is it?", "What if?", or, "What do you think?" Other movements included shoulder and head movements (Butt et al., 2011), such as shaking her head yes or no in accordance with student responses or when giving an explanation or answer herself. These connections between her nonverbal immediacy behaviors and her statements and questions allowed students to be part of the lesson as active listeners and participants.

Another observed nonverbal behavior was Mrs. Randall's wielding of objects (Hennings & Grant, 2001). Throughout the lesson, Mrs. Randall carried reading glasses in her hands, hung them on the front of her shirt, and even twirled them around her hand while holding on to one of the bows. Her glasses were usually held in one or both hands at mid-waist while speaking and walking amongst students' desks during partner and independent work time. At times, they were needed to look closely at students' polygon shapes on their desks, and other times she used them while reading and writing on the triangles chart displayed on the projector screen. While her glasses were sometimes held in one hand (while the other was gesturing), wielding of her glasses was non-instructional and non-immediate.

Instances of Mrs. Randall combining nonverbal behaviors consisted of her asking the class, "How many of you are struggling a little bit? Okay. And that's *okay* because this is just the *introduction* to this lesson, isn't it? We don't *really* know for *sure* . . . *how* to classify an angle. Okay?" Mrs. Randall's voice level went up from previously speaking quietly to small groups of students while walking around to addressing the entire class. Her eyebrows were raised when explaining, "this is just the *introduction* to the lesson, isn't it? We don't really know

for *sure* . . ." Mrs. Randall held a piece of paper in her left hand at waist-level while talking; the paper was used to gesture somewhat when talking. As was seen in other examples described, several words were emphasized while addressing the class. This emphasizing is included in Stanulis and Manning's (2002) tone of voice nonverbal behaviors.

As described previously, numerous nonverbal immediacy movements were used instructionally throughout Mrs. Randall's lesson. The majority of these were not math-related. Gestures that were deemed math nonverbal immediacy behaviors revolved around concepts such as showing numbers on her hands and fingers while saying them aloud. "Can it have *one* obtuse angle? Two? Three?" Mrs. Randall held out her thumb when saying, "one", added her index finger when asking, "Two?" and middle finger when adding, "Three?"

Another math nonverbal immediacy behavior example included drawing shapes in the air while alluding to or specifically describing them. This behavior was typically done to draw or trace the angles found inside triangles, while students were describing their paper polygons on their desks and again while displaying the math instructional video on the interactive whiteboard. "It has an *L* in it. That's one way to tell," was one spoken phrase paired when Mrs. Randall drew an "L" in the air three times. Shortly thereafter, she repeated tracing this "L" shape in the air while saying, "So you have to look for that *L* to see if it's a right triangle." A similar example combined pointing in the air to the three sides of an invisible triangle with the index finger of her left hand while asking, "What do you think we call a triangle that has *three equal sides*? *Three . . . congruent . . . sides*? Three *equal* sides? Three congruent sides?" Pairing words and nonverbal gestures allows students to connect what they see and hear while learning about mathematical concepts such as triangles' sides and angles.

Mrs. Tanavo

Mrs. Tanavo's fifth grade students were seated in groups of four desks that faced one another with the teacher at the front of the room. Mrs. Tanavo wrote four math review terms and definitions on the whiteboard for students to copy into their math notebooks to start the lesson. Students were asked to share what they knew about each previously-learned term. Mrs. Tanavo then introduced a geometry booklet that students created using terms, definitions, and pictorial examples from the lesson that day. Throughout the lesson students were asked for their ideas and input on what each term looked like, how each was named using points and letters, and how they were alike and different from one another. Four students were invited up to the board at different times in the lesson to answer a question by pointing to an example or drawing their ideas on the board.

Smiling, frowning, and raising her forehead were facial expressions (Stanulis & Manning, 2002) observed during Mrs. Tanavo's hour-long lesson. In general, this teacher did not show much variance in her facial expressions. When students made jokes about her choice of letters to name the geometry figures, she smiled and laughed briefly. When students continued in a way that joked about body odors and hinted at swearing, she continued to smile, but she also looked at her watch and reminded students that they needed to move on with the lesson.

Mrs. Tanavo's tone of voice (Stanulis & Manning, 2002) also remained fairly neutral during the lesson, but grew more stern in the previously-described scenarios, where students' detracted from the lesson. There were also occasions where her voice level varied. For example, Mrs. Tanavo emphasized keywords, such as new geometry terms, when writing and saying these words aloud. One example of this intentional enunciating to draw attention to words was, "How

many *spaces* are in a *number* that's to the *ten millions place*?" Mrs. Tanavo's voice level moved from high to low and back again when repeating the phrase "think it in your head" multiple times while students were instructed to silently find an answer to a posed question.

Wielding of objects (Hennings & Grant, 2001) was visible throughout this math lesson as well. Mrs. Tanavo held a whiteboard marker in her hand throughout the entire lesson, as she moved frequently back and forth from writing on the whiteboard to directly addressing students from the front of the classroom. This wielding of the marker also included twisting the cap while the marker was held in both hands (taking the cap off and putting it back on, and holding the marker out to students who were invited to show their answers on the whiteboard). The use of a marker or other object to point to students as well as terms, definitions, and pictures on the board are included in Hennings & Grant's (2001) conducting motions. Mrs. Tanavo's use of the marker was for instructional writing on the board and wielding as a non-instructional tool. Her wielding of the marker also coincided with a considerable amount of wait time to give students time to think, respond, and pay attention before the class moved on with the lesson.

At the very beginning of the lesson, Mrs. Tanavo displayed a combination of nonverbal behaviors while stating, "Our words for today are . . . product . . . you need to know . . . factors. You need to know . . . commutative property . . . and put enough spaces down to show to the ten millions place. That's to the hundreds place; I want you to put [sic] to the *ten millions* place." Wielding a marker, Mrs. Tanavo wrote each word on the whiteboard on the wall at the front of the room while saying it aloud. Later, she wrote examples for each, while again stating them aloud. These are considered math nonverbal immediacy behaviors. In line with Stanulis and Manning's (2002) tone of voice features, emphasis was placed on the final vocabulary term, "ten millions place". Mrs. Tanavo looked over her right shoulder at the class between saying the

words “product” and “factors” to check their attentiveness while she wrote terms, definitions, and examples on the whiteboard. She turned her body away from the whiteboard to face the class while explaining the ten millions place instructions, looking left to right across the room. She then held the whiteboard marker in both of her hands in front of her body.

The majority of Mrs. Tanavo’s math nonverbal immediacy behaviors were demonstrated through small conducting, or hand-arm, movements (Hennings & Grant, 2001). Because Mrs. Tanavo wielded a marker throughout the lesson, she was limited in utilizing both hands for nonverbal movement. The majority of her conducting gestures were observed when each math term and definition were verbalized and then written on the board. Following the names and definitions were explanations and drawings of each. Other small conducting math nonverbal immediacy behaviors exhibited by Mrs. Tanavo included counting on her fingers and showing a number on her fingers while saying it aloud. Large conducting motions included using her outstretched arms and hands to show lines, line segments, and rays. Other instructional nonverbal immediacy conducting motions were minimal, although using a “give me five” gesture with a raised hand to gain students’ attention was frequently used.

Mrs. Paxton

Mrs. Paxton’s fifth graders sat in rows of desks facing the whiteboard and interactive whiteboard for this lesson. Mrs. Paxton moved from writing and drawing examples of mixed numbers and improper fractions on the whiteboard to looking at student work on their individual whiteboards throughout this first part of the lesson. The teacher used examples of patio tiles and pizza from her own life as well as students’ ideas to model these types of fractions in real-world situations. Also included in this lesson were examples shown on the interactive whiteboard from the math lesson video. This video showed and further supported the concept of finding and

writing mixed numbers and improper fractions by using an example of covering box tops with small, individual tiles. Students worked to convert mixed numbers to improper fractions and vice versa through each of these examples, as guided by Mrs. Paxton. The lesson ended with a mixed numbers and improper fractions game being introduced for students to play with partners.

Mrs. Paxton's most frequently used instructional motions included the use of nodding her head, facial expressions, and gesturing. Smiling is a distinctive facial expression described by Stanulis and Manning (2002). When employed by Mrs. Paxton, it was used to encourage students to follow along with the lesson examples, share their ideas, and praise them for sharing. Smiling was often accompanied by nodding her head in agreement. Head nodding is part of Butt et al.'s (2011) shoulder and head movements. A frequently-used gesture included extending her hand and arm out with her palm up and fingers slightly spread apart. This gesture was used to emphasize words or points of importance in the lesson. It was also an indicator to students that they could share their answers and ideas aloud with the class. This particular hand-arm gesture is classified as a large conducting motion (Hennings & Grant, 2001).

Other small conducting motions (Hennings & Grant, 2001) were frequently used in gesturing to examples written on the whiteboard, those displayed on the interactive whiteboard, as well as those used while talking in front of the class. Such small conducting motions were shown with one or both hands in front of her body. At times, her hands displayed open palms. This motion was shown when saying, "It's *much* easier to go to Papa Murphy's with my family." Other times her hands moved from side to side in unison, with her fingertips touching her thumbs, as when explaining, "I don't have meat." Yet another example was bringing her hands together as if holding something invisible to emphasize words such as, "my family likes

such different things." These three examples occurred within one story example about different pizza toppings that Mrs. Paxton's family likes.

A few times throughout the lesson Mrs. Paxton's facial features crinkled into a frown, or a thinking face, to model for students that they should closely examine an example given. A similar facial expression (Stanulis & Manning, 2002) was exhibited when her nose crinkled and her eyes squinted, when she told the class that she would teach them "a little trick". Altering one's facial expressions from a typically pleasant, smiling face to one that shows furrowing of the forehead or eyebrows, for example, indicates to students a change in the lesson content or a shift in where their attention should be. These elements, especially when used routinely, can lead to greater student engagement.

Although wielding a marker was non-instructional (Hennings & Grant, 2001), it was visible throughout the course of the lesson. Mrs. Paxton's movements from the whiteboard to standing in front of the class, walking amongst students, and gesturing at or touching the interactive whiteboard meant a constant need to keep a marker close at hand. Mrs. Paxton's non-marker hand was used to make other nonverbal gestures the majority of the time, which enabled the marker itself to be a less-visible, non-instructional tool. Mrs. Paxton's use of other objects included the whiteboard and interactive whiteboard throughout the lesson. Next, she used the document camera, dice, worksheet, and game board to introduce the math game.

Mrs. Paxton repeated her cue that she would teach students "a little trick" shortly thereafter. Her forehead and eyebrows raised this second time when saying, "There's a trick you can do to *this* to actually make this number. And we'll do that today." Simultaneously, her hand cupped the 6/4 fraction written on the board and then moved to surround the 1 ½ fraction. Her voice level became softer and she finished these statements with a smile while continuing to rest

her hand on the board. Mrs. Paxton's tone of voice (Stanulis & Manning, 2002) remained upbeat and friendly throughout her math lesson. The combination of differing types of nonverbal behaviors explained here shows that Mrs. Paxton's instructional and non-instructional gestures are used to enhance her teaching.

Math nonverbal immediacy behaviors were ever present for Mrs. Paxton. Whether she was at the whiteboard, interactive whiteboard, or directly addressing students, she linked math concepts and gestures. Several times Mrs. Paxton would verbally explain and draw an example of a given fraction. She would then point, gesture, or draw circles in the air when referencing it. When describing real-life examples where fractions are used, Mrs. Paxton's hand-arm conducting movements (Hennings & Grant, 2001) would indicate cutting pieces of a whole pizza or pie as well as signal fraction bars and the location of numerators and denominators in the air or on the whiteboard. In the same manner, while teaching how to change a mixed number into an improper fraction, Mrs. Paxton used hand-arm movements in the air in a clockwise manner to show the direction of the math problem. This movement reinforced the visual example written on the whiteboard.

Other math examples included showing students the size of a family-sized pizza by moving her arms up and out to the sides, as if holding a giant ball in between her hands with her palms facing inward and her fingers spread apart while saying, "Big ones. Family-sized." Shortly thereafter, Mrs. Paxton described, "And we decide to . . . cut this into . . . just *four* pieces" while drawing two perpendicular lines through a circle drawn on the board to create four pieces. Each of these pictures and concepts were invisibly drawn in the air with precise, repeated motions to accompany verbal and written explanations.

Narratives Conclusion

A wide variety of instructional and non-instructional nonverbal immediacy behaviors were observed, regardless of the individual lesson topics and mannerisms of each teacher in this study. Each teacher displayed math and other nonverbal gestures that enhanced elements of their respective lessons and likely contributed to students' engagement. Other factors included teachers' individual styles of lesson delivery, personalities, lesson content, as well as established routines for teaching and learning math in each classroom. Associations between nonverbal behaviors described in this section and teachers' interview responses are made in the following section.

Themes Descriptions

The six teachers from the third, fourth, and fifth grades revealed elements about themselves that were interrelated with the four themes that arose from the data. Each theme is supported by codes and categories that are interconnected, with many interrelating topics found across themes. A more in-depth look at this can be found in the discussion chapter. The four themes include:

1. Classroom Environment and Instructional Elements
2. Math Nonverbal Immediacy Behaviors, Math Concepts, and Real-life Examples
3. Student Engagement
4. Teachers' Reflections and Realizations

Teachers' descriptions of their typical math lessons, as well as knowledge of their own existing nonverbal behaviors during instruction, varied because of differing teacher personalities, personal learning styles, teaching styles, and knowledge of their students' needs and learning styles. Each teacher was willing to share personal insights and answer each question presented

in the interviews. The results revealed four themes that encompass traits of each teacher as well as characteristics distinctive to one or more of the teachers. These themes also indicated teachers' reflections and realizations of their own nonverbal behaviors, a key component of my study.

Theme One: Classroom Environment and Instructional Elements

This first theme revealed that the classroom environment is comprised of knowledge of students; mutual respect, teacher presence, and teacher struggles; as well as knowledge teachers possess regarding instructional elements, which include the math curriculum and tools used for teaching. Several codes comprised the categories of classroom setup, classroom atmosphere, classroom expectations, and lesson elements. Such codes included knowledge of students, respect, teacher presence, teacher struggles, and lesson structure, which included the classroom environment as well as structure and routines of lessons and instructional tools. The original codes were more descriptive of each of these categories and are used to describe the sections of this theme. The classroom environment was not a central aspect of this study. However, the findings showed that this underlying topic affects elements of teaching that foster student engagement and teachers' use of nonverbal immediacy behaviors. This theme is connected to the first research question, "What do teachers' nonverbal immediacy behaviors look like in the classroom during academic instruction in math?" because teachers must work with students to establish routines and structure within the classroom environment before effective, engaging instruction can take place.

Knowledge of Students

Mrs. Zale, a third grade teacher, said she does not always know the path a lesson will take to reach the end goal until she starts talking to her students. She stated that she wants to see what

they grasp and adjusts accordingly as they move through the lesson. Mrs. Kimball, another third grade teacher, talked about using individual student whiteboards so she knows who is following along and who does or does not understand the lesson. Mrs. Kimball also described quick assessments she uses throughout her lessons so she knows which route her instruction should take. She called this re-winding and re-teaching. In her lessons, Mrs. Kimball includes strategies for writing on the board for a cleaner format that is easy for the students to follow. For instance, there are only a few examples listed on the board at one time; these examples follow an organized arrangement to make them easier to read. She also stated that she knows her students will oftentimes blurt or try to help her if she pauses to remember something. These pieces of information allow teachers to best meet student needs while planning and instructing.

Mrs. Paxton, a fifth grade teacher, said she knows teachers really need to get to know their students, especially at the beginning of the year, so they know how to work with each of them. The math lessons and interviews for this study took place in January, approximately five months into the school year. Mrs. Randall, a fourth grade teacher, said that by this time of the year, she knows a little bit more about the students than she did at the start. This knowledge enables her to closely watch her students for cues during individual and partner work time to see those who struggle and those who understand. Mrs. Randall's looking for cues is similar to Mrs. Zale's conversations with students as well as Mrs. Kimball and Mrs. Paxton's use of individual whiteboards to determine student needs and outcomes. These elements are also tied to Mrs. Tanavo's knowledge of students. Mrs. Tanavo, a fifth grade teacher, commented that she frequently walks around during the lesson to make sure students are doing what they are expected to be doing. She said she also uses this movement to listen to students' math conversations with their desk partners. Mrs. Paxton added that including real-life examples in

lessons to engage and motivate students is important. She believes that no matter how many times you have taught a particular lesson, it needs to be tailored to the needs and interests of different classes.

Respect and Teacher Presence

At the beginning of the school year, Mrs. Paxton said she spends a lot of time modeling and practicing expectations and the structure of each subject's lessons. These beginning of the year conversations also include what it looks like during the mini lesson, consisting of student expectations for using whiteboards in addition to what active listening looks like while the teacher is explaining something. In her interview, Mrs. Paxton tied these to the word "respect", which she uses frequently while discussing expectations for the year. Her conversations with students include the explanation that it is not respectful to be writing on their individual whiteboards while she is teaching. Mrs. Paxton used the example that when students talk to her, they do not see her turned around with her back towards them. Rather, she is looking at them.

Mrs. Zale knows that changes in her verbal and nonverbal behaviors are necessary for students to be able to focus and pay attention during her lessons. These bodily gestures and facial expressions, alongside spoken elements of the lessons, show students respect from the teacher. Mrs. Zale stated that most of her verbal, visual, and nonverbal teaching behaviors are not planned; she does not think about doing them ahead of time. All of the teachers indicated that they know, or at minimum hope, their facial expressions, tone of voice, and overall body language reflect positively to their students. Teachers' physical presence in the classroom, especially including nonverbal behaviors, affects the classroom environment as well as delivery of instructional elements.

Teacher Struggles

Four teachers described struggles they experienced during their video recorded math lesson. The examples that did arise were mainly related to a teacher's frustrations with the direction the lesson went, especially when students did not recall previously learned information or grasp new ideas being taught. Mrs. Owens' fourth graders were not as engaged in the lesson as she would have liked them to be. Her students were having a hard time with the vocabulary, such as the difference between a prism and a pyramid. This difficulty was frustrating to Mrs. Owens because these terms were a review from the preceding day. Mrs. Zale's students also had difficulties remembering the brainstorming lesson from the previous day. They went on tangents during this lesson, which did not help her know what they understood or remembered. Similar to Mrs. Owens, Mrs. Randall struggled with re-explaining the math concept when students were not grasping it. Mrs. Tanavo's lesson was longer than typical, and she found that students were getting off task and blurting towards the end. No matter how well a teacher knows her students or how organized the lesson plan and materials are, student misconceptions, questions, and other unexpected problems can arise, creating struggles for the teacher and students.

Lesson Structure and Instructional Tools

The teachers in this school have several resources available for planning and teaching their math lessons. Mrs. Zale stated that she plans by first looking at the end of the lesson, which is the goal or objective. She references related information and strategies learned and used in previous lessons to connect with the current topic. Mrs. Zale plans most of her lessons physically and visually so there is order and organization when she writes things on the class whiteboard. While she is teaching, she references her math notes, which are her plans for each lesson. Mrs. Kimball's instructional choices and decisions are made based upon student progress

and needs through whiteboard work or practice problems from the lesson video. Some years she uses the math lesson video from the curriculum; this year she stated that her students learn better with verbal and written information displayed on the classroom whiteboard.

Mrs. Owens did not discuss her lesson planning methods but did state that she oftentimes uses the interactive whiteboard and students' individual whiteboards during her lessons. Mrs. Randall's lessons include the math video, vocabulary, and other interactive pieces for students. Her students had pre-cut polygon shapes to use when classifying and organizing during this lesson. Mrs. Paxton described that she prepares for each lesson by watching the math video and thinking of relevant, real-life examples to incorporate. Mrs. Tanavo's students had a routine of reviewing up to four math vocabulary words, discussing the objective for that day's lesson, and then using the classroom or interactive whiteboards to teach the lesson.

As briefly mentioned in the narratives section, each teacher in this school has an interactive whiteboard with a projector at the front of the classroom. The math curriculum used includes a short video for each math lesson that is oftentimes used by teachers as a tool for content delivery. Individual student whiteboards or other forms of student notes are another commonly used instructional component. Mrs. Zale typically writes her lesson material on the classroom whiteboard instead of using the interactive whiteboard or math lesson video. In addition, her students use individual whiteboards during the lesson, and later, a paper and pencil assignment. Most of what Mrs. Zale writes on the whiteboard takes place in real time during the lesson; not much is written ahead of time. Mrs. Kimball's lessons include the use of student whiteboards and interactive notebooks for small group re-teaching. Mrs. Owens' students typically do a lot of work on their individual whiteboards. Mrs. Randall's students use a variety of materials, including manipulatives, math notebooks, and whiteboards. Mrs. Tanavo uses the

interactive whiteboard on most math days but did not in this lesson. She instead used the classroom dry erase whiteboard to display math geometric terms while students wrote in booklets. Mrs. Paxton's lesson format also includes student whiteboards.

Mrs. Paxton said her math lessons look pretty similar, or routine, from day to day. She uses the whiteboard at the front of the room as well as the video from the math curriculum. Her students have individual whiteboards on their desks. She tries to take things slowly when writing on the board, pointing to, and interacting with examples. She commented that she also makes sure to give students time to do the same on their individual whiteboards. Math games or other activities are also included each day to practice that lesson's skills. Mrs. Paxton felt that, at this time in the school year, students know that when she is at the whiteboard explaining, their role is to pay attention and engage in the conversation. When she steps away from the examples on the board, it is the students' turn to actively apply what they have learned to their individual work.

Most of the teachers included review as part of their typical math lesson format on this day. Mrs. Zale tried to replicate the brainstorming session from the previous day's lesson to review and remind students of what they already learned. Mrs. Tanavo reviewed geometric terms, such as line, line segment, and ray, in this particular lesson. These and other terms were part of her lesson, which students copied from the whiteboard at the front of the room onto student-made paper booklets at their desks.

Mrs. Randall stated she often includes hands-on manipulatives such as cutout shapes and charts and the use of individual student whiteboards and notebooks in which they draw things such as pictures of vocabulary words. In her interview, she commented that the use of hands-on materials and partner work time allows students to learn in various ways and, thus, is essential for learning. Mrs. Owens knows what she is going to do for certain lessons in terms of

nonverbal behaviors because she has used them or taught them in that manner other years. On this day, she held pictures of geometric nets in her hands and displayed a few examples of nets and three-dimensional solid shapes on the interactive whiteboard.

Mrs. Owens described her lessons as typically including the math video, ideas and examples from the curriculum, as well as additional instructional pieces she finds to be helpful and relevant. These pieces may include songs, gestures, or hands-on materials such as cutting, folding, and assembling their own three-dimensional solids from nets. Mrs. Owens' students were the only class out of the six who sat on the floor at the front of the classroom for the lesson. She mentioned she prefers to have students here, especially when the interactive whiteboard is being used for the lesson. Two reasons include students being able to share ideas with their neighbors, as well as Mrs. Owens easily being able to see what work students are producing during discussions or writing on their whiteboards.

