Chapter 1
Introduction

As the education field further embraces technology, information, and communication, more and more classes are being delivered from a distance. With this increase in distance education comes a need to observe nonverbal communication practices and to identify the use of nonverbal cues in two-way video instructional delivery. Research has established that nonverbal cues play a significant role in classroom instruction (Arnold & Roach, 1989; Cyrs, Conway, Shonk, & Jones, 1997; Rosenthal & Jacobson, 1968). The growing popularity of two-way video and the fundamental concepts of communication establish a parallel between classroom and two-way video instruction delivery. This parallel is observed through real-time responses and the ability to send and receive nonverbal communicated messages. Studies suggest that nonverbal cues administered by the instructor can influence face-to-face communication and instructional delivery in the traditional classroom. Grant and Hennings' (1971) case study measuring nonverbal communication in the classroom and Henly's (1977) research into enhancing communication through nonverbal cues are just two studies that support the important influence nonverbal cues have in instructional delivery. Prior research dating from 1967 to 2000 suggests that nonverbal communication research and classroom instruction theories may be applicable to current practices of instruction delivery via two-way video.

Since the mid 1800's, distance learning has been delivered in the formats of correspondence schools, radio lectures, television classes, and

Internet delivery (Campbell-Coggins, 1989). The increase in technological knowledge, equipment performance, and infrastructure has promoted further changes in the distance education classroom. The medium of two-way video is one example of this classroom change. It is unique because it incorporates nuances of traditional face-to-face classroom instruction with the ability for delivery at a distance.

Two-way video is a distance education medium that provides a face-to-face environment in which student and instructor can see and hear each other while engaging in discussion (Collins & Berge, 1998). This medium offers the ability for student and instructor to engage in real-time interaction between remote sites throughout the instructional process (Day, 1994). Although the similarities between the two-way video classroom and traditional classroom instruction (real time communication, visual presentation, and visual and verbal feedback) make distance education more inviting to teachers, teaching in the two-way video classroom warrants a different approach (Kalke, Massey, McRoberts, & Strand, 1997).

Instruction in a two-way video classroom presents distinctive challenges not encountered in the traditional classroom. Visual aids are received differently; for example, some traditional classroom visual aids cannot be used because the two-way video equipment cannot transmit them adequately to the receiver. Some of these visual aids include the use of the blackboard, small print overhead text, and large objects that do not fit in the camera's range. Modified or new visual aids must be developed to deliver instruction. Stenberg and Trout's (1994)

research found that in the two-way video classroom, transparencies are no longer necessary. Because this visual is projected over a monitor, standard paper is sufficient for displaying information to students. However, they found that when using standard paper, the instructor should use a minimum of 20-point font size and not use white paper, which produces a glare from the camera and lights. These findings are just the beginning of suggested visual aid design changes for instruction in a two-way video classroom.

Research suggests that teachers need to alter their instruction when teaching in a two-way video classroom. Cyrs et al. (1997) recommend that instructors place more emphasis on increased visual images, present eight-to-ten minute lecturettes, increase verbal and nonverbal communication skills, increase student involvement activities, design electronically deliverable syllabi referred to as telesyllabi, and provide directions for students on how to take a telecourse. These changes focus specifically on operation and technical changes in a two-way video classroom. The Cyrs et al. (1997) research generally addresses the importance of the instructor's abilities to communicate nonverbally but does not address specific nonverbal cues or challenges that may be presented during instruction in a two-way video classroom.

While research establishes that nonverbal cues exist in instruction delivery, the literature regarding the two-way video classroom primarily discusses nonverbal communication from a broad perspective. Nonverbal communication is defined as nonword human responses, that is, gestures through which messages can be transmitted (Luthans, 1989; Ruesch & Kees, 1956). Research conducted

in the two-way video classroom recognizes that nonverbal communication is important and places visual aids, presentation skills, and technical skills together as components of nonverbal communication. It also suggests the need for teachers to increase visual aid use, improve presentation skills, improve technological knowledge, and increase overall nonverbal communication skills when teaching in the two-way video classroom. Cyrs et al. (1997), Kalke et al. (1997), Stenberg and Trout (1994), and the current literature, do not address specific nonverbal cues used for instructing in the two-way video classroom. The purpose of this study is to examine the nonverbal cues that teachers use when delivering instruction in a two-way video classroom.