Mrs. Kimball said she uses specific strategies, such as circling numbers that are in the same fact family, in the beginning of teaching a concept. In subsequent lessons, she moves away from that strategy to promote students seeing them displayed visually, but without actually circling the numbers. In much the same manner as all of the teachers, Mrs. Kimball said she uses proximity during lessons to consciously teach to both sides of the classroom. She frequently uses manipulatives and physical activities, which are sometimes nonverbal. In this same manner, Mrs. Zale cleared the board during her lesson to physically remove strategies already grasped by students to make room for new ones. Mrs. Tanavo used familiar groups of letters such as various teachers' initials and the initials of their town as labels to connect geometry with students' interests.

Mrs. Zale stated that she also fosters student engagement in her lessons by including physical examples, such as setting up and moving containers to demonstrate division concepts, which she references again in later lessons. During her video recorded lesson, five students were asked to come to the front of the classroom to physically and visually divide themselves into various-sized groups. Mrs. Zale said she uses these and other types of nonverbal gestures in small group and whole group settings. She also mentioned her students are invited to actively participate in lessons to demonstrate sizes or comparisons between objects, or they may receive cards and must order themselves from least to greatest without speaking.

Theme Two: Math Nonverbal Immediacy Behaviors, Math Concepts, and Real-Life Examples

The first theme, classroom environment and instructional elements, leads into the second, which is one of the central themes of this study. This second theme indicated that teaching mathematics includes foundational math concepts, real-life examples to be used in math, and the inclusion of math nonverbal immediacy behaviors. Codes such as math concepts, nonverbal behaviors, and real-life examples related to student engagement, math concepts, and lesson structure led to the overall categories of math concepts, math real-life examples, and math immediacy. The first research question, "What do teachers' nonverbal immediacy behaviors look like in the classroom during academic instruction in math?" is directly answered within this second theme.

In this study, the math lesson topics varied from classroom to classroom, dependent upon the particular grade level and unit of study. It must be noted that real-life examples were only noticeably present in three of the six lessons. This could be due to the particular lesson topic and how it lent itself to such examples, or perhaps due to teachers' lesson plans and lesson choices

for that day. The potential for implementing real-life examples was present in all six lessons. However, it was not an initial aspect of this study and thus, was not included in interview questions. At the culmination of the study, the presence of real-life examples arose from the findings in such a way that warranted its inclusion. Math nonverbal immediacy behaviors were found in all lessons in various ways. This second theme and the two following are intertwined as well.

Foundational Math Concepts

Mrs. Zale and Mrs. Kimball, both third grade teachers, used students' knowledge of fact families to teach multiplication and division. Mrs. Zale's lesson included division by the numbers one and zero, while Mrs. Kimball focused on the vocabulary words "opposite" and "inverse". Both teachers discussed strategies, such as repeated subtraction or moving on a number line, as ways in which students were already familiar with multiplication and division. These third grade teachers also referenced how multiplication and division are related through the use of these vocabulary words and examples. During our interview, Mrs. Kimball explained the purpose of a math poster hanging on her whiteboard. Such posters contain formal math definitions for reference during lessons and student work time. Mrs. Kimball also commented that she paired this formal math language with student-friendly terms.

The fourth grade teachers were both teaching lessons on geometry topics. Mrs. Owens reviewed geometric terms by using pictures of three-dimensional solids and their nets. Such terms included edges, faces, and vertices as well as lines, rays, points, and angles. Students were asked to show their knowledge through naming and drawing pictures of these three-dimensional solids and nets. Mrs. Randall's geometry focus was on classifying polygons, particularly triangles, by their sides and angles. A review of quadrilaterals started the lesson to lead students

to an understanding of the different components two-dimensional geometry shapes have before moving on to identifying the sides and angles of triangles.

In fifth grade, Mrs. Tanavo continued the geometric trend by reviewing general math terms, followed by her lesson on teaching geometric vocabulary words and examples. She gave students an example of three lines drawn on the board to represent a number to the hundreds place to connect with that lesson's example of ten millions place value. Mrs. Tanavo's vocabulary words included lines, line segments, rays, points, and intersecting and parallel lines, amongst others. This lesson included terms, definitions, and written examples on the whiteboard at the front of the classroom. In her lesson, Mrs. Paxton's taught her students about mixed numbers and improper fractions. Students learned how to convert a mixed number to an improper fraction and vice versa using specific steps and math properties such as multiplication and addition.

Real-Life Examples

While three of the six teachers used real-life examples in their lessons, many math topics lend themselves to real-life examples to promote student engagement, which is the third theme of this study. In her interview, Mrs. Paxton stated she uses real-life examples in each of her lessons, which she feels helps with students' overall understanding. Real-life examples from this particular lesson include demonstrating fractions by ordering different toppings on pizza with her family and purchasing patio blocks for an outdoor space at her home. The example given by the math video showed placing small square tiles on the tops of boxes. Mrs. Paxton said students can see how the math concepts relate to their own lives through the use of such examples that they can relate to or have experienced.

Following her review of fact families, Mrs. Kimball shared a few math story problems that required students to listen, process, write, and solve using division. This included real-life examples such as putting toys into bags. Although not a part of this particular math lesson, Mrs. Zale spoke about other math vocabulary words she has taught this year. This connection was made through other nonverbal gestures she uses to teach these concepts, which also include real-life examples. For example, the commutative property is like the commute she makes back and forth from her home to school each day; the associative property is similar to associating with one's group of friends. I surmise that the other teachers use real-life examples regularly in their lessons, even though they were not obvious in the one lesson I observed from each teacher. As real-life examples were not present in the literature concerning math nonverbal immediacy behaviors, I did not think to include an interview question on this topic. As it was revealed through the findings of the interviews and math lessons, it proves to hold a great importance in this study. Perhaps other interviews or math lessons would show the inclusion of such real-life examples as related to math nonverbal immediacy or other nonverbal behaviors.

Math Nonverbal Immediacy Behaviors

In this study, numerous facets regarding the teaching and discussion of math lessons support math nonverbal immediacy behaviors. Mehrabian (1969) defines immediacy as the use of behaviors that increase closeness to and nonverbal interactions between communicators. As described in the narratives, each teacher's math nonverbal immediacy behaviors varied but were present throughout the lessons. Holding up a number of fingers while saying the same number aloud is considered a math nonverbal immediacy behavior because it connects the verbal with the visual concept, therefore reinforcing the idea being taught. All six teachers demonstrated this number-related nonverbal behavior during instruction. For example, in her video recorded math

lesson, Mrs. Owens displayed two fingers while explaining that a particular solid shape had two bases. Mrs. Zale showed two fingers while telling her students there were two different ways to look at putting objects into different groups. Connecting math terms with small hand movements, Mrs. Paxton demonstrated "numerator" and "denominator" by moving her hand to an area on the top and bottom in the air. Other math-centered gesturing occurred in each teacher's lesson as well. Specific math nonverbal immediacy behaviors differed according to individual lesson topics and teachers' personalities, as described in this section.

Mrs. Tanavo pointed to each period of lines while simultaneously counting aloud the spaces in a number with digits to the ten millions place. She also modeled line segments by holding her arms out to the sides and using her fists as endpoints and then her fingers pointing as arrows to show the change from line segments to rays. Mrs. Tanavo used this same nonverbal immediacy modeling with her arms and hands while her voice changed pitch to say that lines go out in all directions. Mrs. Randall also physically modeled geometry math concepts by drawing a triangle in the air with her finger and later using her forefinger and thumb to make an "L" shape when talking about triangles that have an L-shaped, or ninety-degree, angle. While discussing math concepts, Mrs. Randall said she intentionally whispers or talks louder at different times to draw students' attention to that particular item, using vocal variety.

Parallel to Mrs. Randall and Mrs. Tanavo's geometry lessons, Mrs. Owens' math nonverbal immediacy behaviors were linked to lines, rays, points, and angles. Mrs. Owens said she knows she uses nonverbal gestures to indicate the length, width, and height of three-dimensional solids. She shared that she consciously uses nonverbal gestures when teaching geometry because they have been effective with previous classes. However, Mrs. Owens said

the types of nonverbal behaviors depend upon the math topic. Long division, for example, would utilize different nonverbal gestures than three-dimensional solids.

Mrs. Paxton and Mrs. Zale showed the greatest number of math nonverbal immediacy behaviors during their math lessons. They were continuously moving and gesturing when talking about and demonstrating math concepts. While watching her video recorded math lesson, Mrs. Paxton commented that you could see the space between her hands getting larger when she was talking about the pieces of pizza, and then smaller when she was pointing to an example of the pizza on the board. In the segment when she was describing pieces of pizza, she noticed that she actually cut the pizza into fourths with her finger in the air. She also noticed that she pointed in the air to the numerator on top and the denominator on the bottom. "When I was trying to relate it back to the mixed number, I took my hand and circled the improper fraction, and then . . . took an invisible line up to the mixed number so they could see the connection." Mrs. Paxton stated that helping students make the connection between improper fractions and mixed numbers through visual elements really helped them comprehend that number relationship. She specifically remembered using these gestures during her lesson so students would have to use their eyes to follow her fingers up from the improper fraction to the mixed number.

One nonverbal element Mrs. Zale used in her lesson was the use of hand motions while giving verbal explanations of math concepts. This included examples such as adding everything up or finding the difference of a big and small number. Her vocal sounds also fluctuated when demonstrating the change between a big and a small number for subtraction. She also showed the sizes of things by using her hands and her eyes getting bigger and wider. While interviewing with me, Mrs. Zale talked about varying her voice by slowing it down or lowering it to indicate

the importance of something she was saying. Mrs. Zale also described how she used her hands to visually show how fact families can flip. She moved her thumb and pinky back and forth and explained that they are like sisters and brothers across her fingers.

Mrs. Zale also said she enjoys getting students involved in the lessons as well, so they, too, are actively part of the lesson in nonverbal and physical ways. In her math lesson, students were invited to the front to physically divide themselves into groups to demonstrate dividing a larger group of students or objects into a given number of smaller sets. In her interview, Mrs. Zale recalled other math lessons where she has utilized math nonverbal immediacy behaviors. She gave the example of physically moving her body from zero to 50 to demonstrate moving forwards and backwards while adding and subtracting on a number line. She also recalled flipping her hands back and forth when demonstrating the commutative property of addition. The example of her car commuting back and forth from school and home each day for the commutative property complemented the gesture of putting her hands together like parenthesis when teaching the associative property. She explained to students that you associate with your friends, just as numbers associate with one another for this property.

In her interview, Mrs. Paxton mentioned she does a lot of pointing and circling in the air to demonstrate math concepts because her students are very visual. She explained that if there is an important idea being taught, she will take a lot of time to point to or circle it. Whether they realized they were gesturing during the lesson, or had time to reflect upon it while watching their video recorded math lesson and in conversation with me during the interview, each teacher mentioned the use of some type of gesturing while teaching math.

Theme Three: Student Engagement

The findings of this study indicate that student engagement in any lesson or activity is linked to the categories of teachers' knowledge of student needs and struggles, motivational elements, and the inclusion of verbal and nonverbal communication. These categories arose from the following codes: knowledge of students, student struggles, and student engagement as related to real-life examples, lesson structure, positive and negative experiences, motivation, math concepts, and verbal and nonverbal examples. Answers to the third research question, "What are teachers' perceptions of their nonverbal behaviors on student engagement?" are found herein, whereas a larger section on teachers' nonverbal behaviors is described in Theme Four.

All teachers agreed student engagement is essential for learning and is directly impacted by the ways in which teachers motivate students and communicate in the classroom. As compared to math nonverbal immediacy behaviors, a greater variety of general nonverbal immediacy behaviors were found in teachers' video recorded math lessons. This finding is attributed to math concepts having a narrower range of nonverbal options, bound by the topic and related vocabulary words. General nonverbal behaviors can be linked to various aspects of the classroom, including math lessons, the classroom environment, and previously discussed student engagement. In addition to math-specific nonverbal behaviors, the inclusion of verbal and nonverbal communication in academic lessons can enhance and heighten student engagement.

Student Needs and Struggles

Although four of the six teachers talked about struggles their students had during this video recorded lesson, each teacher described student needs that did or could positively impact students' learning in this and future lessons. Each year, Mrs. Paxton finds that her students need

routine, which is why her math lessons are the same format from day to day. In her math lesson, Mrs. Paxton's students wrote the examples provided on the classroom whiteboard on their individual whiteboards so it was easy for her to see that they were engaged in the lesson. She also mentioned they interacted in conversations with her as well as their partners for the game. Through these actions, she felt able to observe and assess that they were engaged in and understood her lesson objectives.

While she stated that the components of her lessons typically stay the same, Mrs. Tanavo said she varies her lesson formats to keep students interested and engaged. In this particular lesson, she included a review of four math terms, stated or written learning objectives, and several new geometry vocabulary words and examples. In other lessons, Mrs. Tanavo includes the review, learning objectives, and note taking along with math videos, an activity or game, as well as homework time. Knowing her students' learning styles allows her to plan for and use a flexible structure to meet all students' needs and interests. Much like Mrs. Paxton and Mrs. Tanavo, Mrs. Zale engaged students in this math lesson by beginning with elements such as brainstorming to recall review elements. Mrs. Zale stated her students are able to say, "I can kind of see it in my brain and I know that's happening because that's what we did before" when referencing examples they had studied in earlier lessons.

Mrs. Kimball knows her students need to "have a task at hand" to stay actively engaged. Hands-on, minds-on learning is a phrase used by Mrs. Kimball to explain that her students need to be engaged in their own learning. Mrs. Randall also stated that her students need hands-on elements in each lesson. The use of manipulatives or other objects, in addition to taking notes during the lesson, is one way Mrs. Randall typically assists her students in learning vocabulary

words. Mrs. Randall also has students think on their own, talk with their desk groups, and share with the class in each math lesson.

Similar to all of the other teachers, Mrs. Kimball keeps her students engaged by incorporating writing throughout each lesson. She uses the classroom whiteboard or interactive whiteboard and has students write the same examples on their individual whiteboards. Her students know they are going to be asked to interact with the lesson in some way and show their work each day. Mrs. Paxton knows her students need time to process information throughout the lesson. She will write on the whiteboard or interactive whiteboard first and then allow students time to think and write on their own whiteboards. Without this time, she said they would be overwhelmed. Instead, they benefit from being able to listen, process, and write during instruction. Utilizing these individual whiteboards allow students to show the teacher their work during the lesson. Mrs. Kimball also knows her students need a lot of nonverbal and verbal elements such as cadence in songs and rhymes to keep them engaged and assist them in learning the information.

To further engage her students during a lesson or activity, Mrs. Kimball kneels down and works one-on-one with students during independent practice in each lesson to gain an awareness of their needs and struggles. This is one element of Theme Three: Student Engagement. Mrs. Kimball daily assesses her students based upon strategies taught in class, when they do individual work, and on math tests. What Mrs. Owens plans for her next lessons is in response to what she sees students producing on their whiteboards. In this math lesson, students were able to tell her what some of the math vocabulary terms referred to. They were then able to apply these terms when finding the differences between two and three dimensions while working with geometric solids and nets.

Mrs. Randall spoke of her frustrations when her students did not understand part of the lesson on triangles. She stated that they likely needed more discovery time with the triangles and other polygon shapes before they could identify properties of each. Mrs. Randall felt her students were engaged in the lesson, however, especially when talking with their partners and in sorting and classifying their shapes. A big moment of realization came for the students when they could see and understand that triangles' properties include various-sized sides as well as angles.

Although Mrs. Zale used a familiar structure for this video recorded math lesson, her students had trouble remembering strategies for multiplying and dividing while they were reviewing the previous day's lesson. In our interview she told me a few students had been off topic on various tangents, and seemed to do better once they got back on track. Because she knows her students tend to get sidetracked if too many visuals are posted at once or even ahead of time, she writes or posts examples as soon as they are needed in the lesson.

Mrs. Owens knew her students were not as engaged in her video recorded math lesson as she would have liked them to be. New vocabulary examples, prism versus pyramid, were more difficult for students during this lesson. In addition, she didn't feel as though the paper pictures of nets captured students' attention as much as images displayed on the interactive whiteboard would have. If she were to teach this lesson to her students again, she would change that, especially considering that she knows this year's students are visual learners. She also realizes that each year students grasp concepts differently. Mrs. Owens commented that this group of students is not as kinesthetic as last year's; they had difficulties building nets into three-dimensional models despite their visual strengths. Because she knows her students don't like to take risks, Mrs. Owens said she would encourage them to try challenging things in the future.

As described in the first theme with the classroom environment and instructional elements, getting to know one's students early in the school year allows a teacher to assess students' needs and struggles. When students experience difficulties or frustrations, it is important for teachers to have a positive relationship already established. Mrs. Paxton stated she feels it is important for her students to know she is a person, not just a teacher. She also wants her students to know she appreciates them. When she knows how to best work with each student, she knows if she should kneel next to them or stand a little farther away. What a teacher does is dependent upon each student's comfort and need for one-on-one assistance. Because of these dynamics, Mrs. Paxton incorporates real-life examples that not only engage students in learning, but allows each to find connections to their own lives. These driving forces are directly associated with students' motivation.

Motivational Elements

Motivation was not specifically named by many of the teachers, but elements of each lesson certainly led to student engagement through being active participants. Such participation was observed when students were working at desks, talking with partners, and acting out math stories and problems. Mrs. Paxton believes that the teacher sets the stage for the students. She stated that how you exhibit your feelings regarding teaching and learning alongside students, transfers to their motivation to participate.

Mrs. Kimball and Mrs. Zale include students in interactive elements of their lessons. In past lessons, Mrs. Kimball has had students wear signs labeled with "gallons" and "pints" and then order themselves from least to greatest to compare sizes. Mrs. Randall's students benefit when they can see and experience math images, manipulate them, and talk about what they are learning with various partners. She tries to show as well as tell students that it's okay to share

with others, even if they don't get the correct answer. As described in Theme Two, Mrs. Zale's students acting out division examples motivated some to engage in the lesson by solving their own story problem and others by watching their classmates demonstrate by physically and visually moving into various-sized groups.

To encourage students that are following along, Mrs. Kimball said she includes several nonverbal affirmations while teaching. Examples she shared include things that her third graders love that help them know they are on the right track doing the right things, such as eye contact, smiling, thumbs up, or a clap. Mrs. Randall believes that students can be teachers for each other. This personal peer interaction can be motivating for students as well. Mrs. Paxton purposefully smiles at her students and shows excitement so they will be more motivated to learn the lesson. She believes students will be more motivated and engaged in the lesson if she shows them she is also excited to be there. Each of these teachers exemplified these elements in their lessons.

In her lesson on geometric terms, Mrs. Tanavo chose specific groups of letters when labeling each figure to capture students' attention. She used her own initials, initials of other teachers, as well as initials for the town they live in. This example was also mentioned in Theme One. Mrs. Paxton said that how you present yourself gets kids excited to be there and excited to learn. Her students know that she will give them her full attention if they ask a question or share an example. Mrs. Paxton demonstrates her full attention by turning to look directly at the speaker instead of being turned away while writing on the board. Demonstrating attentiveness ties to motivation, also described in Theme One. In making a point to display her attentiveness, Mrs. Paxton said she shows her students she is interested in what they are saying and hopes they will reciprocate during her lessons.

In addition to connections made in Theme Two, Mrs. Paxton believes real-life examples are connected to motivation. Mrs. Paxton was the only teacher of the six to state the phrase "real-life examples" in her interview. She feels students are very interested in teachers' lives. If she can incorporate examples from her life in each lesson, she feels they will be more motivated to grasp the concepts she is presenting. Students may also be able to apply such examples to their own lives, heightening their engagement. Mrs. Paxton noted that students seem particularly interested in examples that show how adults work in the real world. These illustrations show them that it isn't just about learning fifth grade math, but adults also apply such math examples in their lives right now. Mrs. Paxton shared the example that, when they were discussing shapes in geometry, a student brought in blueprints from her dad's engineering firm. Using students' interests and real-life examples gives students additional motivations to be interacting with and applying the lesson.

Verbal and Nonverbal Communication

Pairing verbal information with nonverbal components allows students with varying learning needs and styles to wholly participate in a lesson. This all-encompassing method of teaching allows for student and teacher engagement in ways that a strictly verbal delivery cannot. Verbal and nonverbal communications are included in management techniques, the classroom environment, a teacher's presence or personality, or even cues to pay particular attention to something new or essential for understanding.

While verbally instructing her students, Mrs. Zale said she uses eye contact and pointing to nonverbally show students they need to be paying attention if they are off task. In her lesson, she also combined verbal and nonverbal communication with her explanations, physicality of

separating students into groups, as well as the writing of examples on the whiteboard. Each teacher agreed that verbal and nonverbal elements must be incorporated into their lessons.

Verbal communication. Although the focus of this study was nonverbal elements in math lessons, the teachers understood verbal explanations are essential in teaching any subject. Mrs. Zale recalled communicating verbally with the class in her lessons when explaining a math idea, asking students questions, and requesting volunteers. Part of her lesson also included a verbal discussion with the class regarding fact families. An earlier example described Mrs. Zale telling non-content-related stories prior to the start of the math lesson to get students attuned to her voice. Mrs. Kimball said she verbally repeats key words over the course of a unit. She also verbally posed several math story problems, giving students time to think and respond before showing visual examples on the classroom whiteboard.

Verbal affirmations were included in each video recorded lesson. The phrases themselves varied, but each teacher verbally recognized students' efforts and responses during various parts of the lessons. For example, Mrs. Paxton verbally encouraged students to participate in discussions and share their ideas. In the interviews, Mrs. Kimball, Mrs. Randall, and Mrs. Paxton were three teachers who spoke specifically about their awareness of verbally encouraging their students while they teach.

Nonverbal communication. Mrs. Zale thinks nonverbal behaviors have a direct effect on children and how or how much they are engaged. She stated there is a direct relationship between what she says, how she acts with her hands or body movements, and what she writes on the board during a lesson. Mrs. Kimball said that the use of hand motions, movement, and different voices gets and keeps her students engaged in all aspects of a lesson. Teachers' descriptions of their large and small hand-arm movements, whole body movements, facial

expressions, and vocal variety are described in the following sections. Physical contact and posture and torso movements were either not observed in the math lessons, or only observed a minimal amount. They were not discussed in great depth during the teachers' interviews. Therefore, these nonverbal behaviors are not included in this section.

Large and small hand-arm movements. Mrs. Kimball commented she feels her students are more engaged if she is performing and acting out the lesson. Mrs. Paxton stated she frequently incorporates math nonverbal immediacy behaviors to connect with her students' visual learning styles. She said that using her hands to point helps students learn because their eyes follow what she is pointing at. Mrs. Zale recalled physically moving her hands to demonstrate students and objects being separated into groups. She also mentioned raising her hand to model for students to also raise their hand to answer a question or share a thought with the class. Mrs. Owens knows that movement gets the attention of her class while Mrs. Kimball shared she uses nonverbal motions before verbal to get the attention of a student that is off task.

Mrs. Tanavo stated that the use of gestures during the lesson also helps students learn. Mrs. Tanavo anticipated that the more she moves, gestures, and varies her voice, the more things there are for students to pay attention to. Even if they are not listening to her voice, they may be watching. For example, to get students to stop talking, Mrs. Tanavo clapped her hands and counted down from five to zero while displaying the numbers on her hand. In her math lesson, Mrs. Owens pointed to several objects, such as students' whiteboards, pictures of nets in her hands, and the interactive whiteboard. At times she did this as a silent reference for students while they were working on their whiteboards, and other times, she paired these gestures with verbal language.

Mrs. Owens also used nonverbal techniques to help her students manage their materials. She said her students do not always remember to cap their markers all the way, so she demonstrated hitting the top of the cap with her hands and telling them to listen for the click it makes when it is fully closed. Mrs. Paxton used visual cues and physical movements like gesturing to specific numbers and examples on the board as a way to indicate to students that this information is important, and is something to pay particular attention to. Mrs. Paxton pointed, or gestured, to students when indicating it was their turn to talk; Mrs. Kimball used these same large and small hand-arm motions in combination with phrases such as "Good job!" or "Nice work!" in response to an answer provided.

Whole body movements. Mrs. Tanavo has seen students repeating gestures, especially geometric gestures, which she has used in a particular lesson. Students have gestured when explaining or repeating math concepts back to her, but she has not see these gestures used in peer-to-peer interactions. Mrs. Owens has seen her students later use the same gestures that have been used in lessons, especially when learning geometric terms such as lines, rays, and angles. In one instance, her students were using their hands, arms, and voices to help themselves recall differences between small, acute angles, and large, obtuse angles. Mrs. Zale has seen students using the same nonverbal gestures used in class with peers and when they are explaining something back to her at a later time.

Mrs. Kimball stated she uses proximity during her lessons, continuously moving to the front and the back of the room. Mrs. Randall believes the teacher's physical presence is a part of classroom management. This particularly affects student engagement when student misbehaviors exist. Mrs. Owens also referred to her physical presence when she works one-on-one, in small groups, or instructing her entire class. She goes to where the students are during

each lesson. If they are at their desks, she is moving amongst them. If they are on the floor in the front of the classroom, she sits next to or leans toward them. Mrs. Zale will move to one side of the classroom during a lesson to force students on the opposite side to pay attention. Sometimes she can really see if they are following her visually if she is farther away. Mrs. Zale also uses proximity control in getting physically closer to students when they are having difficulties staying on task or struggling to understand the lesson.

While introducing the lesson, Mrs. Paxton stays near the side-by-side classroom whiteboard and interactive whiteboards at the front of the room. She then uses close proximity to students when they are working on individual whiteboards at their desks. Students know the routines in her classroom, so these different uses of proximity are students' signals. They know to be listening and watching the lesson on one of the classroom boards while Mrs. Paxton is at the front, and that she will be looking for examples on their whiteboards while she is walking amongst their desks. "I think sometimes that close proximity . . . kind of portrays that I . . . I want to see how they're applying the mini lesson, and how they are grasping what I'm teaching."

Facial expressions. Mrs. Randall asserted that she does anything she can to help her students understand. Her use of facial expressions shows students they have the correct or an incorrect answer. She feels as though visual elements like gesturing or facial expressions make the lesson more interesting for students. Mrs. Paxton also uses her facial expressions and eye contact to model respect to students by showing them she is listening.

Most of the teachers commented that modeling of thinking strategies is characteristic of reading lessons. When their attention was brought to the use of facial expressions to model this thinking during math problem solving as well, the teachers agreed that the use of their forehead, eyebrows, and eyes could nonverbally be used for this purpose. In watching her video recorded

lesson, Mrs. Paxton noted one particular instance where she asked the students to think about something, and she gave the impression that she was doing the same through her facial expressions. "If the kids can see me really thinking about it, hopefully it allows them to think, 'Wow, I really need to think about that, too.'"

Mrs. Owens stated that she uses her forehead and eyebrows to get students' attention. Her facial expressions help students get back on track if they are not following along, or are used to show the class she is ready to move on with the lesson. In her lesson, Mrs. Owens smiled and nodded while a student was responding verbally as a sign of nonverbal affirmation. Mrs. Kimball said she also encourages students through her nonverbal facial expressions, such as displaying wide open, excited eyes, a raised forehead, and smiling. Mrs. Paxton feels as though she smiles and portrays a happy facial expression the majority of the time while teaching. Displaying happiness is her way to show her students she is excited to be there, to learn alongside students, and to positively encourage them to be engaged.

Vocal variety. Vocal variations were mentioned the greatest number of times by all of the teachers when discussing their nonverbal behaviors. Mrs. Owens stated, "If I'm wanting to get them to pay attention, my voice may go lower, or it may go higher, depending on what will get their attention." Mrs. Zale echoed this same notion when explaining that she uses her voice fluctuations to get her third graders to turn their attention to what she is saying. For example, she tells students a quiet story on an unrelated topic before starting the math lesson to get them calm, quiet, and focused on her voice. This seems to help them listen and pay attention to the actual lesson better than just starting the lesson itself.

Mrs. Zale followed these statements by saying this year's students have a difficult time paying attention to things that are not fluctuating or moving. Because of this, she intentionally

incorporates verbal and nonverbal behaviors into her lessons. She says it seems to be effective because students are more intent on listening and focusing when vocal variety is utilized. Mrs. Zale includes vocal variety to give her third graders the feeling that they are learning something grown-up and almost secretive. She also uses a varied tone of voice to alert students about something new, different, or exciting that is about to happen. Mrs. Zale stated her students realize this change in her voice when she lowers it or slows it down.

Mrs. Tanavo feels her students will not get bored if her voice is not monotonous. Rather, they will be more likely to pay attention if her voice goes up and down. Mrs. Kimball tries to be animated and use different voices. Mrs. Paxton believes that using a calm voice helps students sense they are part of a calm environment, which helps student learning as well. She also senses that her students play off her, modeling themselves after her voice and hand gestures when they are talking to their peers, or when they are explaining something to the entire class. She says this student interaction piece "goes back to the importance of the teacher."

Mrs. Kimball has a few students in her classroom this year who receive speech and language services. These particular students need to hear words articulated when they are being verbally delivered. We discussed the fact that Mrs. Kimball enunciated several words in a sentence in her math lesson. She commented this enunciating is done especially for her speech students, but also said this can benefit all of her students. Mrs. Kimball stated that the context and purpose of her spoken words also affects the manner in which she speaks. For example, reading a text aloud to deliver information, reading a fictional story aloud, or getting the students' attention all require different vocal selections. Mrs. Paxton mentioned that she incorporates laughter into her lessons as yet another way to gain student interest and motivation, which leads to engagement.

Over the years, Mrs. Zale said she has noticed the trend that students need more and more vocal, visual, and nonverbal variety incorporated into daily lessons to get and keep their attention. "The more that I change the things that I'm doing or the more that I physically move my hands or my body to get their attention the easier it seems to be for them." If students are not attentive, they may realize that something is changing and may think they need to pay attention.

Eye contact. Mrs. Zale stated she can tell when her students are engaged because of the responses they give back. When she pauses while reading and they look up at her, she knows they are listening. Conversely, when her students' eyes start to wander, she knows she has to "jazz it up" a little to get their attention back again. Mrs. Kimball said she uses eye contact first, and then a nonverbal gesture to get students' attention if they are off task. Mrs. Zale commented that she also uses eye contact to get students' attention in a nonverbal way if they are not supposed to be doing something.

Mrs. Randall stated that she consciously employs eye contact with her students in all parts of her lessons. She knows how her eyes and facial expressions are fundamentally important for student engagement. When teaching and having conversations with her students, Mrs. Paxton said she frequently employs eye contact. While students are learning expectations and the format of lessons at the start of the year, she feels as though discussing and practicing the use of eye contact is very important. Students must learn this skill to use with adults as well as one another; Mrs. Paxton models this by using eye contact with her students throughout the school day.

Theme Four: Teachers' Reflections and Realizations

Theme four addresses the second research question, "How do teachers describe their own nonverbal immediacy behaviors?" This theme concludes the interview findings with teachers'

initial reflections and realizations after viewing segments of their video recorded math lessons. Coding of the interviews included verbal and nonverbal examples as related to the lesson structure, student engagement, teacher presence, teachers' reflections, the classroom environment, and math concepts. Teachers' reflections and realizations arose from the categories of nonverbal behaviors displayed, the structure of their lessons, and students.

When asked how they communicated during their lesson, all six teachers listed examples of verbal and nonverbal behaviors they typically demonstrate. These interviews compelled the teachers to reflect upon various teaching methods as well as student interactions before, during, and after they watched portions of each of their video recorded math lessons. For example, Mrs. Paxton's reflection upon this math lesson included a plan to use the same intentional, instructional motions that she used in this lesson in the future. These intentional, instructional motions include facial expressions, vocal variety, and circling or pointing to math concepts, as well as modeling thinking and using her gestures to show students they should pay attention to her, or they should be responding verbally or on their whiteboards. These areas are discussed in the following sections.

Nonverbal Behaviors in Math Lessons

Through viewing video clips from their math lessons and in conversation with me during the interviews, teachers came to a greater realization that verbal and nonverbal communication are not only linked, but essential for student engagement. Prior to seeing segments of their video recorded math lesson, teachers surmised ways in which they expressed themselves nonverbally in this, and other, math lessons. Teachers were provided with a list of nonverbal behaviors to compare to their knowledge of their own teaching, which aided in common language across all participants. This listing of nonverbal behaviors is included in the interview questions (see

Appendix C). These particular nonverbal behaviors and their impact on the structure of the lesson as well as students are included in these findings for their preconceptions and realizations.

Mrs. Zale: Initial reflections. Mrs. Zale is aware of multiple verbal and nonverbal behaviors she regularly uses in her math lessons. Examples include the use of her hands to show the sizes of things or separating students and objects into smaller groups. She also uses movement across the front of the room for management purposes as well as to physically demonstrate examples (such as how to move on a number line). Mrs. Zale said she knows she fluctuates her voice from loud to softer or higher to lower to indicate to students something is very important. Mrs. Zale also shared that very few pieces of her lessons are intentional. Those intentional pieces include planning and asking students to come up to demonstrate, while unintentional parts seem to be related to her movements across the classroom and modeling surprise and thinking by using her facial expressions.

Mrs. Zale shared that most of the physical, nonverbal pieces she exhibits in her lessons are not planned. Before she started her teaching career, these types of nonverbal behaviors were not natural elements in her lessons. Almost like an evolutionary process, Mrs. Zale began incorporating nonverbal behaviors over time. She stated that she likely thought more about incorporating them into lessons in her first years of teaching, but now they are typically spontaneous. Her nonverbal behaviors seem to arise out of classroom situations where they naturally occur, such as time spent working with students during instructional time. I asked if she would change anything if she were to reteach this lesson. Mrs. Zale said she would have visually laid out the reverse fact families prior to the lesson explanation, and then discussed the fact families with the numbers zero and one. She does not plan to change her currently-used nonverbal immediacy behaviors.

Mrs. Zale said she uses some nonverbal and visual examples, or strategies, because they work for her and she also hopes they work for her students. During this particular lesson, Mrs. Zale knows she communicated verbally, visually, and nonverbally. When reflecting on this lesson, Mrs. Zale stated she was surprised when her students did not seem to recall the concepts from the previous day and also felt frustrated when she "messed up" her notes for the lesson. She also stated that the students got stuck on the concept of repeated subtraction while they were brainstorming known-strategies. Because of this, they got off track and didn't recall the other strategies from the lesson the day before.

Mrs. Zale mentioned that the way she visually and physically sets up her lessons for student participation or on one of the classroom whiteboards is typically reflected in students' assignments. At times, this can be limiting to students because they do not always try their own way of doing things. They may only use the examples provided in the lesson. Mrs. Zale stated that, as each year has gone by, students seem to need more and more nonverbal elements and variety incorporated into daily lessons. She has learned and utilized these elements through necessity, but also sees their value as being part of everyday lessons. During a lesson, Mrs. Zale continues with her nonverbal behaviors if they are working, or changes them if students are not engaged.

Mrs. Zale: Realizations. When the first video clip of her math lesson was shown, Mrs. Zale commented on her use of hand gestures to model repeated subtraction. She thinks she incorporates gestures such as these because she is a visual person. She can see the repeated subtraction in her own mind and hopes that idea transfers to her students as well. Some of these gestures are unintentionally used, but she still believes they can be effective for teaching math concepts. As briefly stated in theme three, Mrs. Zale sometimes moves to one side of the

classroom to encourage students on the opposite side to pay attention. This movement is almost intentional, since her goal is to regain students' attention, but she stated she does not always know she is doing this in the moment. While watching her video recorded math lesson, Mrs. Zale observed herself doing this. She commented that she is sometimes in the midst of teaching and finds herself on one side of the room or the other. While watching herself teaching from the classroom whiteboard, she commented that the physical placement of the word "divide" followed by physically erasing it was done for specific reasons. She wanted to show students that new strategies could replace old ones and help students think in different ways about math concepts.

At one point in the lesson, Mrs. Zale described her facial expressions as thinking very hard. She showed this while asking students to think of another word they could use instead of "divide". She knew her modeling of thinking was very intentional, but she did not know if this is something she typically does or if her voice usually sounds this way when she asks questions. Mrs. Zale also said she often touches her face when she is processing or thinking. Through watching another segment of her math lesson, Mrs. Zale observed that she indeed touches her face while modeling thinking. "I touch my face . . . often when I'm thinking, when I'm processing. I raise my eyebrows or open my eyes wide. Oh I didn't think about that. I pretend like I didn't think of something a lot. My goodness, I never thought of that." Mrs. Zale calls this lying intentionally, but in a constructive manner, to model for students that they are also to think about a problem. She did not initially realize how many nonverbal behaviors she exhibited through this modeling.

Continuing in our conversation about her nonverbal behaviors displayed during her video recorded math lesson, Mrs. Zale shared that she believes the use of nonverbal behaviors is tied to

how well teachers know their content, which is also connected to increased number of years of teaching. She also stated that the use of these behaviors comes more naturally as you have taught the lessons a few times. "So by now this lesson has been done so many times in my head and physically by my body that I have a stronger visual, I think, of what I see in my mind."

I asked Mrs. Zale how she thinks participating in this study will affect how many of her nonverbal behaviors she will notice in other lessons. Mrs. Zale commented that she will ask herself while teaching lessons in the future if her nonverbal behaviors are more helpful to her or to her students. She will determine if her instructional and non-instructional nonverbal behaviors are effective or not, just as she assesses students for understanding of the lesson concepts. Mrs. Zale pledges to continue to use these verbal, visual, and nonverbal elements in her lessons because they are and have been effective. She mentioned plans to use nonverbal gestures in her geometry unit, especially because the vocabulary lends itself to voice fluctuations in addition to large and small hand-arm motions to make the shapes.

Mrs. Kimball: Initial reflections. Mrs. Kimball shared that she uses "a lot of hand motions all day long" when she is talking. She knows she moves a lot and tries to be aware of using both sides of the classroom. She also puts forth a conscious effort to be animated and use different voices. Mrs. Kimball does know that she demonstrates a lot of nonverbal behaviors without realizing she is doing them. She performs them almost instinctually, just like Mrs. Zale. However, Mrs. Kimball did not know if she uses her forehead and eyebrows to model thinking during a math lesson, though she stated she uses it during reading instruction and when reading stories aloud.

Mrs. Kimball said she knows her students need to be actively engaged, so she cannot stand up in front and teach for great lengths of time. She also asserted that enthusiasm and

excitement shown in any subject area is contagious and catches students' attention. She described her use of songs and rhymes as a cognitive and linguistic way to engage students in learning science concepts and multiplication facts. "I feel that my students are more engaged in a lesson if I perform it more and act it out more." Mrs. Kimball also works to verbally and visually recognizes students who are following instructions during work times, as well as those who accurately solve problems or are using their strategies to find a solution. She said she really wants students to focus on a strategy if they do not recall how to solve a problem. Being actively engaged, or "hands-on minds-on", is her goal for every student.

Mrs. Kimball: Realizations. At the beginning of her first video clip, Mrs. Kimball noticed that she was standing way off to the side because she was not using the interactive whiteboard. On the days she uses the classroom whiteboard, she stands off to the other side. She stands on one side so students have a better visual of what is being displayed on one of the boards. In another section of her video, Mrs. Kimball gave students the instruction to take out their small whiteboards and then she used wait time before stating the first math story problem. Mrs. Kimball mentioned that she employs a lot of this waiting as well as displaying numbers on her fingers. Wait time also took place during her video recorded lesson when she was telling students various math problems, such as Max putting his toys into two bags. The use of specific phrases are intentionally stated and repeated in students' language for recall and understanding. In this example with Max and his toys, Mrs. Kimball her use of the phrases "put them into" alongside "divide them into" as a way to give students a key to solving such models, which will also encourage students to become problem-solvers.

When listening to how she used vocal variety for the Max story problem, Mrs. Kimball described her voice as going lower to get students ready to "key-in" to the example she was

about to give. In another video clip, I drew Mrs. Kimball's attention to her cadence while talking to the class. She shared that having speech and language students this year, who need to hear particular articulations enunciated, has brought a greater awareness of her vocal variety. Mrs. Kimball compared her read aloud cadence, or fluency, to a different tone of voice that she employs when trying to draw the attention of her students or verbally state a math problem. Mrs. Kimball laughed when seeing and hearing the enthusiasm she expressed with her arms up at shoulder-height when she asked her students if they were "ready to *shake* it up." She called herself a little cheerleader and said she likes showing excitement when she teaches. Mrs. Kimball did not realize she was doing this during this particular lesson, but said she was trying to set the stage for what was coming next.

We also discussed Mrs. Kimball's use of math nonverbal immediacy behaviors, described previously in Theme Three. In addition to writing the numbers and division symbols used in her examples on the board, Mrs. Kimball pointed to each part of the division set as she named them and reviewed the fact families with the class. I told her that verbalizing, showing, and then doing the work reinforces students' understanding.

Wielding objects instructionally or non-instructionally was a new vocabulary word for all six teachers. Mrs. Kimball did not know she used a marker when making a big sweeping motion with her arms to represent the size of a big number. While watching the video, she also realized that she spoke about the dividend, but didn't write that number inside the long division symbol. She was glad to hear and then see that she later added the number on the board. Mrs. Kimball sees herself continuing to use the nonverbal behaviors she has utilized in her future lessons. She said her lesson planning includes thinking through not just the material, but how she is going to present the information to reach each student. She will namely continue to include a lot of

pausing and dramatic gestures to catch students' attention and keep them on task. In addition, she will carry on with her vocal variety in all subject areas, especially for students with specific needs.

Mrs. Owens: Initial reflections. From the list I provided during interviews, Mrs. Owens identified a wide variety of nonverbal behaviors she uses in her daily lessons, including large and small hand-arm gestures, facial expressions, proximity, tone of voice, and making or avoiding eye contact. Mrs. Owens said she knows she uses some nonverbal elements in her lessons, especially using her tone of voice. She also mentioned that she probably smiles at students if they share a correct answer. When reviewing the ways in which she taught this particular math lesson, she mentioned she typically stands, and doesn't sit, during most math instructional time. She thought it might be easier to video record a lesson if she was sitting, rather than standing, which would result in her moving more. Mrs. Owens mentioned she has not been video recorded in so long that she wasn't sure what types of nonverbal behaviors she exhibited during her math lesson.

Mrs. Owens stated her students are visual learners a few times during our interview. Interestingly, she shared that she is an auditory learner. She not only needs to hear the information, but she also must verbalize it and put it into her own words before it is learned. Being able to see and talk about a new idea is essential for her understanding. When planning lessons, Mrs. Owens works with this knowledge of her own learning and teaching styles, coupled with knowledge of her students' learning needs.

Mrs. Owens stated she does not necessarily plan out every gesture she uses in a lesson. Similar to Mrs. Zale and Mrs. Kimball, she said they just emerge while she is teaching. In talking about learning to be an elementary education teacher in college, Mrs. Owens said she

does not recall actually being taught to use nonverbal behaviors during lessons. She said, "You noticed those characteristics in good teachers that you observe" and therefore are more likely to use them yourself in your own teaching practices. Mrs. Owens described it as something that she was drawn to. Because she observed it and could make a connection with these types of gestures, she could understand them a little better and apply them to her own teaching.

Mrs. Owens: Realizations. In her initial video clip, Mrs. Owens was explaining that prisms have two bases. Each time she said the number two, she held up two fingers. When asked, Mrs. Owens did not think this pairing of her spoken words alongside large and small hand-arm motions is something she plans ahead of time. She also was not aware that she does this while teaching, because it has not been something she has previously considered when planning or teaching lessons. In discussing other large or small hand-arm motions, Mrs. Owens thought that using her arms to show the three dimensions of each solid shape clarified the concept for students. She said they had a better understanding of what length, width, and height meant in relation to these solid shapes.

Mrs. Owens also did not realize her voice level had dropped when telling students to not worry about spelling their math vocabulary words. She stated her change in voice was because she wanted to give them more information without distracting them from writing and working on their individual whiteboards. She also enunciated and emphasized several key vocabulary words when talking to students about the sides, angles, and vertices of the three-dimensional nets and solid figures. In reflecting upon these types of voice level changes, Mrs. Owens realized that she did not plan it ahead of time but knows why she did it in that moment. She commented that people naturally change their voices to reflect a different purpose, or focus, while in conversation with others. Teaching can be a like a conversation with your students about a specific topic.

Upon listening to her statement to students about writing the name of a three-dimensional solid instead of drawing a picture of it, she realized she should have told them to try drawing it. Mrs. Owens has stated before that her students are visual learners and this would be a time to use that strength, especially because they do not always like to take risks. Encouraging them to take a chance could have helped them learn something new about three-dimensional solids, enable them to use their visual strengths, and attempt new skills.

Mrs. Owens stated she often has markers or pens in her hand while teaching, and will likely continue to wield these objects instructionally or non-instructionally in future lessons. She also says she crosses her arms often, especially when listening to students' responses, but does not think this will distract most students. Through participating in this study, Mrs. Owens' level of awareness of her nonverbal behaviors has been raised. She realized her actions or words could detract from the lesson if they are too pronounced or too loud.

Mrs. Owens will also use "Any movement that keeps kids focused or engaged without getting out of control! It could be anything that helps paint a picture of what I'm trying to teach." Reflection upon the format of her math lessons, she knows she needs to work on having students turn and talk to their neighbor more often. She said it is more natural for her to include this conversation piece in subjects such as reading, health, science, and social studies. Utilizing it more in math will give her students verbal and nonverbal opportunities to explain their thinking to peers to more deeply engage with the content. Mrs. Owens ended by saying she realizes now that she does employ nonverbal behaviors to clarify and redirect. Her next step is to plan purposefully to implement more nonverbal immediacy behaviors in her lessons in all content areas.

Mrs. Randall: Initial reflections. Mrs. Randall feels she is very animated during her lessons because she incorporates singing and dancing. She knows she talks with her hands, so large and small hand-arm motions are things she naturally does. Mrs. Randall also feels she does a good job with using hands-on materials in her math lessons to aid in student understanding and engagement. When talking about proximity, Mrs. Randall said she is always in and amongst the students; she does not ever sit at the front of the classroom while teaching. She was previously aware of modeling thinking in her reading lessons and smiles most of the time in each subject. She also hopes she portrays a normal facial expression and tone of voice. Mrs. Randall said, "I hope I'm not frowning, but I don't know that I'm always smiling."

Prior to watching her video recorded math lesson, Mrs. Randall could not recall if she had changed the level or tone of her voice, but she knows at times she whispers to her students and has a louder voice when reading aloud. She works to maintain eye contact with students throughout the lesson to determine who understands and who is struggling with the concepts. In this lesson, she stated that she experienced frustration when the students did not catch on immediately to some of the concepts. Mrs. Randall did recall, however, that students learned there are three different types of angles and discovered that triangles have three angles inside them. To bridge this gap between misconceptions and realizations in future lessons, Mrs. Randall would give students more discovery time with their polygon shapes at their desks. I asked if she has seen students repeating gestures she, or they, have done in class. Observing students use gestures outside of lesson instruction was not something she has previously thought about, but decided that she has observed students repeat gestures, songs, and actions they have done when learning information for various subjects.

Mrs. Randall: Realizations. At the start of her video recorded math lesson, Mrs. Randall noticed she gestures with her hands while talking, even when she was walking around the classroom and not instructing the entire class. She commented that her hands were moving the entire time she was talking. For example, Mrs. Randall spoke about putting four-sided polygons into different groups. Her right hand went into her left hand when saying, "Putting groups in, taking groups out." These motions were small, instructional hand motions. Specifically, this type of gesture modeled the math concepts for students through verbal and visual ways, building understanding and engagement.

Other non-instructional movements included wielding her glasses. Mrs. Randall especially took note of the great number of times she put her glasses on and took them off. At times, she used them for reading purposes, she folded and unfolded them, or clipped them onto the front of her shirt. Other times, they spun around in her hand while she talked and gestured. Mrs. Randall wondered aloud if this behavior was distracting for students, especially those that sit in the front row. She said such behaviors might be even more distracting for students who sit in the front row; these are oftentimes students who have the greatest difficulties staying focused. She said she would be more cognizant of such non-instructional behaviors in upcoming lessons. Mrs. Randall stated her participation in this study will not only benefit her in learning about instructional and non-instructional nonverbal behaviors, but will positively impact her students and her student teachers in turn.

When a student answered a question correctly, Mrs. Randall immediately noticed the look of surprise on her face. Her mouth made the shape of an "o" and her eyebrows and forehead went up. Although she did not know her facial expressions looked like this while she was teaching, she knows she reacted because this student had said something she wanted him to

say. Mrs. Randall was also aware of using her hands during the lesson to show "groups" and to show an "L" shape while talking about polygons and triangles. She guessed she was using her hands to display these math concepts because she is a very visual person. She needs visual elements for herself, so naturally tends to use such motions while teaching others.

Mrs. Randall was not aware of using her hands to show the movement of in and out or displaying and counting numbers such as one, two, three on her fingers. A few times her fingers wiggled while holding up a number. Mrs. Randall knew she was holding her fingers up to display the number of sides on a triangle, but did not know she was moving them as well. Mrs. Randall commented that her use of fingers in this lesson was akin to sign language. This section of her math lesson continued with drawing an invisible triangle in the air immediately following the discussion of a triangle having three sides.

Mrs. Randall used vocal variety to emphasize key words during instruction. "What about if it's an *obtuse* triangle? Anybody have an idea? Can it have *one* obtuse angle? Two? Three?" In another video clip, Mrs. Randall immediately noticed her hand motions and her facial expressions when asking students how many congruent sides an isosceles triangle has. When calling on a student, an incorrect response was given. She showed a reaction on her face and commented to me that the student could tell it was the wrong choice. Mrs. Randall recalls making this face because is because it is something she often uses to show students if their answers are correct or if they need to consider a different option.

Mrs. Randall noted that she felt discomfort during her lesson because she knew she was being video recorded and her students did not understand something she had thought they would. She also observed her hands were constantly clasped in the front of her body, usually holding her glasses, because she felt self-conscious about her weight. Teaching in front of and working with

her students each day does not cause this same feeling of unease, but knowing the video camera was taping her changed her nonverbal mannerisms. Because of this unease, Mrs. Randall said she likely had fewer hand gestures because of her hand and arm positions. She also recalled her mouth feeling dry because of feeling nervousness being video recorded. I was not present in the classroom during any of the video recorded math lessons because I did not want my presence to have an adverse effect on the students or the teachers. I knew the video camera was going to be somewhat of an intrusion because it is not part of the regular classroom environment. As three of the teachers mentioned, being video recorded and viewing the results are not commonplace for most teachers. Mrs. Randall shared with me that she has never been video recorded in her entire teaching career, although she was happy to participate and interested to know my findings.

Through her participation in this study, Mrs. Randall learned the difference between instructional and non-instructional motions. She is also more aware of her facial expressions, vocal variety, and demonstrating certain small hand motions and wielding of her glasses without realizing it. Mrs. Randall knows her presence in front of the room and interacting with students at their desks affects student engagement. She is hoping her nonverbal immediacy behaviors will help students pay attention and make lessons more interesting for them. Mrs. Randall hopes to be more aware of her actions that she already incorporates into her lessons and will intentionally use them for visual and instructional student gains. Because she is aware of using thinking aloud strategies in reading class, she stated she will especially begin this when teaching math story problems, which require higher-level thinking as well.

Mrs. Tanavo: Initial reflections. Mrs. Tanavo is aware of using her hands a lot when she talks. She knows she points to examples already written on the board during her lessons. For example, when reviewing terms, she pointed to each in the order in which it was learned or

discussed. Mrs. Tanavo also knows she uses a "high five" attention-getting technique to indicate students should either raise their hand to answer a question or quiet their voices when she counts from five down to zero.

In this lesson, Mrs. Tanavo recalled repeatedly reviewing the body gestures they had learned alongside lines, line segments, and rays. Mrs. Tanavo stated that she is aware of using hand and arm gestures such as these, but does not know that it is always intentional. In conversation about the use of gestures alongside spoken explanations in math lessons, or math nonverbal immediacy behaviors, Mrs. Tanavo said she believes employing multiple instructional pieces (such as showing and explaining examples in addition to the use of gestures) gets students engaged. "Not everything in math really lends itself to a gesture." However, Mrs. Tanavo consciously uses body movement when teaching geometry, as in this lesson. Although she said it is not as easy, she also uses hand gestures in other math concepts such as mean, median, mode, and range.

Mrs. Tanavo was unsure about changes in her tone of voice or facial expressions, such as smiling or modeling thinking by raising her forehead and eyebrows. In our interview, Mrs. Tanavo said she did not think it was likely that she used a great deal of vocal variety in this particular lesson due to the strictly note-taking format. Just as math nonverbal immediacy behaviors depend upon the topic, she also stated that her facial expressions and vocal variety depend on the lesson format she is using.

When talking about eye contact, Mrs. Tanavo mentioned that she scans, or looks out at each group to determine their engagement and to show students she is actively observing them while they work. Although she could not name when she employs nonverbal immediacy behaviors such as vocal variety, facial expressions, and gestures, she hopes they are positive and

engaging when used. She also said that she hopes she smiles and uses her facial expressions to model thinking.

Although she knew she did not incorporate it as much in this particular lesson, Mrs. Tanavo also urges students to do more thinking about math than just recording vocabulary words, definitions, and examples. Students' desks are arranged in groups of four so they are able to talk about their ideas with their group before they share as a whole class. Mrs. Tanavo believes this talking in small groups gives students opportunities to share their ideas with one another. While students are discussing in groups she walks around to encourage students to do what they have been instructed to do. This proximity also enables her to hear what they are saying and allows her to assess their understanding.

Mrs. Tanavo: Realizations. When watching her video recorded lesson, Mrs. Tanavo noticed right away that she does vary her voice and emphasizes words more than she initially thought. When reviewing math terms during the lesson, she had asked students, "How many *spaces* are in a *number* that's to the *ten millions place*? Ten millions place. How many *spaces* is that?" I brought Mrs. Tanavo's attention to the immediacy behaviors she used when pointing to the number of blank spaces she wrote on the board for a number in the hundreds place. This was done so students would then transfer this to a larger number in the ten millions place value. She later wrote the correct number of blanks for the ten millions place number and pointed to each period, cementing the idea for students that there are individual digits as well as periods in a large number.

Another realization came when Mrs. Tanavo watched herself write on the whiteboard at the front of the classroom. She commented that she does not think she should face the board as much during future lessons. However, she doesn't know how to write on the board and not turn

her back on the students. This video segment also caused her to wonder if writing words and terms on the board during the lesson is more effective than having them pre-written and accessible on the interactive whiteboard. Mrs. Tanavo was facing the board when saying "good job" to a student for sharing an answer. She commented that she was smiling while saying this. Even though you could not see her facial expression, she commented that you could hear an upbeat tone in her voice.

Instructionally, Mrs. Tanavo did not realize she was saying the number two and holding up two fingers simultaneously. She remarked it is probably a good thing that she combined these elements even though it was not planned. It appeared to be a natural gesture for her and likely adds to student engagement and understanding. After telling students to contemplate what a ray's endpoints would look like, she repeated the phrase "Think it in your head" four times. Immediately upon hearing this, she said that she absolutely varies her voice, even though she was not as aware of this beforehand.

During the lesson, a student raised her hand to ask if it the new geometry term "ray" was the same thing as an "array". Asking for another student to state the difference, Mrs. Tanavo repeated this student's explanation of using dots while pointing with her index finger to imaginary dots in the air. This nonverbal pairing was a surprise to Mrs. Tanavo, but also understood it to be another one of her natural tendencies to demonstrate what she teaches. Overall, Mrs. Tanavo said she used more gestures in this lesson than she had originally intended to use. Some were gestures she was planning to use the following day, but she displayed them without realizing it in this lesson.

Non-instructionally, Mrs. Tanavo knew ahead of time that she tends to fidget with her lanyard and keys. This is something she tells her students at the beginning of the school year so

they are aware of this. Mrs. Tanavo also welcomes students to have their own object to fidget with if it helps them focus during lessons. After watching the video, Mrs. Tanavo was reminded of playing with a whiteboard marker in her hands while walking around the classroom, waiting for students to finish writing in their math booklets. She also noticed using her hands non-instructionally while pacing back and forth across the front of the classroom. She hopes these examples of non-instructional wielding of objects and hand motions are not distracting to her students. We discussed it is possible that making her students aware of her fidgeting allows them to ignore these nonverbal behaviors. We also talked about her wielding of a marker may be part of her teaching routine, so it is not noticed by students. Also, if students are engaged in the lesson, they may not pay as much attention to non-instructional wielding of objects.

When I asked which nonverbal behaviors she will continue to use, Mrs. Tanavo stated she would continue to use her "high five" management signal and gestures in geometry. She also plans to use more intentional, instructional gestures in future lessons. Mrs. Tanavo mentioned her interests were piqued when I asked her to participate in this study on how teachers communicate during math lessons. During our interview, she also commented that her self-awareness of her nonverbal behaviors was limited. Through our conversation, Mrs. Tanavo and the other teachers also had opportunities to learn more about the background of nonverbal immediacy behaviors, especially in connection with teaching mathematics.

Mrs. Paxton: Initial reflections. Mrs. Paxton plans her lessons to be very similar in format to give her students the familiarity and routine that they need. Because students need routine, she also keeps her communication methods similar from day to day so her students know what to expect and also get to know her style of communicating. Mrs. Paxton stated that she knows facial expressions are an important nonverbal type of communication. Mrs. Paxton said

she is definitely not a monotonous type of a person; she frequently varies her voice from louder or softer to higher or lower. She also knew she incorporates verbal encouragement so students will share examples that relate to a given lesson. She commented that she uses her hands nonverbally to get students motivated for the lesson by pointing to examples on the board or holding out her hands palms-up to students, indicating it is their turn to think about and then respond to the lesson.

Mrs. Paxton's initial reaction to being questioned on her use of smiling was that she felt she smiles at her students most of the time. Then she added that she hopes this is what she expresses to them. When asked if she would change anything about this lesson if she were to teach it again, she initially responded quickly with "no." After thinking for a moment, she stated that after having the opportunity to watch a video recorded of the lesson, she was certain she would find things to change. At the end of a lesson or activity she reflects upon which students did not participate as much, or who she could have interacted with even more to engage them in their own learning. This reflection also includes consideration of other real-life examples she could use alongside math concepts in future lessons.

Mrs. Paxton commented that her lesson format is similar from day to day to encourage familiarity and routine for her students. Because of this, she thought her lesson communication methods would also be similar from day to day. Each day she begins her lessons with writing examples on the classroom whiteboard, and then allows time for students to also write. She said she is aware of her physical movement around the room while students work during this writing time. Movement is also incorporated when she is trying to get the students excited and motivated for the lesson. When students are working at their desks or with partners, she walks around to look for examples and understanding of the lesson. She stated: "Sometimes that close

proximity . . . kind of portrays that . . . I want to see how they're applying the mini lesson and how they are grasping what I'm teaching."

Mrs. Paxton knows she uses her hands to point to things written on the board and examples provided in the math video. She also circles invisible things in the air while explaining math concepts in the hopes that students' eyes follow her gestures. This pointing indicates to students that the information is important to pay attention to and absorb. Instead of hoping students are listening and following along to strictly verbal explanations, the addition of visual elements encourages student engagement. Mrs. Paxton described modeling respect to students through her use of eye contact with them when she is teaching as well as when she is listening to students verbally engage with her. She stated that tone of voice is very important. If students feel they are part of a calm environment, their learning will positively be impacted. Incorporating laughter is another way Mrs. Paxton provides the type of environment that fosters student motivation and engagement.

Mrs. Paxton also knows she verbally encourages the students to share their own examples. She smiles and verbally praises them for participating through sharing with partners and the class in addition to writing on their individual whiteboards. She wants her students to visually see she is excited to promote motivation for them. Mrs. Paxton described putting her palm up and gesturing toward the class to signal to them that it is their time to think and then respond. She also spoke of incorporating conversations about the math topic and real-life examples into her lessons to foster student motivation and engagement.

Mrs. Paxton: Realizations. Upon watching the first video clip of her math lesson, Mrs. Paxton noticed that her tone of voice definitely changed. She thought she was doing this to get students interested in the lesson. She also noted that she did not previously realize how much

she uses her hands. Her hands were not just pointing at the board, but they were constantly moving and pointing. She commented that part of it is her teacher presence to get students motivated to pay attention, but it is also nonverbal behaviors that help them stay engaged. When she described examples of fractions, the space between her hands was getting larger as she talked about pizza and smaller when she was pointing to an example on the board.

When Mrs. Paxton was waiting for students to write or to answer a question during this lesson, her hands were still and in front of her body, to signal that she was waiting for them to think or respond. She had not realized she showed this with her body movements while she was giving students time to consider a problem. Mrs. Paxton commented that her students need time to process, so she was giving them time to think and write on their boards. Similar to other teachers in this study, Mrs. Paxton said her students are visual learners. She also believes that teacher presence is a big part of the classroom climate. She commented that teaching is more than what you are saying and how you say it. "If your hands are going, and you're moving around the room, I think all of that plays into motivation, and how kids are excited to be there, and excited to learn because of how you're presenting yourself."

In another segment of her video, Mrs. Paxton reflected upon her earlier comment that she thought she smiles and does not show an angry or mad face when teaching. What she observed herself doing was wrinkling her forehead when demonstrating she was thinking very hard about a math example while asking students to do the same. She remarked that if she is modeling this type of thinking, it hopefully indicates to students that it is important for them to think about it as well. She also noticed that she used her hand to physically and visually cut a pizza into fourths in the air when talking about fractions. She stated "numerator" and "denominator" and gestured

in the air to an invisible number on the top and bottom, respectively. She followed this example with doing the same types of gesturing to connect mixed numbers and improper fractions.

Now that she is more aware of her own nonverbal behaviors, Mrs. Paxton thought she would continue with her current model of teaching. Although she could see nonverbal immediacy behaviors being using in multiple content areas, she stated that more would likely be used in math. In the future, Mrs. Paxton said she will also be more aware of using her forehead and eyebrows to model thinking as she continues to challenge her students to think on their own. Because students are so visual, the pointing and circling, or other gestures, are crucial for student learning and engagement. A final comment Mrs. Paxton made was regarding her teacher personality. Her natural tendency of being excited and positive with her students will naturally continue to be a part of her future lessons, whether or not she plans ahead to incorporate these things into her lessons or they naturally arise while she is teaching.

Themes Conclusion

In the thematic section of Chapter IV, I provided descriptions of the four themes that emerged from the analysis of teachers' video recorded math lessons and one-on-one interviews. Descriptions of each teachers' classroom environment and math lesson elements, as well as descriptions of the verbal and nonverbal behaviors exhibited during their video recorded lessons show a wide range of teaching styles, lesson formats, and displayed instructional and non-instructional behaviors. Through interviews with each teacher, I discovered that key elements of elementary teachers' nonverbal behaviors during mathematics instruction include more than the use of nonverbal immediacy behaviors paired with teaching of mathematics concepts.

I also found student engagement to encompass more than including math nonverbal immediacy behaviors alongside math concepts. The inclusion of establishing a classroom

environment and routines with instructional elements prepare the way for the use of math and other nonverbal immediacy behaviors during instruction. Finally, interview conversations with these teachers in grades three, four, and five showed that each teacher's knowledge of her instructional and non-instructional nonverbal behaviors varied from person to person. A commonality across teachers was the idea that they do not necessarily plan out every gesture used in a lesson. In this study, teachers discussed that their familiarity with the lesson topic, as well as knowing their students, were important factors that contributed to their displayed nonverbal behaviors. Teachers' self-perceptions and later realizations showed they are aware of many, but not all, nonverbal behaviors they exhibit during instruction. Factors pertaining to teachers' self-awareness may include the math concept to be taught, lesson format, and even confidence in teaching and knowledge about a particular topic.

CHAPTER V

DISCUSSION

The purpose of this study was to describe teachers' instructional and non-instructional nonverbal behaviors as well as teachers' perceptions of the impact of such nonverbal behaviors on student engagement. The research questions guiding this study were:

1. What do teachers' nonverbal immediacy behaviors look like in the classroom during academic instruction in math?
2. How do teachers describe their own nonverbal immediacy behaviors?
3. What are teachers' perceptions of their nonverbal behaviors on student engagement?

This study was approached through a qualitative, phenomenological research design. Spiegelberg (1984) explains that phenomenology is an inductive, intuitive, and descriptive research method whose goal is to describe common human experiences as they emerge from the data. The construct, immediacy, is used in this study to describe teachers' nonverbal behaviors during math instruction. The outcomes of the study were aimed to determine teachers' self-awareness and realizations of their use of such behaviors during math instruction. The connection between teachers' perceptions of their nonverbal behaviors and their impact on student engagement was also investigated. The four themes that emerged from analysis of the video recorded math lessons and interviews are:

1. Classroom Environment and Instructional Elements
2. Math Nonverbal Immediacy Behaviors, Math Concepts, and Real-life Examples
3. Student Engagement

4. Teachers' Reflections and Realizations

The four major themes, which emerged from data analysis of teachers' interviews, were clustered into two groups. The first group recognizes classroom elements, such as instruction and the classroom environment (Theme One), alongside elements that lead to student engagement (Theme Three). The second group examines teachers' reflections and realizations of their displayed instructional and non-instructional nonverbal behaviors (Theme Four) using the format and other instructional tools utilized while teaching math lessons (Theme Two). In this chapter, I state and discuss two assertions derived from thematic data analysis and relationships within the conceptual framework of phenomenology.

Assertion One

The first assertion derived from thematic data analysis was, "Student engagement during math lessons is interdependent with teachers' nonverbal behaviors." Figure 4 visually shows each element of Themes One and Three that relate to establish the notion that each of the elementary teachers in this study demonstrated background knowledge on both the curriculum and their students (Assertion One). Figure 6 lists specific elements from each teacher's interview that align with Themes One and Three. The relationships between Themes One and Three comprise Assertion One.

Phenomenological research is a process by which several individuals' lived experiences present a common theme, or phenomenon (Creswell, 2011). Assertion One shows teachers' commonalities when including lesson and instructional tools, knowledge of their students' needs as well as abilities to determine areas of strength and struggles, using motivational elements to gain and keep students' attention, and knowledge of their own use of verbal and nonverbal

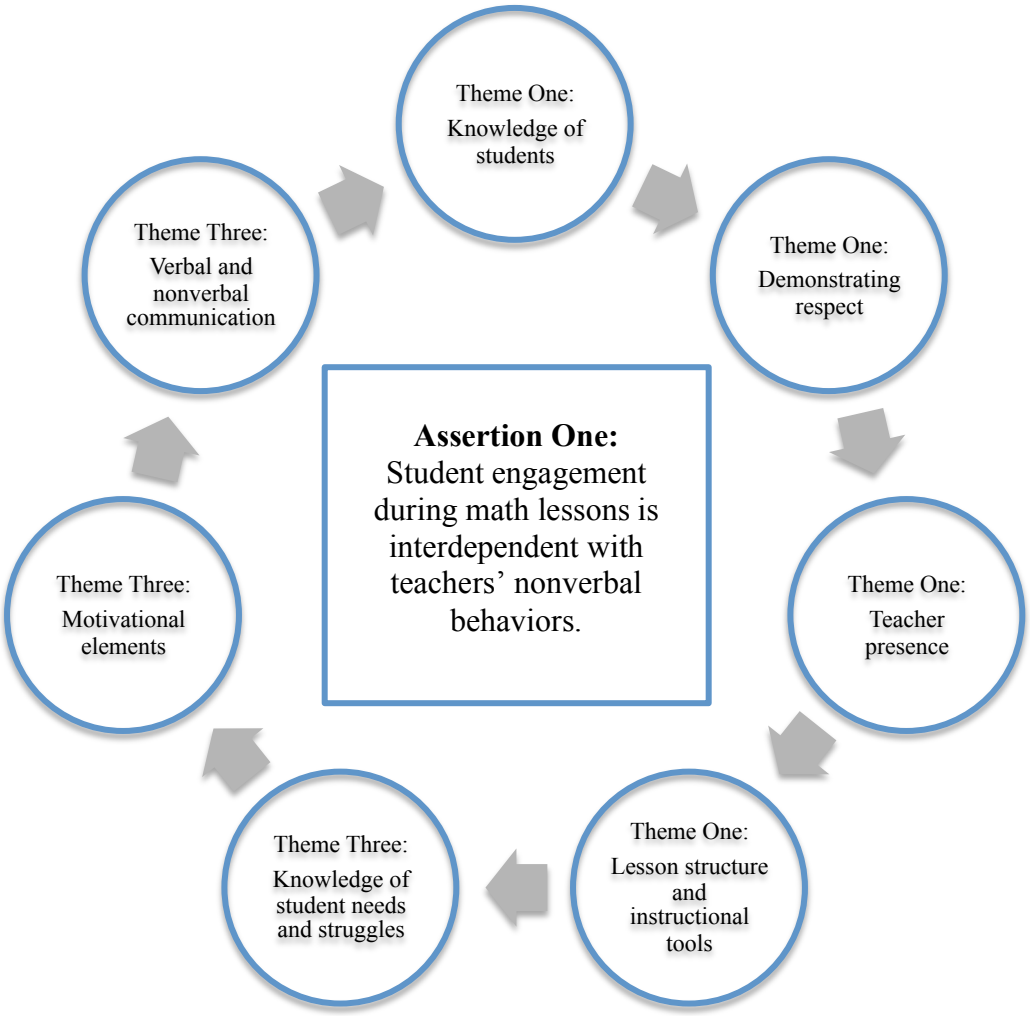

Figure 4. Elements of Assertion One that show the connections between Theme One and Theme Three that lead to the phenomenological understanding of the curriculum and students.

behaviors in their lessons (see Figure 5). Interconnections found between the features of Assertion One have raised the phenomenological idea that familiarities with available instructional resources allow teachers to concentrate on students' needs and struggles within the classroom environment.

Teacher Presence

Although only explicitly stated by Mrs. Paxton, a teacher's presence affects the classroom environment in ways that the teacher may not realize. How a student feels about

being at school can directly impact his or her engagement. In Theme One, Mrs. Paxton correlated her excitement while teaching with students' engagement and motivation as well as demonstrating respect for one another. All of these factors were tied to her teacher presence. Three of the teachers mentioned their teacher personality when describing their own nonverbal behaviors, such as "talking with their hands." However, ways in which their personality and presence affect students was not a topic of discussion for most. A teacher's encouraging presence in the classroom can lead to feelings of positive self-concept (Leflot et al., 2010) when combined with teachers' verbal and nonverbal communicative acts during instruction, ways to engage and motivate students, understanding students' needs and struggles, and familiarity with the lesson structure and instructional tools.

Lesson Structure and Instructional Tools

The teachers in this particular elementary school have a common curriculum and instructional tools for teaching mathematics. Each classroom also has an interactive whiteboard for use during their lessons, such as presenting the math curriculum video for each lesson, displaying images that correspond with each lesson, and using interactive whiteboard software to draw, create, and otherwise manipulate text and objects. These common instructional tools were reflected in Theme One through teachers' video recorded math lessons and descriptions of typically used lesson components. Each teacher used the classroom whiteboard in her lesson, and three utilized the interactive whiteboard as well. Two of the teachers said this particular lesson was slightly different in format from their usual structure, but other typical components were used during their video recorded lesson.

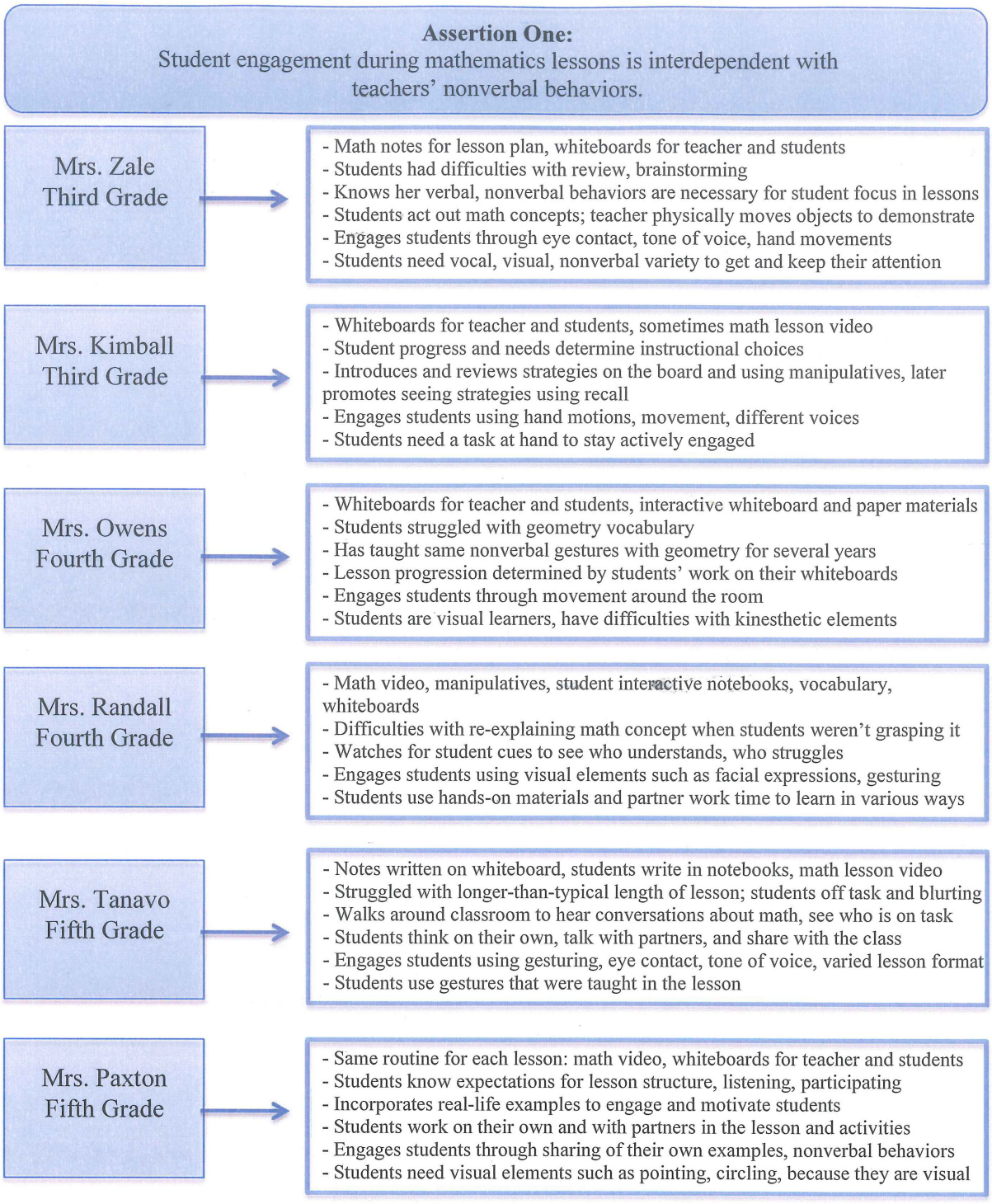

Figure 5. Assertion One: Teachers' collected responses that show commonality based upon background knowledge of the curriculum and students.

Through our interview conversations, each of the teachers discussed the fact that students' needs and learning styles drive their use of the traditional whiteboard or the interactive whiteboard. The lesson topic also determines what types of manipulatives, whole group and student partnership activities, and nonverbal immediacy behaviors were employed. Familiarity with the curriculum and available instructional tools allows teachers to focus on their delivery of the content and student understandings during a lesson. Mrs. Zale spoke about her years of experience as a teacher, number of years in her grade level, and knowledge of working with this current math curriculum. This familiarity gives her more time to become acquainted with individual students' struggles and needs. Ambady and Rosenthal's (1993) study on "thin slices" of nonverbal behavior show high accuracy when individuals rate strangers' nonverbal gestures. If teachers have opportunities to spend extensive amounts of time with their students each day and throughout the course of a school year, they have great potential for interpreting students' struggles and needs. In a typical classroom, and as described by the teachers in this study, interactions with students include observation of student work, peer interactions, and nonverbal behaviors exhibited, as well as verbal conversations held between teachers and students.

Knowledge of Student Struggles

As stated in Theme Three, four of the six teachers indicated their students experienced difficulties with a part of the math lesson. Mrs. Zale and Mrs. Owens' students had problems when trying to recall terms and examples from the previous day's lesson. Mrs. Randall's students did not immediately grasp the idea that angles cannot have three obtuse angles, and she found it challenging to re-explain several times. Mrs. Tanavo's students had difficulties staying focused and on task due to the quantity of material covered and the length of the math lesson. Through our interviews and the foregoing examples provided, each of the six elementary

teachers expressed overall knowledge of their students' needs, struggles, and understandings (Theme Two). The teachers in this study promoted Leflot et al.'s (2010) supportive relationship theory through their reactions to students' responses, the respect they demonstrated through each situation (Theme One), which are derived from teachers' awareness and knowledge of their students. Alibali et al.'s (1997) study on children's use of gestures while explaining problem-solving strategies indicated that teachers can gather information from the children's hand movements, not just from their spoken expressions. When teachers get to know their students' mannerisms and have face-to-face conversations with them, the result is a greater understanding of the students' overall feelings about and understanding of the lesson.

Knowledge of Student Needs

Student needs (Theme Three) is another facet to this overall knowledge of students. Mrs. Paxton specifically spoke about keeping her lesson routines the same from day to day. In her research, Avni-Babad (2010) found that routine situations promote feelings of well-being, safety, and confidence. This routine setting was exemplified in each classroom when teachers articulated their use of lesson materials (Theme One) and expectations for listening and engaging in the lesson through whiteboard work (Theme One). In addition, routine situations were also promoted by teacher presence through observations (Theme One), teacher and student conversations with others (Theme Three), as well as expectations for using manipulatives and games (Theme One).

Each teacher spoke of her typical format for teaching math lessons. While Mrs. Owens and Mrs. Paxton typically use the math lesson video, other teachers may or may not incorporate this specific element in their lessons. Mrs. Randall works to include hands-on pieces while Mrs. Zale incorporates movement. Each teacher has students share with partners or with the whole

class to help identify student understanding and needs related to the lesson topic. Overall, intentionally embedding a familiar lesson structure and use of lesson materials, as well as sharing expectations for instructional and partner or work time, prepares students for success, while indicating a great awareness of student needs.

A prominent point that all of the teachers made was knowing their students' learning styles and what students need to stay focused and engaged during each lesson. Frymier and Houser (2009) and Houser and Frymier (2009) found teachers' communication skills are significant predictors of students' motivation and learning and that "communication between teachers and students is relational as well as content driven" (Frymier & Houser, p. 215). Supporting the purposes of this study as well as the findings that have established Assertion One, students' engagement, as related to motivation, is the focus.

Motivational Elements

Frymier and Houser (2009) indicate that teachers who explain concepts clearly facilitate understanding. The teachers in this study worked to do this through observing students' working independently and in partnerships. Teachers also incorporated interactive pieces during instruction and encouraged students to verbally and physically engage in learning activities. For example, Mrs. Zale had five students come to the front of the classroom to physically divide themselves into smaller groups. Mrs. Randall's students used manipulatives with partners to classify the sides and angles of polygons. Mrs. Tanavo wrote vocabulary terms, definitions, and examples on the classroom whiteboard. Her students copied these into their own geometry booklets. Mrs. Owens, Mrs. Kimball, and Mrs. Paxton's students used whiteboards at their desks to write and solve problems during the lesson.

Mrs. Paxton spoke the most about including motivational elements in her lessons, many of which can be applied to the other teachers' lessons. For example, including real-life examples from her life encourages the students to pay attention to and apply the math lesson each day. Mrs. Paxton also asks students to share examples from their own lives, which motivates students to engage in their own learning and grasp the concept in a different way. Each of the teachers' interactive learning situations allowed teachers to immediately observe and assess student engagement which, as stated by Frymier and Houser (2009) and Houser and Frymier (2009), leads to student motivation and thus, student success. Mrs. Paxton also stressed showing students her excitement through her facial expressions, tone of voice, and body language while teaching and interacting with the class.

Student Engagement and Student Needs with Verbal and Nonverbal Communication

Leflot et al.'s (2010) research supports the notion that individuals who have supportive interactions with others experience feelings of positive self-concepts. Kronenberg and Strahan (2010) write: "Students who reported the most positive levels of support from teachers demonstrated higher levels of effort, attention, and persistence" (p. 78). Each teacher mentioned components they integrate into their math lessons to meet student needs and actively engage students in the lesson through the use of verbal and nonverbal communication methods. These components can result in student success, which lead to feelings of positive self-concepts. Stanulis and Manning's (2002) nonverbal elements (including tone of voice, facial expressions, and eye contact) were observed and discussed in teachers' interviews. Hennings and Grant's (2001) hand-arm movements and whole body movements were also observed and discussed when promoting student engagement. Sfard's (2009) instructional gestures apply to each nonverbal immediacy behavior mentioned herein.

Mrs. Zale stated she engages her students through eye contact, her varied tone of voice, and hand movements while she is talking because she knows they need vocal, visual, and nonverbal variety. She explained that her intentional use of these features is a signal to students that what they are learning is something new or important. It also catches and maintains their attention throughout a lesson. Like Mrs. Zale, Mrs. Randall said she uses her hand motions, physical movement, and different voices in the same manner. She shared that her students need a task at hand to stay actively engaged. In her video recorded lesson, Mrs. Randall used her entire body in a dramatic way and put emphasis on various words while verbally stating division story problems. She also spoke about particularly using her facial expressions and voice to indicate to students whether their answers were correct or if they needed to try again.

Mrs. Kimball and Mrs. Paxton also displayed these types of expressions when their students were working on whiteboards at their desks. In addition to her facial expressions, Mrs. Randall spoke about her use of gesturing to engage students. Mrs. Owens' students are visual learners, so she said she engages them through whole body movement around the room. This strategy can include her nonverbal behaviors as well as students acting out gestures for length, width, and height of three-dimensional solids or other math concepts. Mrs. Tanavo stated that she intentionally incorporates gesturing, eye contact, and tone of voice to help her students focus on the information being taught. Mrs. Paxton engages her students through the sharing of their own real-life examples and her use of nonverbal behaviors whenever possible.

Teachers' deliberate inclusion of verbal and nonverbal communication elements can simultaneously meet students' needs and engage them in learning. They can also indicate to students that their work and participation are valued. Benzer (2012) writes: "Body language is a comprehension and communication tool via physical movements and changes that show a

person's feelings, thoughts, and attitudes about other persons and things" (p. 467). Sfard (2009) encourages the use of a variety of nonverbal behaviors when instructing students. Sfard's (2009) research has shown there is a close relationship between gestures and language, especially in mathematics. Many facets of teaching can lead to student engagement, especially when positive interactions are present.

The experiences and perceptions of these six elementary teachers regarding the implementation of their curriculum and knowledge of their students' strengths and struggles (Assertion One) lead to an understanding of how they view and interpret their own nonverbal behaviors (Assertion Two). The phenomenon that has resulted from Assertion One indicates that an understanding of the elements of a knowledge of curriculum and students is a precursor to being able to understand one's own exhibited nonverbal behaviors (Assertion Two).

Assertion Two

The second assertion derived from thematic data analysis was: "Teachers' perceptions of their nonverbal behaviors are essential to the lesson content and instruction as well as intent to form immediacy with students." Figure 8 visually depicts each element of Themes Two and Four that relate to one another. Together they support the notion that foundational math concepts, real-life examples, and math nonverbal immediacy behaviors are correlated with actual nonverbal behaviors displayed, reflections regarding students, and the structure of their lessons (Assertion Two). Figure 6 lists specific elements from each teacher's interview that align with Themes Two and Four. The connections made between these two themes comprise Assertion Two.

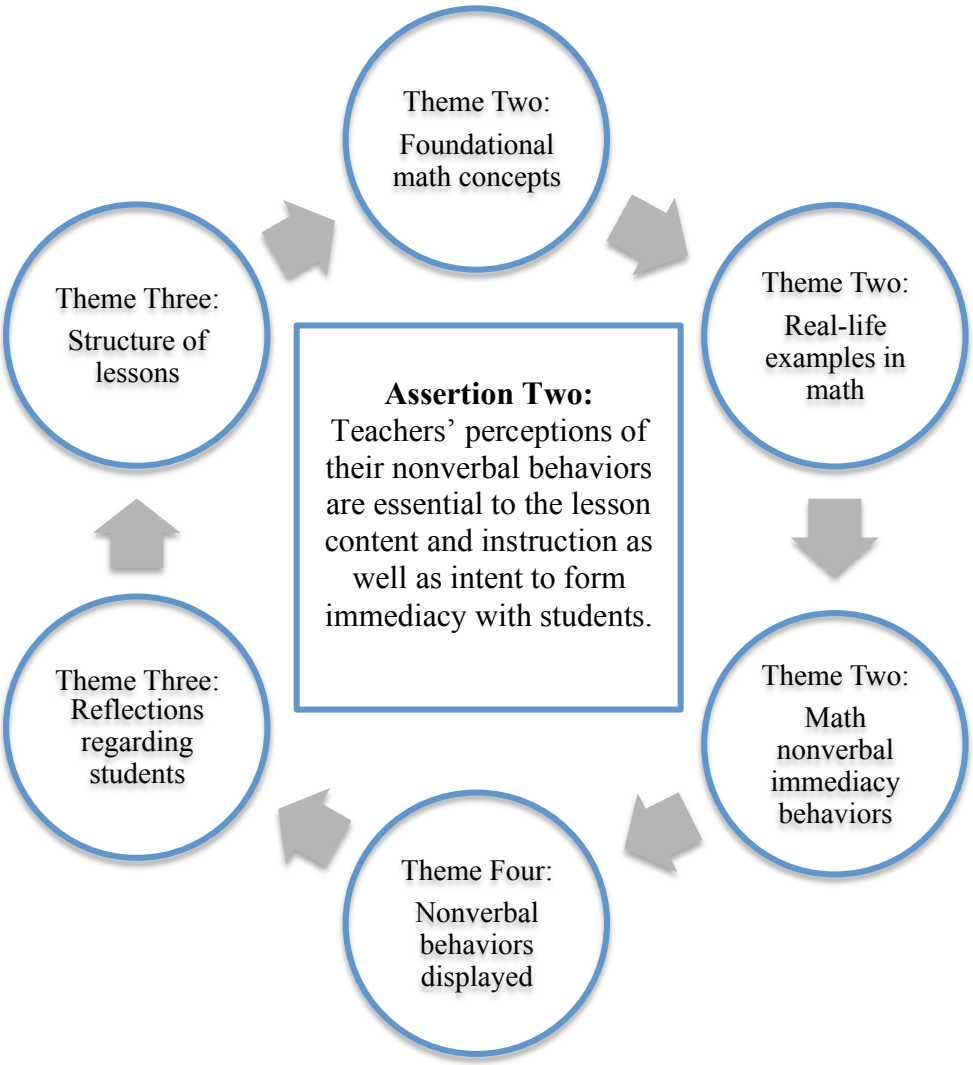

Figure 6. Elements of Assertion Two that show the connections between Theme Two and Theme Four that lead to the phenomenological understanding of teachers' displayed instructional and non-instructional nonverbal behaviors.

Assertion Two illustrates the phenomenological findings that stem from my examination of Theme Two and Theme Four. Sokolowski (2000) writes that studying a phenomenological issue requires us to ask ourselves what the parts are as well as the wholes that are present in the research. The teachers in this study presented individualistic nonverbal behaviors, or parts, and yet, also shared commonalities that made them a whole. Phenomenology portrays the lived experiences of individuals, like these teachers, in ways that illuminate their perspectives

(Creswell, 2011). Spiegelberg's (1984) explanation of the goal of phenomenology is that it describes common human experiences as they emerge from the data through an inductive, intuitive, and descriptive research method. The teacher participants in this study were video recorded in their natural classroom setting and interviewed within one week of the lesson. The findings that follow show the assertions made about teachers' self-perceptions and actual observations of their nonverbal behaviors.

Commonalities amongst the teachers described in Assertion Two are illustrated in Figure 7. Interconnections among the features of Assertion One have raised the phenomenological idea that teachers can be led to an awareness of their instructional and non-instructional nonverbal behaviors exhibited during mathematics instruction through reflection on the instructional setting and lesson components and interactions with students. This statement combines the findings of Assertion One: "Student engagement during math lessons is interdependent with teachers' nonverbal behaviors," as described previously. Through the interviews, each teacher described her elevated awareness through participating in my study.

Foundational Math Concepts Including Real-life Examples

The teachers in this study were asked to share what took place in their lesson, what they would change if they were to teach it again, and how they communicated while they were instructing. The interviews took place within one week of each video recorded math lesson. One week's time also means multiple other math lessons were taught in addition to other subjects and

events that typically take place in an elementary school. I reminded teachers of their lesson topic as a lead-in and brief reminder. I also had the video displayed on my computer screen so they had a visual of the classroom from that day: where students were seated, what was on the

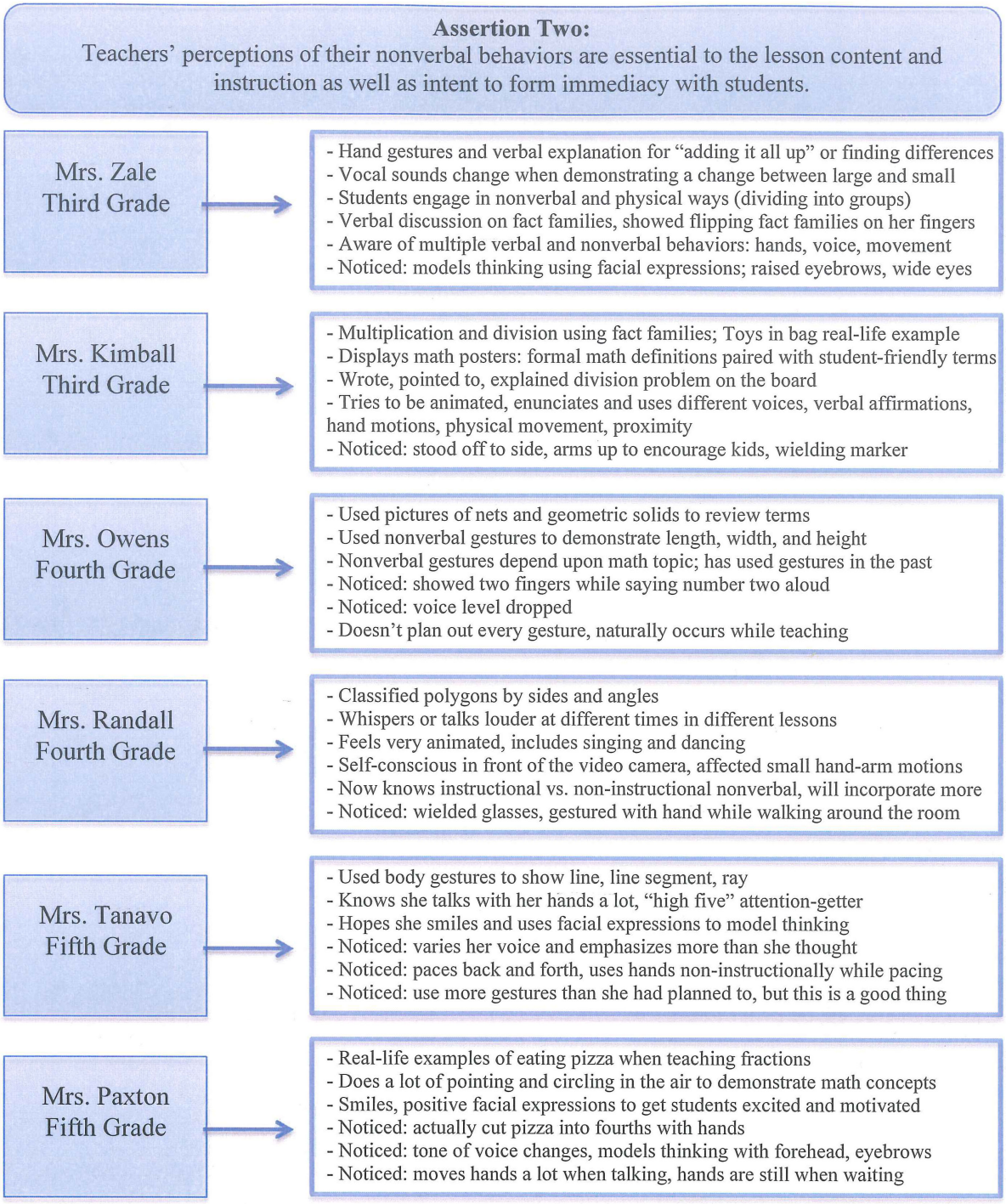

Figure 7. Assertion Two: Teachers' collected responses that show commonality based upon reflections and realizations of their own displayed nonverbal behaviors during math instruction.

classroom whiteboard or interactive whiteboard, and even what they wore on that day. These reminders appeared to help each teacher visually and mentally recollect their lesson.

Math Nonverbal Immediacy Behaviors

Sfard (2001) believes that putting communication at the core of mathematics education will cause teachers to reconsider how they teach as well as the ways in which individuals think about what is being taught and thus, learned. Sfard (2001) recommends that participating in learning, not merely acquiring information, will lead to a greater depth of understanding and application of knowledge. Dick et al. (2012) have studied the impact of gestures on the brain. They assert children and adults gather meaning from the combination of spoken language and hand movements during conversation. Battersby and Bolton (2013) advise teachers to make sure students understand the gestures they use during instruction. Having students repeat such gestures while explaining the math concept can help ensure their interpretations are accurate. Battersby and Bolton also recommend incorporating student input when creating and utilizing such gestures. In this section, examples of instructional as well as specific math nonverbal immediacy behaviors are described. This is done to showcase each teacher's range of behaviors exhibited.

Reflections

The inclusion of teachers' reflections and realizations regarding their instructional and non-instructional nonverbal behaviors as well as the impact on students' engagement during math instructional time was essential to my study. These elements are also central to Assertion Two as they show teachers' initial thoughts and later realizations regarding their instructional and non-instructional nonverbal behaviors. Teachers' inward views of themselves resulted from examining elements of their mathematics instruction, the structure of the video recorded as well

as typical lessons, and their knowledge of their students. The act of teaching a lesson is multi-faceted and does not allow much time for reflection in the moment. Such elements may include planning a lesson, delivering the content, gauging student engagement and understanding while teaching, shifting the focus of the lesson in order to meet students' immediate needs, and working with students to further their comprehension during whole group, small group, or individualized work time. Each teacher's initial self-reflections and later realizations are displayed in Figure 8.

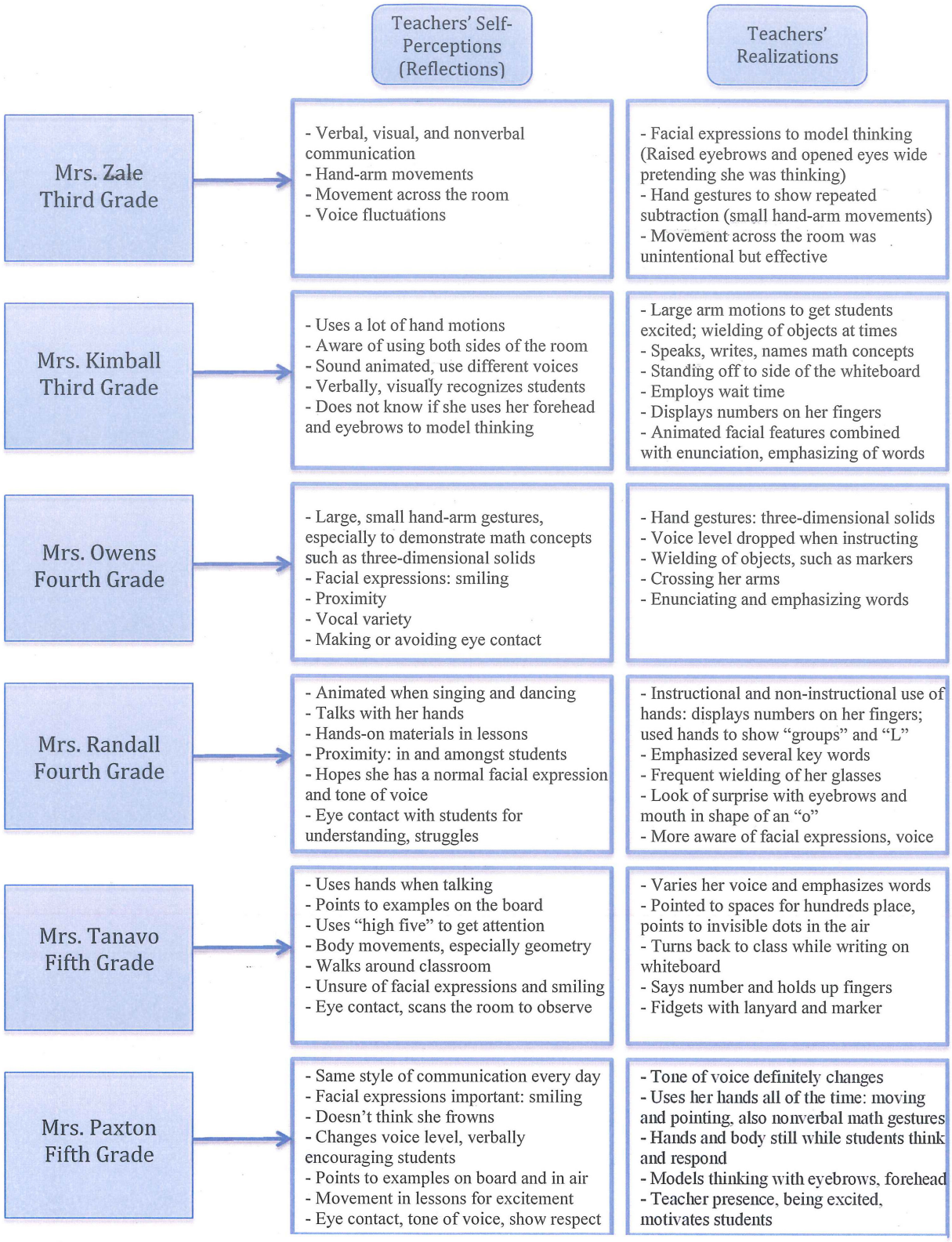

Figure 8. Teachers' self-perceptions (reflections) and realizations from one-on-one interviews (Theme Four).

Limitations

First, this study focused on a variety of nonverbal immediacy behaviors teachers in upper-elementary classrooms use during mathematics instruction. Although efforts were made to keep teachers from fully knowing the purpose of my study, understanding that communication behaviors were the focus of the observations may have caused teachers' awareness of their instructional and non-instructional nonverbal behaviors to be heightened prior to the video recording of their lesson and interview. Some or all of the teachers therefore may have taught in a more self-conscious manner, which may have lead to more distracting and non-instructional nonverbal immediacy behaviors during the lesson. This particular issue was exemplified by Mrs. Randall's clasping her hands together at mid-waist, which resulted in the restriction of some of her typical small hand movements. It was expected that the length of the observation and instructional time lead teachers to overall become engaged in the lesson and fall into their natural teaching rhythms.

Second, because a phenomenological study describes the meaning of individuals' lived experiences regarding a concept or a phenomenon (Creswell, 2011), the findings of these six elementary teachers regarding their actual and perceived nonverbal behaviors may be limited to upper elementary school teachers or at minimum, this pool of participants. I did not seek to include teachers from lower elementary, middle school, or high school levels who may have been able to add further information regarding their use of instructional and non-instructional nonverbal behaviors during math instruction. The inclusion of a wide array of teachers would have provided a broader description of the potential nonverbal behaviors used in today's classrooms.

Third, including students' perceptions of their teachers' nonverbal behaviors during instruction would have provided great insight into their learning needs, feelings of engagement, and attitudes towards teachers' teaching styles. The expectation that the level of knowledge these teachers had about the personalities and learning abilities of their students might be used when applying the concept of nonverbal teaching behaviors affecting student engagement. Therefore, teachers were asked to infer if students' levels of engagement were related to their nonverbal instructional methods, although this study did not analyze students' performance, attitudes, or behaviors regarding their teachers' nonverbal actions. Teachers' individual personalities as well as those of their students will affect aspects of instruction, their relationship with students, and the overall classroom environment. Such matters, whether or not they are directly studied by a given researcher, are still of great importance when analyzing the teacher as a whole.

Fourth, due to the high female-to-male teacher ratio at this school, the data shown in this study may look different than data from a school with a more equal female-to-male teacher ratio. Current research does not indicate if female nonverbal behaviors vary significantly from male nonverbal behaviors (Roorda et al., 2011). Personal mannerisms, teaching styles, and the content matter were expected to affect individuals' nonverbal immediacy behaviors, regardless of their gender.

Fifth, the teachers in this school are primarily in the middle class. The teacher participants in this study were exclusively Caucasian. Due to these two factors, the findings of this study may look different than if the teachers were of other socioeconomic or cultural backgrounds.

Sixth, only six of the 18 elementary classroom teachers in the selected school participated in this study. This limited number of participants may not have provided results that can be generalized towards teachers in upper elementary schools throughout the Upper Midwest or across the United States. However, this study's results relating to self-perceptions and realizations of nonverbal immediacy behaviors will provide opportunities for teachers of any grade or age level, especially those in math, to self-reflect upon their nonverbal conduct.

Finally, because I am an elementary teacher at the same elementary school in which this study was conducted, other factors may have influenced the study. Although I employed researcher reflexivity, it is possible that the teachers may have approached the interviews in a different manner than if a stranger or a less-familiar researcher were conducting the study. While I made every effort to remain professional and keep consistency from interview to interview, my relationship as a colleague may have altered the interview atmosphere for some or all of the participants. It was my hope that the teachers would feel more comfortable disclosing their thoughts and feelings regarding their lesson, student engagement, and namely, their personal views on their nonverbal behaviors, because of our existing rapport.

Recommendations for Teacher Education

First, although in-service and preservice teachers have an understanding that student learning is impacted not only by what you teach, but *how* you teach it, the specific use of nonverbal immediacy behaviors is a relatively unfamiliar area of study for elementary teachers. Incorporating nonverbal immediacy behaviors into college-level courses would not be an arduous task with the right background knowledge and understanding of nonverbal behaviors. However, because of the lack of research in the area of elementary teachers and students,

proposing such an implementation would require training and further research before its inclusion in preservice teaching courses.

Second, there are already a large number of requirements for preservice teachers. These may include gaining basic content knowledge of subjects they will teach, instructional methods and classroom management techniques, assessments, field experiences as well as lesson planning, in addition to college mandated requirements such as standards requirements, dispositions reports, and teaching evaluations. Adding nonverbal immediacy behaviors to one college course might make a considerable impact on preservice teachers' current and future lesson deliveries and thus, student engagement. However, presenting studies to support the addition of this little-utilized topic into already full college courses may be difficult to do.

Finally, during their experiences in the field, preservice teachers must be paired with in-service teachers who employ effective student engagement techniques, such as the use of nonverbal immediacy behaviors. To engage students in learning, teachers must first be able to build relationships with their students. These relationships build trust and respect, which lead to a great knowledge and understanding of student needs and learning styles. This accumulation of knowledge leads to teachers being able to incorporate instructional nonverbal behaviors that deepen students' understanding of a topic. To reach our students where they are academically and socially, and then push them to reach their full potential, this multi-faceted approach must be employed. Preparing preservice teachers for a successful career must start with these foundations in place.

Directions for Future Research

First, these findings may have implications for future research based upon teacher and student nonverbal mannerisms, instructors' self-assessments of their own behaviors, as well as

students' assessments of their teachers' gestures and effects on their learning. Although teachers' self-perceptions may be closely aligned with some of their actual nonverbal behaviors, a general lack of training and self-awareness in the area of nonverbal body language indicated partial understandings of the number of instructional and non-instructional nonverbal immediacy behaviors the teachers in this study actually exhibited. Regardless of self-awareness, training, or years of experience, all participants in the classroom environment might benefit from education on nonverbal immediacy behaviors.

Second, similar research might be done on the nonverbal immediacy behaviors of kindergarten through second grade teachers, or teachers in one grade level teaching the exact same lesson in a given subject area. Similarities and differences among teachers in any of the foregoing areas, as well as comparisons to this study, would provide even more information in the field of elementary teachers' nonverbal behaviors in classroom settings. Further studies might also correlate the actual student responses to specific teaching behaviors. In this study, students' reactions were based solely on teachers' interpretations and recollections of student engagement during the lesson. Finding if teachers' and students' nonverbal behaviors are reflective of one another may show the impact such gestures have on students. For example, students may be generally disinterested or highly engaged as a mirror to their teachers' nonverbal energy level. This finding would establish causality between instructional and non-instructional motions, as well as positively and negatively perceived body language (e.g., tone of voice, facial expressions, hand motions, and body posture). Such studies may include interviews or questionnaires directly ascertaining students' reactions to teachers' classroom approaches to communication.

Finally, although several researchers have conducted studies where "thin slices" of teacher behavior were analyzed and used in conjunction with high school and college student ratings of teacher effectiveness (Ambady & Rosenthal, 1993; Babad, Avni-Babad, & Rosenthal, 2003; Goodboy, Bolkan, Myers, & Zhao, 2011; Horan, Houser, Goodboy, & Frymier, 2011; Whitaker, 2011), a major gap in research exists for elementary students' ratings of their teachers. This missing data shows an incomplete picture of how and why students' self-concepts develop and change due to the classroom environment. This information may also support research in areas such as student performance related to self-image, attitude, empowerment, and overall motivation (Frymier & Houser, 2009; Houser & Frymier, 2009). Describing students' reactions to teachers' verbal and nonverbal messages through observations of both parties would strengthen my hypothesis that these types of relationships directly affect overall student performance.

It would be of value to examine student responses to surveys as well as to interviews; the former might report initial reactions to teachers, while the latter would give students more time to analyze their teachers' behaviors and think about their classroom experiences as a whole. In general, the findings of such a study would likely support the relationship between positive body language and positive student results, but they may also show greater or lesser effects on students depending on the extent of body language used by the instructor. Incorporating these tools to establish involved, effectual, supportive interactions between teachers and students would allow teachers to increase their role as a positive influence on students' social and academic growth.

Concluding Thoughts

Sokolowski (2000) defines phenomenology as the "reality and truth of phenomena, the things that appear" (p. 14). In describing phenomenological research, Groenewald (2004) writes

"The aim of the researcher is to describe as accurately as possible the phenomenon, refraining from any pre-given framework, but remaining true to the facts" (p. 5). Beck (2013) describes phenomenological research as including "rich concrete descriptions of personal experiences for analysis" (p. 188). Through analyzing the video recorded math lessons and one-on-one interviews of these six teachers, including multiple associations and depictions of my findings, I have worked to express the true thoughts and actions of each teacher.

Using phenomenology as the core, I found that the six teachers in this study demonstrated a level of self-awareness that has affected their students in positive ways. My goal for the participants was to raise the cognizance of their existing instructional and non-instructional nonverbal behaviors. An additional advantage proved to be the impact their awareness will have on their future lessons. Universally, all participants had some knowledge of their nonverbal behaviors while teaching. All six teachers also observed instructional and non-instructional nonverbal behaviors from their math lessons that they had previously not been aware of. It is my hope that the six teachers' participation in this study will have a lasting impact on their future teaching methods and thus, student engagement.

APPENDICES

Appendix A
Email Invitation to Participants

Dear Participant,

Hello! Here is some information for you regarding my study:

I will get you copies of my parent letter to send home with students briefly explaining my study. Students are not the focus of my study or the video recording, but parents may not want their child on the video recording. I can talk to you about a place in your room where this/these student(s) can sit that would be out of range of the video camera, but would still allow them to participate in the lesson.

Please look at your calendar for early next week (Monday through Wednesday) to see which day might work best for me to video record a math lesson. I will come in before your lesson to get the camera and tripod set up. I can push record when you start your lesson before I leave your classroom (I will not be present for the video recorded lesson) and you or a student can push stop at the end. If you're comfortable with it, you or a student can also push record at the start and at the end so I would not be in your room at all. Think about it and see what you would like to do.

The Math Lesson: I am looking to video record your core lesson instructional time. In my classroom, this includes a real-world problem (interactive problem solving), the main lesson (video or slides I have prepared), and guided practice together. (Prior to the lesson we correct together as a review and following the lesson we do a math game tied to the lesson; these types of elements do not need to be included in the video recording.)

I will be in touch again to schedule an interview with you sometime at the end of next week or the start of the following week. This can be before school, during your lunch time, after school, or at another time that works for you. I'm estimating the interview to last about 45 minutes. Please note that one or two additional interviews may be needed, depending on the amount of information we discuss in our initial interview.

Thank you for your participation in my study! It is greatly appreciated!!

Sonja Brandt

Appendix B
Parental Consent Letter

January 2015

Dear Parent or Guardian,

I am writing to inform you of an upcoming research study I will be conducting at your child's school. I am a fifth grade teacher at your child's school. I am currently enrolled in a doctoral program at our local university in the Teacher Education Program. To complete the program requirements, it is necessary for me to complete and submit a research project. My project involves observing teachers' communication methods during math instruction. The Institutional Review Board on campus has approved this project. In addition, the building principal and teachers have agreed to participate.

In order to examine teachers' communication methods in math, a video recorded math lesson will be recorded for each teacher participating in this project. Please note that the teacher's communication, and not the students', is the focus of this lesson. The video camera will be set up in the back of the classroom to avoid video recording students' faces and to capture the teachers' movement during the lesson. It is possible that your child's face may be recorded if he or she turns to the side, turns toward the back of the classroom, or walks around the room during the lesson. The video will only be shared with the classroom teacher, my university advisor and myself. If you do not wish for your child to be in range of the video camera during this time, he or she can sit in another place in the classroom during this particular lesson. Your child's identity will not be revealed at any time during the research or in the final manuscript.

If you have any questions please feel free to contact me. Thank you!

Sonja Brandt

Appendix C
Nonverbal Behaviors Interview Questions

1. Tell me about your video recorded math lesson. Was this a typical math lesson for you and your class?

    a. What went well? Is there anything you would do differently next time?

    b. What can you tell me about how you communicated during this lesson? (Communicated with students, communicated the content; instructional and non-instructional movements, which are called nonverbal immediacy behaviors)

2. What types of nonverbal motions do you frequently use while teaching? (After initial response, a list of nonverbal immediacy behaviors given. See Tables 1 and 2.)

    a. Especially: hand gestures (large or small hand movements), hand-arm motions, proximity, making or avoiding eye contact, facial expressions, tone of voice, vocal variety, avoiding gesturing, maintaining eye contact, smile or frown while talking, explaining a mathematical concept while using intentional gestures or motions).

3. I have selected several segments from your video recorded math lesson. Let's examine each one.

    a. After viewing each segment: What can you tell me about how you communicated during this lesson? (Communicated with students, communicated the content; instructional and non-instructional movements, called nonverbal immediacy behaviors.)

    b. Are the nonverbal behaviors you used in this/these segment(s) typical of your math lessons? Can you explain or describe such behaviors?

4. How do you feel your nonverbal behaviors affect student engagement? (The class as a whole; individual students) Why do you think that?

a. Can you give me examples of times your nonverbal immediacy behaviors may have impacted student engagement?

5. What types of intentional, instructional motions do you see yourself using in future lessons?

6. What non-teaching actions do you find yourself using repeatedly while you are teaching math?

7. How might your awareness of your instructional and non-instructional nonverbal behaviors affect how you will teach now or in the future?

Note. Questions 2, 5, 6, and 7 adapted from Hennings, D. G., and Grant, B. M. (2001). Non-verbal teacher activity in the classroom. *Education*, *93*(1), 42-44

Appendix D
Video Recorded Math Lesson Sample Transcription and Color-Coded Analysis

Mrs. Paxton Math Lesson
Friday, January 23, 2015
5th grade classroom
Student names changed

Lesson Topic: Mixed numbers and improper fractions

Environment:
Students seated at desks facing the front of the classroom. Three long rows of desks facing forward, with a center aisle. Teacher stands at front of room in front of the whiteboard and Smartboard facing students during the lesson.

Remarks:
- Frequently uses left hand chest height, palm up, fingers spread and thumb out moves up and down twice gesture to emphasize words or points in the lesson
- Smiles frequently
- Uses arm out, palm up, to gesture to students to call on them
- Uses hand and arm movements to indicate pieces of a whole (pizza or pie examples) as well as to show fraction bars, numerators, and denominators
- Also uses hand and arm movements in a clockwise manner to show direction of math problem (mixed number converting to improper fraction)
- Draws examples said aloud (fractions), points to, gestures to, and circles (using a marker and in the air) examples on the whiteboard and on the Smartboard screen

Codes:
blue: instructional motions
green: non-instructional-related, but intentional, nonverbal behaviors (shaking head no to student sharpening a pencil)
orange: facial expressions
red: math instructional gestures
black: non-instructional nonverbal behaviors
purple: changes in voice level, pitch
pink: wielding objects (non-instructional)
dark yellow: head scratching, itching, touching of the hair or face

Unit 1
"I can't believe you...are...understanding things we haven't even talked about yet. For example, simplifying fractions."
- Holds marker in right hand, fingers closed around marker, index finger on top, motions slightly up and down in front of right side of body on each word while saying, 'I can't believe you are understanding so many things'

- Hand turns upside down - palm facing up, holding marker between fingers, fingers spread out (as if holding a ball in her hand) while saying, 'we haven't even talked about yet'

Unit 2
"For example, mixed numbers. This is a term I will introduce to you *today*. And, I know some of you are using that term

- Words 'mixed number' already written on board
- Turns sideways towards board, reaches up with left hand, palm toward board, points with four fingers to words 'mixed number' while looking at class over right shoulder
- Adds an 's' to the end of the phrase 'mixed number', turns back to face class, smiles, both hands hold marker in center of body at mid-torso

Unit 2
"The second term I'm going to introduce to you today … is … improper fractions. And again, some of you were using this yesterday.

- Turns to the left and walks to the board, raises hand to write 'improper fractions' on the board as she says,'improper fractions' aloud
- Nods head while writing when student says 'improper fractions' as she is writing and just before she says 'improper fractions' herself
- Voice goes up with "and again"

Unit 3
"So go ahead and write these two down, please."

- Turns from writing on the board; walks to right side of classroom while holding marker in both hands at mid-torso

Unit 4 **0:42**
"So there is a *relationship* between a mixed number and an improper fractions. And I'm going to *show* you that relationship today.'

- Puts cap on marker with both hands at mid-torso while saying 'relationship'
- Reaches up to point to phrases 'mixed number' and 'improper fraction' while saying each aloud
- Turns back toward class with marker held in both hands at mid-torso, takes a step forward, turns to the side, takes a side step back toward the board

Unit 5 **0:51**
"So you can take a mixed number, and guess what? And change it into a what?

- Points to mixed number with fingers on left hand, arm extended, while turned and looking at the class while saying 'mixed number'
- Points to phrase 'improper fraction', smiles and nods when student responds with 'improper fraction'

Unit 6
"You can take an improper fraction and you can what? Change it into a mixed number.

- Points to improper fraction again, this time with side of hand underneath the phrase 'improper fractions' and then 'mixed numbers'
- Nods head while saying 'change it into a mixed number.'

Unit 7 **0:59**
"So there you can find equivalent, improper fractions to mixed numbers and vice versa."

- Laces fingers together in front of body, palms toward body, moving hands together and apart several times while saying, 'so there you can find equivalent, improper fractions'
- Moves hands from center of body, fingers facing each other, to the left in one motion, to the right, and back to the left while looking to the left (picking something up and moving it a few inches to the left) while saying 'to mixed numbers and vice versa'

Unit 8
"So, can you try on your whiteboard and show me an example of a mixed number. Just try. I'll give you a clue. A mixed number has a whole number, and it has a fraction. "

- Takes a step backward, turns body slightly to the right, points with index finger of left hand pointing up in the air multiple times while saying 'try on your whiteboard and show me an example of a mixed number' and taking a few steps to the right
- Hands come together at center of torso holding marker and smiles
- Continues walking to the right and then turns to square shoulders/face front of students while holding marker
- Left hand holds marker on left side of body with elbow bent while holding up right hand up in the air, palm facing students, fingers spread and thumb out to side while saying 'a whole number'
- Takes a few steps forward while hand slides diagonally to the right side of body, fingers move closer together (as if holding something in hand like a sandwich) as saying 'and it has a fraction'
- Keeps hand out to side (as if holding a sandwich) while saying, 'show me an example of a mixed number'

Appendix E
Examples of Teachers' Significant Statements Levels I and II

SIGNIFICANT STATEMENTS	SIGNIFICANT STATEMENTS Level II
P7: We talk a lot about real-life examples	P7: Real-life examples
P8: So in the video you'll see that we stop a lot and talk about how does this apply to real world examples	P8: Lesson apply to real world
P11: we'll stop and talk about and look at the math problem and try to relate it to an example that relates to their life	P11: Math problem relates life
P14: and again examples that relate to their life	P14: Examples relate real life
P19: incorporating different examples of how mixed numbers and improper fractions relate to their life	P19: Incorporating different examples
P46: so if you can pull in examples from how you use the lessons	P46: Examples from lessons
P48: I share with them things about that my husband and I like to do	P48: Share things husband does
P49: Whether it's going out for pizza, or different stuff like that	P49: Going out for pizza
P51: for example, in fractions, I talk about Brent and I going out for pizza	P51: Fractions going out for pizza
P52: or my family is vegetarian, so a lot of times I will talk with them about if we go out for pizza	P52: Vegetarian family pizza
P53: or go to Papa Murphy's, we get different types of, or kinds of pizza	P53: Papa Murphy's pizza
P54: I would say that I use my life examples a lot with the kids	P54: Use life examples with kids
P56: Yes. Again, I think any time you can apply the mini lesson to something and how it relates to your life	P56: Apply, relate lessons to life
P57: the kids are able to see...yep, I'm, you know, I'm not just learning this because Mrs. P. is supposed to teach me this in fifth grade	P57: Kids see learning
P59: this is how it applies to somebody's life	P59: Applies to life
P60: I think that application piece is used not only to get them motivated, but also just to grasp the concept	P60: Application to grasp concept
P141: I'm talking about pizza	P141: Talking about pizza
P142: so you can see that my hands, you know, are getting larger as I'm talking about the pizza	P142: Hands larger as talking about pizza
P178: And kind of in my head plan out what you know, what,	P178: Plan real-world examples

what real-world examples go really well with this	
P182: Yeah, I think so.	P182: Yeah, think so
P183: The kids, I have learned, really engage in examples that relate to not only their life but to your life	P183: Kids engage relate their, your life
P184: I've noticed when I talk about things, you know, with my husband and I,	P184: Talk about husband and I
P185: things that relate to my life outside of school, it really gets them interested	P185: Relate life outside school, interested
P187: this is like, how you know, an adult would use this in the real world.	P187: How adult use in real world
P188: And then you find a lot of times, they, they now look at, think of their parents	P188: Think of parents
P189: I had a student last week bringing in a blueprint. Because her dad's an engineer.	P189: Student blueprint, dad's engineer
P190: We were talking about shapes, those types of things.	P190: Shapes
P193: but how it also applies then they're motivated to learn.	P193: How applies, motivated to learn
P227: for example, when I was talking about the pizza,	P227: Pizza example
Z366: And um the radio station that I listen to often has …good… stories	Z366: Radio station good stories
Z367: Not just stories but stories that matter	Z367: Stories that matter
Z372: or isn't that just the neatest thing you ever heard	Z372: Neatest thing you heard
Z380: usually have nothing to do with math	Z380: Usually nothing math
Z386: It just comes.	Z386: It just comes
Z387: I try and think about something that it – maybe something I saw.	Z387: Think about something I saw
Z388: It can be I just talked, I just talked to Mr. Howard in the hallway and do you know what he told me	Z388: Mr. Howard told me
Z389: This is what he saw or I mean just something little	Z389: He saw or something little
Z390: It's never planned, it's never in my lesson plans	Z390: Never planned
Z391: it's – it's just what happens when we sit down to start math.	Z391: Just happens start math
Z393: I need to somehow get them back to hearing me	Z393: Needed to get hearing me
Z399: whether that's right or not	Z399: Whether right or not
Z401: but for this piece its purpose isn't necessarily directly academic	Z401: This not directly academic

Z402: but I think it pulls them in… to… listening to what the academic piece is	Z402: Pulls them listening to academic
Z403: So… yeah it (pause) developed over time unintentionally I think	Z403: Developed unintentionally over time
Z404: It works	Z404: It works
Z405: For that moment it works.	Z405: For moment it works
Z529: Or… um create another visual or pull in another story	Z529: Create visual, pull in story
Z530: If we have to have another story at that time	Z530: Have to have another story

Appendix F
Examples of Teachers' Significant Statements and Codes

SIGNIFICANT STATEMENTS Level II	CODES
P254: Kids relates to teacher presence	Teacher presence
P255: Gestures how present you are	Teacher presence (Nonverbal example)
P256: Vibe give to kids	Teacher presence
P257: You feel being there	Teacher presence
P259: Set stage for kids	Teacher presence
P263: Going through motions	Teacher presence
P267: Lot comes from teacher	Teacher presence
P309: Teacher presence	Teacher presence
P311: Teacher presence	Teacher presence
P314: Part of personality	Teacher presence
P326: All things teacher presence	Teacher presence
Z11: Frustrated me	Teacher struggles
Z12: Messed up how wanted to teach	Teacher struggles
Z113: Causes stress to think	Teacher struggles
Z168: Without using all energy	Teacher struggles
Z185: Own concerns why happening	Teacher struggles
P164: Not respectful to write while talking	Lesson structure (Respect)
P166: Talking, don't see back turned writing	Lesson structure (Respect, Nonverbal example)
P169: Expect the same	Lesson structure (Respect)
Z409: Tell me if you know	Lesson instruction (Verbal example)
Z410: Physically, raise your hand	Lesson instruction (Nonverbal example)
Z418: Think before you say it	Lesson instruction (Nonverbal example)
Z429: See fact families	Lesson instruction (Nonverbal example)
Z435: You're so clever	Lesson instruction (Nonverbal example)
Z436: How did you figure that out?	Lesson instruction (Nonverbal example)
P1:Math lessons similar daily	Lesson structure
P2: Mini lesson	Lesson structure
P15: Same thing in lesson	Lesson structure
P26: Incorporate examples	Lesson structure
P27: Incorporate more examples	Lesson structure
P31: Each lesson very similar	Lesson structure
P32: Communication similar each day	Lesson structure
P34: Use verbal and nonverbal in lessons	Lesson structure (Verbal example, Nonverbal example)
P42: Use nonverbal communication	Lesson structure (Nonverbal example)
P62: Stay up front when teaching	Lesson structure (Nonverbal example)

P65: Walk around classroom	Lesson structure (Nonverbal example)
P69: Walking around	Lesson structure (Nonverbal example)
P76: Kneel, whisper to student	Lesson structure (Verbal example, Nonverbal example)
P77: Stand further away	Lesson structure (Verbal example, Nonverbal example)
P78: Conversation with student(s)	Lesson structure (Verbal example)
P78: Conversation with student(s)	Lesson structure (Verbal example)
P84: Teacher engaged in lesson	Lesson structure (Nonverbal example)
P85: Smiling, acting excited	Lesson structure (Verbal example, Nonverbal example)
P97: Raise hand call on	Lesson structure (Verbal example, Nonverbal example)
P98: Not turned to board writing	Lesson structure (Nonverbal example)
P121: Take time point to examples	Lesson structure (Nonverbal example)
P134: Step away from whiteboard	Lesson structure (Nonverbal example)
P136: Expected to write down what see	Lesson structure
P137: Point to examples	Lesson structure (Nonverbal example)
P146: Kids know what explaining up front	Lesson structure (Verbal example)
P146: Kids know what explaining up front	Lesson structure (Verbal example)
Z77: Had verbal and discussions	Lesson structure (Verbal example)
Z79: Visually wanted come separately	Lesson structure (Nonverbal example)
Z80: See physicality of moving	Lesson structure (Nonverbal example)
Z87: Need move on	Lesson structure
Z96: With kids do that often	Lesson structure
Z112: Side opposite to me	Lesson structure
Z114: Think go to right	Lesson structure (Nonverbal example)
Z124: Ask students come up	Lesson structure (Student engagement)
Z125: Things to create communication	Lesson structure (Student engagement)
Z127: Not just mine	Lesson structure (Nonverbal example)
Z131: Keep going with lesson	Lesson structure
Z151: when very important	Lesson structure (Nonverbal example)
Z153: something very important	Lesson structure (Nonverbal example)
Z162: What use most	Lesson structure (Nonverbal example)
Z173: Only way think of	Lesson structure
Z174: Easy for me to do	Lesson structure
Z175: Seems effective	Lesson structure (Student engagement)
Z191: Most not planned	Lesson structure (Nonverbal example)
Z192: Unless calling students up	Lesson structure
Z193: Physically set up lessons	Lesson structure (Nonverbal example)
Z194: Other things off cuff	Lesson structure (Nonverbal example)
Z195: Because it's effective	Lesson structure (Nonverbal example)
Z196: Hopefully been effective	Lesson structure (Student engagement)

Appendix G
Four Themes and Teachers' Interview Connections

Theme #1: Classroom Environment and Instructional Elements
Categories: The classroom environment is comprised of knowledge of students; respect, teacher presence, and teacher struggles; in addition to elements of lessons, which include the lesson structure and instructional tools.

Mrs. Zale (third grade)

1. Students had difficulties remembering the brainstorming lesson from the day prior; they got off on tangents during this lesson, which didn't help the teacher know what they understood or remembered. (Knowledge of students)
2. Teachers' math notes (lesson plan) for this lesson
3. Tried to replicate the brainstorming session from the previous day's lesson to review and remind students of what they already learned.
4. In this lesson, the whiteboard at the front of the room was used, in addition to students' individual whiteboards and later, students' paper and pencil assignment.
5. Five students were asked to come to the front of the classroom to physically and visually divide themselves into various-sized groups.
6. Knows that changes in her verbal and nonverbal behaviors are necessary for students to be able to focus and pay attention during her lessons.
7. Most of her verbal, visual, and nonverbal teaching behaviors are not planned; she doesn't think about doing them or plan them ahead of time.
8. Physically sets up and moves containers to demonstrate concepts; references them again in later lessons to foster student engagement.
9. References information and strategies learned and used in previous lessons to connect with the current topic.
10. Clears the board to physically remove previously used strategies to make room for new ones.
11. Plans most of her lessons physically and visually so there is order and organization when she writes things on the class whiteboard.
12. First looks at the end of the lesson (the goal or objective) when planning.
13. Doesn't always know the path the lesson will take to get to the end goal until she starts talking to her students. Wants to see what they catch onto and adjusts it as they move through the lesson.
14. Most of what Mrs. Zale writes on the board takes place in real time during the lesson; not much is written ahead of time.
15. Uses nonverbal gestures in small group and whole group settings.

Mrs. Kimball (third grade)

1. Student whiteboards, lesson video, interactive notebooks for small group reteaching
2. Individual student whiteboards allow this teacher to know who is following along and who is or isn't understanding the lesson
3. Quick assessments happen during the lesson so she knows which direction to take the lesson from there ("If I need to rewind, reteach…")

4. Instructional choices and decisions are made based upon student progress and needs (whiteboard work or lesson video)
5. Students are physically part of the lesson to show sizes or comparisons between objects
6. Proximity - Try to teach to both sides of the room
7. Use of manipulatives and physical activities, which are sometimes nonverbal (students have cards and must order themselves from least to greatest without speaking)
8. Strategic writing on the board for a cleaner format that is easy for the students to follow along with
9. Uses specific strategies, such as circling numbers that are in the same fact family, in the beginning of teaching a concept. Later moves away from that strategy to promote seeing visually without physically circling the numbers.
10. Knows her students will oftentimes blurt or try to "help" her if she pauses to remember something

Mrs. Owens (fourth grade)

1. Students typically do a lot of work on their whiteboards.
2. They maybe weren't as engaged as I would have liked them to be. Students were having a hard time with the vocabulary, such as the difference between a prism and a pyramid. This was frustrating to Mrs. Owens because it was a review.
3. Often uses the math video, ideas and examples from the curriculum, and also her own lesson format. Would rather have students on the floor in front of the interactive whiteboard if it is being used for the lesson.
4. Had pictures of nets on paper
5. A few examples of nets and three-dimensional solids shown on the interactive whiteboard
6. Knows what she is going to do for certain lessons in terms of nonverbal behaviors because she has used them or taught them in that manner other years.

Mrs. Randall (fourth grade)

1. Lessons include the math video, vocabulary, notebooks, drawing pictures of vocabulary
2. By this time of year know a little bit more about the students
3. Use of whiteboards, hands-on manipulatives like cutout shapes and charts
4. Watches students for cues to see those who struggle and those who understand
5. Struggled with re-explaining the math concept when students weren't grasping it
6. Partner work time is essential for learning.
7. The use of hands-on materials and partner work-time to be able to learn in various ways

Mrs. Tanavo (fifth grade)

1. Notes from the board that students copied onto paper booklets
2. Use the interactive whiteboard in most math lessons, although not today
3. Reviewed previously-learned geometric terms (line, line segment, ray)
4. Frequently walks around during the lesson to make sure students are doing what they are expected to be doing and so she can hear their conversations about math with their desk partners.
5. Uses familiar groups of letters (teacher's initials, initials of the town) to label geometric terms.

6. Struggled with the length of the lesson (longer than typical) because students were getting off task and blurting.

Mrs. Paxton (fifth grade)

1. Math lessons look pretty similar from day to day.
2. Students have whiteboards on their desks. Mrs. Paxton uses the whiteboard at the front of the room as well as the video from the math curriculum. Activities are also included to practice that day's skills.
3. Really need to get to know your students, especially at the beginning of the year, so you know how to work with each of them.
4. "A lot of what we do in our classroom *is* routine."
5. Student/classroom/lesson expectations: "And I think the kids know, that what I'm upfront explaining, they're expected to be watching, and engaging in the conversation. And then when I, I take a second and stop...step back, it's their turn to write what they see on the board."
6. Lesson structure: "And so I try to take things slow, write things down, point, interact with them, and then give them time to do the same on their board."
7. At the beginning of the school year, a lot of time is spent modeling and practicing expectations and the structure of each subject's lessons.
8. These beginning of the year conversations also include what it looks like during the mini lesson, including student expectations for using whiteboards in addition to what it looks like to listen while the teacher is explaining something.
9. The word respect is used frequently while explaining and discussing expectations for the year; "When I'm explaining something, it is not respectful to be writing stuff on your board. And have your head down. And when you're talking to me, you don't see me turned around my back towards you...while I'm writing. Because I'm looking at you."
10. Lesson structure: "So when I'm done explaining, and I step away, it's your turn to actively apply what you see."
11. In preparing for each day's lesson, Mrs. Paxton watches the math video and thinks of real-life examples that can be used to motivate the students.
12. Planning real-life examples to engage and motivate students is important, because each class is different, no matter how many times you have taught a particular lesson.

Theme #2: Math Nonverbal Immediacy Behaviors, Math Concepts, and Real-life Examples
Categories: Teaching of mathematics includes foundational math concepts, real-life examples, and the inclusion of math nonverbal immediacy behaviors.

Mrs. Zale (third grade)

1. Uses hand motions while giving verbal explanations of math concepts such as adding everything up, or finding the difference of a big and small number.
2. Her vocal sounds change when demonstrating the change between a big and a small number (subtraction).
3. Physically moves her body from zero to another number to demonstrate moving on a number line.

4. Enjoys getting students involved in the lessons as well, so they, too, are actively part of the lesson in nonverbal and physical ways.
5. "Tone of voice – the fluctuation of my voice like you had mentioned I do… a lot of that and slowing down my voice when something is very important or lowering it "
6. Shows sizes of things by using her hands and her eyes getting bigger and wider.
7. "See fact families I put my hands, my thumb and my pinky back and forth when we talk about fact families they can flip, they can flip. They are brothers and sister across my fingers."
8. Flips her hands back and forth when demonstrating the commutative property of addition. Uses the example of her car commuting back and forth from school and home each day.
9. Puts her hands together like parenthesis when teaching the associative property. She gives the example that you associate with your friends.

Mrs. Kimball (third grade)

1. Multiplication and division of fact families
2. Teaching of and use of math strategies for multiplication and division.
3. Point out how multiplication and division are related
4. Real-life math story problems with examples such as putting toys into smaller groups
5. Math vocabulary: opposite and inverse
6. Teaching students and reviewing math concepts utilizing the pairing of math language and student-friendly terms
7. Displaying posters that contain formal math definitions for reference during lessons and student work time.
8. Holds up a number of fingers while saying the same number aloud - math immediacy
9. Draws a long division symbol on the board and then points to it several times throughout the lesson
10. Wields a marker while moving arms in big sweeping motion to show the size of a large number
11. Also used the marker to write a number and then gesture to it on the board

Mrs. Owens (fourth grade)

1. Students reviewed geometric terms (edges, faces, vertices) using pictures of three-dimensional solids
2. Students named the three-dimensional solids name for a given net
3. Students named nets and drew pictures of nets
4. Knows she uses nonverbal gestures to indicate the length, width, and height of three-dimensional solids.
5. Uses nonverbal gestures that she has used in the past, and that have worked with previous classes.
6. The types of nonverbal behaviors depend on the math topic. "If it's long division, it's going to be different nonverbals and . . . [sic] kind of actions than the three-dimensional solids."
7. Uses nonverbal gestures when teaching other geometric terms, such as lines, rays, points, and angles.

8. Consciously uses nonverbal gestures when teaching geometry because they have been effective before.
9. In the video recorded lesson, showed two fingers while saying the number two aloud

Mrs. Randall (fourth grade)

1. Whisper or talk louder at different times
2. Classified polygons by their sides and angles
3. Draws a triangle in the air with her finger
4. Her fingers make an "L" shape when talking about triangles that have an L-shaped angle
5. Fingers hold up the number that she says aloud

Mrs. Tanavo (fifth grade)

1. Geometry terms (line, line segment, ray, point, intersecting and parallel lines, etc.)
2. Used body gestures to review line, line segment, and ray
3. This lesson on geometry terms included written words, definition, and written examples on the whiteboard at the front of the classroom.
4. Gives students a previously-used example of three lines drawn on the board to represent a number to the hundreds place to connect with today's example of ten millions place value.
5. Points to each period when counting aloud and pointing to the number of spaces in a number to the ten millions place.
6. Models line segments by holding her arms out to the sides and using her fists as endpoints.
7. Holds her arms up in to model a line while her voice goes up when she says that they go on in "all directions".
8. Holds up the number two on her fingers while saying “two” aloud.

Mrs. Paxton (fifth grade)

1. Lesson: mixed numbers and improper fractions.
2. Uses real-life examples in each of her lessons, which she feels helps with their understanding of the lesson.
3. Real-life examples include going out for different kinds of pizza with her family to show examples of fractions
4. Through the use of real-life examples, students can see how the math concepts relate to their own lives.
5. Does a lot of pointing and circling in the air to demonstrate math concepts because her students are very visual.
6. If there is an important idea being taught, Mrs. Paxton will take a lot of time to point to or circle it.
7. While watching her video recorded math lesson, Mrs. Paxton commented that you could see her hands getting larger when she was talking about the pieces of pizza, as well as smaller when she was pointing to an example of the pizza on the board.
8. Video observation: When she was talking about pizza, Mrs. Paxton noticed that she actually cut the pizza into fourths with her finger in the air.

9. Video observation: Mrs. Paxton also noticed that she pointed in the air to the numerator on top and the denominator on the bottom.
10. Video observation: "When I was trying to relate it back to the mixed number, I took my hand and circled the improper fraction, and then and then, you know, took an invisible line up to the mixed number so they could see the connection."
11. "Making that connection between improper fractions and mixed numbers. Instead of just telling the kids, these two are related, actually having them take their eyes and follow my fingers up from the improper fraction to the mixed number, really helped that sink in. "

Theme #3: Student Engagement
Categories: Student engagement is linked to knowledge of student needs and struggles, motivational elements, and the inclusion of verbal and nonverbal communication.

Mrs. Zale (third grade)

1. Students had trouble remembering the review from the day before.
2. Students seemed to do better once they got back on track (off of their tangents).
3. "Third graders tend to be a little sidetracked on things like that – the visuals- so I like to put the visual up as soon as we need it."
4. Mrs. Zale used elements such as brainstorming and review to engage students in this lesson.
5. Five students were asked to come to the front of the room to physically and visually separate themselves into various-sized groups to demonstrate for the rest of the class.
6. Uses eye contact to get students' attention in a nonverbal way if they are not supposed to be doing something.
7. Uses her tone of voice to alert students to something new, different, or exciting about to happen.
8. "Tone of voice – the fluctuation of my voice like you had mentioned I do… a lot of that and slowing down my voice when something is very important or lowering it "
9. Includes vocal variety to give her third graders the feeling that they are learning something grown-up and almost secretive.
10. Students are more intent on listening and focusing when vocal variety is utilized.
11. Mrs. Zale's students have a difficult time attention to things that are not fluctuating or moving, so she intentionally incorporates verbal and nonverbal behaviors into her lessons. She says it seems to be effective!
12. "Or if they aren't attending they realize something is changing and they maybe think I have to listen to that"
13. Over the years, Mrs. Zale has noticed a trend that students need more and more vocal, visual, and nonverbal variety incorporated into daily lessons to get and keep their attention.
14. "The more that I change… the things that I'm doing or the more that I physically move my hands or my body to… get their attention the easier it seems to be for them. "
15. Referencing previously-used physical or visual examples helps students recall information.

16. When referencing previously-learned examples, students are able to "I can kind of see it in my brain and I know that's happening because that's what we did before".
17. Will move to one side of the classroom during a lesson to force students on the opposite side to pay attention. Doesn't always know that she is doing this; will find herself on one side or another. Is almost intentional (routine or habit?) but doesn't always know she is doing it.
18. Will tell students a quiet story before starting the math lesson to get them calm, quiet, and focused on her voice. This seems to help them listen and pay attention to the actual lesson better than just starting the lesson itself. It "draws them in".
19. Thinks nonverbal behaviors have a direct effect on children and how or how much they are engaged.
20. "I... think without that the communication that they hear (pause) just plain language communication without anything nonverbal is too boring for them anymore. And they lose – they lose interest."
21. "If I don't fluctuate my voice, if I don't use some of those nonverbal tools… in my read aloud, they… don't listen."
22. Mrs. Zale sees students using the same nonverbal gestures used in class with peers and when they are explaining something back to her at a different time.
23. Will ask herself in future lessons if her nonverbal behaviors are more helpful to her or to the students; if it's effective or not.

Mrs. Kimball

1. Students are observed using strategies taught in class when they do individual work in class and on math tests.
2. Knows her students need to "have a task at hand" to stay actively engaged.
3. Students know they're going to be asked to do something and show their work.
4. The use of hand motions, movement, and different voices gets and keeps the students engaged.
5. Nonverbal affirmations include eye contact, smiling, thumbs up, a clap. "Third graders love any kind of nonverbal affirmation that they're on the right track. That they're doing the right thing."
6. Uses eye contact first, and then a nonverbal gesture to get students' attention if they're off task.
7. Students interactively show least to greatest or wear a sign that says "gallon" or "pint" to compare sizes.
8. Kneels down and works one-on-one with students during independent practice.
9. Typical lessons involve a lot of writing on the large whiteboard and students also writing on their individual whiteboards. This "keep[s] them occupied with their learning". Mrs. Kimball called this hands-on, minds-on learning.
10. "I feel that my students are more engaged in a lesson if I perform it more and act it out more."
11. Knows students need a lot of verbal, nonverbal and cadence, such as songs and rhymes to keep students engaged and learn the information.

Mrs. Owens (fourth grade)

1. Students were not as engaged as she would have liked them to be.
2. Individual whiteboards allow students to show the teacher their work during the lesson.
3. Mrs. Owens goes to where the students are during each lesson. If they are at their desks, she is moving amongst them. If they are on the floor in the front of the classroom, she sits next to or leans toward them.
4. Students were able to tell her what some of math vocabulary terms referred to during this lesson.
5. Students did okay with "understanding the difference between the two dimensions and the three dimensions".
6. New vocabulary words, prism versus pyramid, were more difficult for students during this lesson.
7. Didn't feel as though the paper pictures of nets grabbed students' attention as much as images displayed on the interactive whiteboard would have.
8. Knows this year's students are visual learners.
9. As each lesson progresses, what happens next is in response to what she sees students producing on their whiteboards.
10. Each year students grasp concepts differently.
11. This group is not as kinesthetic as last year's; they had difficulties building nets into 3D models.
12. Moves in different ways (nonverbally, physically around the room) to get students' attention.
13. Thinks that moving gets students' attention.
14. "If I'm wanting to get them to pay attention, my voice may go lower, or it may go higher, depending on what will get their attention."
15. Knows her students don't like to take risks, so will be more encouraging of trying challenging things in the future.
16. "You know they’re not going to remember to cap their markers all the way, but it might help them remember to hear or to see that, you know, visual and that click."
17. Has definitely seen her students later use the same gestures that have been used in lessons, especially line, rays, angles, and more specifically, using their hands or arms and voices to demonstrate small, acute angles, and large, obtuse angles.

Mrs. Randall (fourth grade)

1. See and experience math images, manipulate them, talk with various partners.
2. Student realizations about various types of angles.
3. Hands-on lessons.
4. Tries to tell and show students that it's okay to share, even if they don't get the correct answer.
5. Does anything she can to help students understand.
6. Uses facial expressions to show students they have the correct or an incorrect answer.
7. The teacher's physical presence is a part of classroom management, which affects student engagement, especially when student misbehaviors exist.
8. Visual elements like gesturing or facial expressions in the lesson make it more interesting for students.

9. Wondering if taking off and putting on glasses was distracting for students.
10. She believes that students can be teachers for each other.
11. The students that get easily distracted the most often sit in the front row, so she will be more cognizant of her non-instructional behaviors that may distract them even more.

Mrs. Tanavo (fifth grade)

1. Taking notes during the lesson helps students learn the vocabulary words better.
2. The use of gestures during the lesson also helps students learn.
3. Varied lesson formats to keep students interested and engaged; includes a review, stated and/or written learning objectives, taking notes, math videos, and an activity, in addition to work time.
4. Has students think on their own, talk with their desk groups, and share with the class in each math lesson.
5. Hopes that students pay more attention if her voice goes up and down; comments that "maybe if it's not monotonous, then maybe they won't get . . . bored".
6. Claps her hands to get students to stop talking.
7. Tried to choose letters to label geometric figures that would catch students' attention.
8. "I mean you would hope that the more you move, the more you vary your voice, the more you gesture, the more things there are for them to pay attention to… even if they are not listening to your voice, maybe they are watching you."
9. Sees students repeating gestures used in the lesson, especially geometric gestures, when repeating them back to her. Does not see these gestures used in peer-to-peer interactions.

Mrs. Paxton (fifth grade)

1. Real-life examples and students' interests are utilized to foster student engagement and application.
2. Students did a nice job of writing the examples on their whiteboards, so it was easy for Mrs. Paxton to see that they were engaged in the lesson. "The kids did a really nice job of writing the lesson examples down on the board and interacting with me in conversations, so I think through that I was able to observe and assess that they were grasping what I had intended for them to learn that day."
3. Students really need routine. (Math lessons are the same format from day to day.)
4. Important for students to know you're a person, not just a teacher.
5. "I think they are very interested in your life, and so if you can pull in examples from how you use the lessons, again I think it will be more motivated, to grasp the lesson."
6. Being able to apply examples to their own lives enables students to grasp the concept while being motivated to learn.
7. When you know how to best work with each student, you know if you should kneel next to them or stand a little farther away. Depends on each students' comfort and need for one-on-one assistance.
8. "I think motivation is huge, and I want the kids to see that I am excited to be there, and I am engaged in the lesson."
9. "So, by smiling at them, and acting excited, my hope is that, they will also be motivated to learn the lesson."
10. Tries to model respect to students by using eye contact to show them she is listening.

11. So if I, if someone is having their hand raised, and I call on them, my job is not to be turned to the board writing something, something down, but to be looking right at them. So they know I'm interested in in what they have to say. And hopefully they will do the same to me back."
12. Mrs. Paxton feels that using a calm voice helps students sense they are part of a calm environment, which helps student learning as well.
13. Student examples, akin to real-life examples she provides, give students motivation to be interacting with the lesson.
14. Mrs. Paxton wants her students to know she appreciates them.
15. Incorporates math nonverbal behaviors to connect with her students' visual learning styles.
16. Pointing to or circling items on the board is a cue to students that that information is important to pay particular attention to.
17. "Like I said kids are very visual, so I think their eyes kind of go with what you're pointing at and I think that helps them learn.
18. Students need time to process information throughout the lesson, so writing first, and then allowing students time to write and think is beneficial. Without this time, they would be overwhelmed.
19. Mrs. Paxton's experiences in incorporating real-life examples into her math lessons have shown her that students engage in examples that relate not only to their life, but to her life as well.
20. Students are particularly interested in examples that show how adults work in the real world.
21. This shows them that it isn't just fifth grade math, but it is used by adults in their lives right now.
22. When they were discussing shapes in geometry, a student in Mrs. Paxton's class brought in blueprints from her dad's engineering firm.
23. "So I think anytime you can get the kids engaged, and not only just the lesson, but how it also applies, then they're motivated to learn."
24. "Kids are, are excited to be there, and excited to learn because of how you're presenting yourself."
25. Believes that her students play off of her, modeling themselves after her voice and hand gestures when they are talking to their peers, or when explaining something to the entire class.
26. "They play off of how you look, how you feel about being there. Which I, which just goes back to the importance of the teacher."
27. Mrs. Paxton believes that the teacher sets the stage for the students. How you feel about being there, teaching them and learning alongside them carries over to the students' motivation to participate.

Theme #4: Teachers' Reflections and Realizations
Categories: Teachers' reflections and realizations have arisen from nonverbal examples displayed, the structure of their lessons, and students.

Mrs. Zale (third grade)

1. Nonverbal examples: Is aware of multiple verbal and nonverbal behaviors she regularly uses in her math lessons. Examples include the use of her hands to show the sizes of things or finding the difference between a large and a smaller number; vocal variety; and movement across the front of the room for management purposes as well as to show how to move on a number line, for example.
2. Students: Mrs. Z. was surprised when her students didn't seem to recall the lesson concepts from the previous day's lesson and also felt frustrated when she "messed up" her notes for the lesson.
3. Lesson structure: If she were to reteach this lesson, she would have laid out the reverse fact families prior to the explanation and then visually lay out the fact families with the numbers zero and one.
4. Lesson structure: In reflecting upon the lesson, Mrs. Z. stated that the students got stuck on the concept of repeated subtraction and therefore got off track and didn't recall the other brainstorming strategies from the day before.
5. Nonverbal examples: Knows that she communicated verbally, visually, and nonverbally during this lesson.
6. Nonverbal examples Doesn't feel as though all of her verbal, nonverbal, and visual behaviors were part of her natural personality before she began teaching. She likely thought more about them in her first years of teaching, but doesn't as much now. As each year has gone by, students seem to need more and more of those types of variety incorporated into daily lessons. She has learned and utilized these elements through necessity.
7. Nonverbal examples Doesn't think about or plan her verbal and nonverbal behaviors; they naturally come out in her teachings.
8. Lesson structure She continues to use these verbal, visual, and nonverbal elements in her lessons because they are and have been effective.
9. Students Uses some nonverbal and visual examples or strategies because it works for her; it is unintentional, but she hopes that it also works for her students.
10. Lesson structure Knows she was intentionally modeling thinking at one point in the lesson, but doesn't know if she normally talks like that.
11. Nonverbal examples In the video, Mrs. Zale saw that she touches her face while modeling thinking.
12. Nonverbal examples "I raise my eyebrows or open my eyes wide… oh I didn't think about that. I pretend like I didn't think of something a lot. My goodness, I never thought of that." Mrs. Zale calls this lying intentionally to model for students that they are also to think about a problem. She did not realize how many nonverbal behaviors she exhibits when she does this modeling, however.
13. Nonverbal examples Mrs. Zale thinks the use of nonverbal behaviors is tied to how well you know your content, which is also connected to increased number of years of teaching.

14. Lesson structure Very few pieces of her lessons are intentional. Those include planning and asking students to come up to demonstrate. Most of the physical pieces she exhibits in her lessons are not planned.
15. Students She continues with her nonverbal behaviors if they are working, or changes them if students are not engaged.
16. Lesson structure The way she visually and physically sets up her lessons (on the whiteboard or student participation) typically is reflected in their assignments. At times, this can be limiting to students because they don't always try their own way of doing things. They may only use the examples provided in the lesson.
17. Lesson structure Plans to use nonverbal gestures in her geometry unit, especially because the vocabulary lends itself to voice fluctuations, arm and hand movements to make the shapes.
18. Lesson structure Will continue to do what she does in future lessons.
19. Nonverbal Also thinks she will notice her nonverbal behaviors more.

Mrs. Kimball

1. Students Knows her students need to be actively engaged, so she cannot stand up in front and teach for great lengths of time.
2. Nonverbal Shared that she uses "a lot of hand motions all day long" when she is talking.
3. Nonverbal She knows she moves a lot and tries to be aware of using both sides of the classroom
4. Nonverbal Tries to be animated and use different voices.
5. Lesson structure Knows she does a "freeze and wait" during instruction.
6. Nonverbal Doesn't know if she uses her forehead and eyebrows to model thinking during a math lesson, though she uses it during reading.
7. Nonverbal Knows she does a lot of nonverbal things "instinctually, without realizing" she is doing it
8. Students Found it interesting that she stood off to one side of the whiteboard; also recognizes that she must also stand off to the opposite side when using the interactive whiteboard. Does each so students can see the board that's currently being used and it is still accessible to the teacher.
9. Nonverbal In watching the video, she sees that she holds up her fingers to show a number quite often.
10. Nonverbal Is more aware of enunciating words this year because of students on a speech IEP
11. Nonverbal Not aware of the use of her arms moving upward in the air while encouraging students to get ready for something new.
12. Lesson structure While watching the video, she realizes that she spoke about the dividend, but didn't write it inside the long division symbol. Was glad to hear and then see that she later added the number on the board.
13. Nonverbal Didn't know she used a marker when waving her arms to represent the size of a big number.
14. Nonverbal Sees herself using a lot of pausing and dramatic gestures in future lessons.
15. Students Enthusiasm and excitement shown in any subject area are contagious and catches students' attention.

Mrs. Owens (fourth grade)

1. Nonverbal Knows she typically stands, and doesn't sit, during most math lessons.
2. Students Thinks students would have grasped the lesson better if more images of nets would have been displayed and highlighted on the interactive whiteboard
3. Nonverbal Knows she uses some nonverbal elements in her lesson, especially using her tone of voice.
4. Nonverbal Knows she probably smiles if students get something right.
5. Students Knows she uses her hands to indicate that she wants students to show or tell her more information.
6. Nonverbal Uses a wide variety of nonverbal behaviors in her daily lessons, including large and small hand gestures, facial expressions, proximity, tone of voice, and making or avoiding eye contact.
7. Students Avoids giving a student attention if they are not following directions, but doesn't necessarily avoid gesturing to gain the same result.
8. Lesson structure In response to using intentional, instructional nonverbal behaviors in math: "They could. I guess I'm just not thinking about it. I know that I consciously do those things in geometry because they have worked before.
9. Nonverbal Doesn't think she plans ahead when using two fingers when saying the number two aloud. Also wasn't aware that she did that while teaching.
10. Nonverbal Didn't know her voice level dropped when telling students to not worry about spelling their math vocabulary words. Knows it was because she wanted to give them more information without distracting them from writing and working on their individual whiteboards.
11. Nonverbal In reflecting upon her voice level changes in this lesson, realizes that she didn't plan it ahead of time, but knows why she did it in that moment.
12. Nonverbal Changing of your voice to reflect a different focus or purpose are "things you do in conversation" with others.
13. Students Upon listening to her statement to students about writing the name of a 3D solid instead of drawing a picture of it, she realizes she should have told them to try drawing it. They are visual learners and this would be a time to use that strength, because they don't always like to take risks.
14. Nonverbal Hasn't been video recorded in so long that she wasn't sure what types of nonverbal behaviors she exhibits during her math lessons.
15. Lesson structure Doesn't necessarily plan out every gesture you use in a lesson; you just do them while you're teaching.
16. Lesson structure In talking about learning to be an elementary education teacher in college, Mrs. Owens said she doesn't recall actually being taught to use nonverbal behaviors during lessons. She says that "you noticed those characteristics in good teachers that you observe" and therefore are more likely to use them yourself in your own teachings. "Because it because it was something that you were drawn to, so you could understand them a little bit better."
17. Mrs. Owens shared that she avoids giving a student attention if they are not following directions, but doesn't necessarily avoid gesturing to gain the same result. She uses positive redirecting to gain students' attention again by standing next to or looking at them.

Mrs. Randall (fourth grade)

1. Students Recognizing students' realizations: Students learned that there are three different types of angles and discovered that triangles have three angles inside them.
2. Students Teacher frustration that students didn't catch on to concepts immediately.
3. Students Next time would give students more discovery time with polygons
4. Lesson structure Always seem rushed for time; not always enough time for all activities you want to do.
5. Lesson structure Feel she does a good job with using hands-on materials
6. Nonverbal Feels she is very animated; sings and dances
7. Lesson structure Aware of using her hands during the lesson to show "groups" and to show an "L" shape, but not aware of using them to show the movement of "in and out" or counting "one, two, three" on her fingers
8. Nonverbal or Students Showed surprise on her face when a student answered with a correct answer
9. Nonverbal Learned the difference between instructional and non-instructional motions
10. Nonverbal Stood with her hands in front of her body during this lesson because she was self-conscious in front of the camera. Is not self-conscious in front of her students.
11. Nonverbal Probably had fewer hand gestures because her hands were clasped in front of her body (self-conscious).
12. Nonverbal Had a dry mouth because she was nervous to be video recorded.
13. Nonverbal Gestures with hands while talking, even when walking around the classroom.
14. Nonverbal Noticed how many times she put her glasses on and took them off
15. Students Hadn't thought about students repeating gestures she, or they, have done in class. Decides students to repeat gestures, songs, actions they've done for various subjects
16. Nonverbal Knows she does a lot of thinking aloud in reading, but hasn't done it in math. Will do more of this in future lessons, especially for math story problems, which require thinking strategies.
17. Nonverbal Will hopefully be more aware of actions that she already does, and "intentionally make them either something that is going to help instruction, or, for visual."

Mrs. Tanavo (fifth grade)

1. Nonverbal Knows she uses her hands a lot when she talks; especially to use the "high five" attention-getting technique and pointing to examples on the board.
2. Nonverbal Unsure about changes in her tone of voice or facial expressions, such as smiling.
3. Lesson structure Didn't think it was likely that she used a great deal of vocal variety in this particular lesson due to the strictly note-taking format of the lesson.
4. Students Tries to look out at students and scan across the room to try to see each group of students at their desks.
5. Lesson structure "Not everything in math really lends itself to a gesture." However, uses body movement when teaching geometry and mean, median, mode, and range.
6. Nonverbal or Lesson structure Hopes she smiles and uses her facial expressions to model thinking.

7. Nonverbal When watching her video recorded lesson, she notices right away that she varies her voice and emphasizes words more than she initially thought.
8. Lesson structure Comments that she shouldn't face the board as much during future lessons. However, she doesn't know how to write on the board and not turn her back on the students.
9. Lesson structure Wonders if writing words and terms on the board during the lesson is more effective than having them pre-written and accessible on the interactive whiteboard.
10. Nonverbal Notices she paces back and forth across the front of the classroom. Also uses her hands non-instructionally while pacing.
11. Nonverbal Notices she used more gestures than she had originally planned to use. Some were gestures she was planning to use the following day, but displayed them without realizing it in this lesson.
12. Nonverbal or Lesson structure Didn't realize she was saying the number two and also holding up two fingers. Thinks it's probably a good thing that she used it, even though it wasn't planned; was a natural gesture for her.
13. Lesson structure Will continue to use her "high five" and geometric gestures. Will plan including more intentional gestures in future lessons.
14. Nonverbal Hopes some of her "fidgety" nonverbal behaviors are not distracting to students.
15. Nonverbal After watching the video, was reminded of playing with a whiteboard marker in her hands while walking around the classroom, waiting for students to finish writing in their math booklets. (Non-instructional wielding of object.)

Mrs. Paxton (fifth grade)

1. Students At the end of a lesson, Mrs. Paxton thinks about who she could have encouraged to get involved, or different examples she could have used alongside the math concepts.
2. Students Verbally encourages the students to share examples and nonverbally uses her hands to point as well as physical movement around the room.
3. Nonverbal An important nonverbal type of communication is facial expressions.
4. Nonverbal “I feel like, or I hope, I am smiling at students a lot of the time.”
5. Nonverbal Says she is definitely not a monotonous type of a person; she varies her voice from louder or softer to higher or lower.
6. Nonverbal Upon watching her first video clip, Mrs. Paxton noticed that her tone of voice definitely changes.
7. Nonverbal She also observed that she did not previously realize that she uses her hands so much. She commented that part of it is her teacher presence to get students motivated to pay attention, but it is also nonverbal behaviors that help them stay engaged.
8. Lesson structure Mrs. Paxton commented that her lesson format is to write something down on the whiteboard, and then wait for students to also write it down.
9. Nonverbal Did not realize that her hands frequently move while she is talking, but then they are still in front of her body while she is waiting for students to answer or respond on their whiteboards.
10. Students Students play off of you, the teacher. If your nonverbal gestures indicate your happy and excited to learn with them, they will want to be more motivated.

11. Nonverbal Observed herself furrowing her forehead and eyebrows when she asked the students to think about something. This is something she never noticed that she does while teaching.
12. **ALL** Will plan to use the same intentional, instructional motions that she used in this lesson in the future. This includes the facial expressions, vocal variety, and circling or pointing to math concepts, as well as modeling thinking and using her gestures to show that students should pay attention to her or they should be responding verbally or on their whiteboards.
13. Students "No matter who I'm talking to I want them to feel that I'm excited to talk to them, have a conversation. And part of that is your nonverbal...communication with your hands, and your eyes, and your voice, those types if things."
14. Lesson structure "So I definitely think there are some strategies that you would see more so with math. And some that you would do no matter what.

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