Statement of the Problem

There has been no research performed on the use of nonverbal cues in the two-way video instruction delivery. Therefore, there is a need to identify and confirm through observation the practice and development of nonverbal cues utilized when instructing in the two-way video classroom.

Significance of the Study

Two-way video is becoming a viable component of distance education and is thus impacting higher education. Colleges and universities have developed policies and procedures to ensure that their faculty and facilities are prepared to

meet the demands of this modern day delivery system. There is a need to identify a relationship between nonverbal cues and two-way video instruction delivery. It is only natural that the research in two-way video instruction is continued to include nonverbal communication cues.

This study is important because of the need to identify what nonverbal cues are being used in the two-way video classroom. Through observational analysis of teachers instructing in a two-way video classroom, knowledge will be acquired that can guide the development of future two-way video instructional delivery methods. By identifying nonverbal cues used in the two-way video classroom, this research can then be used to gain understandings of the two-way video teaching process, improve instructional delivery methods for teacher training, and establish theory in the two-way video medium.

Research Question

What nonverbal cues are used by teachers when delivering instruction in a two-way video classroom?

Chapter 2
Review of Literature

Reviews of three areas of related research were considered relevant to this study. The following areas of related literature were examined: 1) an overview of communication techniques, 2) nonverbal cues in classroom instruction, and 3) nonverbal communication in the two-way video classroom.

Overview of Communication Techniques

In the teaching process, the communication techniques a teacher uses play a significant role in instructional delivery. The components of communication are a fundamental human characteristic; simply defined, they are the use of symbols to transfer the meaning of information. Often, communication techniques as they relate to instructional delivery are taken for granted. While the instruction process historically focuses on verbal communication, other techniques are involved. In this review of literature, the fundamental techniques of communication are discussed to develop a foundation for their use in two-way video instruction delivery. The basic communication techniques used in classroom instruction are written, verbal, listening, and nonverbal.

Written. Within the four communication techniques, written communication is the least natural. Communicating through writing is an acquired technique not essential to all humans (Quasthoff, 1995). This developed technique allows information to be conveyed without physical presence. The

origin of written communication took place in the form of symbols. Symbols are images with individual meaning that allow us to express and communicate ideas. Semiotics, which is the formal study of symbols, is the foundation for written communication and must be understood to comprehend what a person thinks and how he articulates that information in written form (Langer, 1960). Early symbols have been depicted in prehistoric caves. During this period, the symbols used were “tallies,” viewed as notations as well as tokens used as symbols of goods. Examples of symbols commonly recognized in the American culture are the American and Confederate flags, religious icons, and color schemes.

Symbols such as flags and awards should not be confused with signs. Symbols have the ability to influence emotion, and signs often communicate an action to the receiver. For example, when looking at the symbol of the American flag, an American may see more then just the Stars and Stripes. He or she might see this as a symbol of pride, support, freedom of choice, democracy, and much more. When looking at a sign that has the printed letters S-T-O-P, one might view this as an execution command and literally stop their present action (Langer, 1960). Signs and symbols are obviously used differently within many cultures. Signs communicate information to request an action from the receiver. Symbols, on the other hand, may enter into our minds and thoughts and cause us to conceive and reflect upon ideas and beliefs (Langer, 1960; Ruesch & Kees, 1956). Therefore, the symbols are linked together to create a visual transformation of information, thoughts, and ideas understood as writing.

Verbal. Verbal communication is distinctly different from its written counterpart. Because of culture, dialect, and regional location, the interpretation of verbal communication can change with the receiver. Verbal communication is a mutually oriented vocal production and reception of linguistic signs (Quasthoff, 1995). Language is the expression of vocal tones that are linked to form meaning. Verbal communication techniques are interpreted as a primary channel for communication in traditional classroom instructional delivery. An assumption is that language, or verbal communication, is only one act or technique of communication occurring in human behavior (Luthans, 1989).

From a scientific perspective, the beginning analysis of verbal communication may be traced to Darwin (1987), who focused on the impact of facial and body movements on verbal language. Darwin used photographs published in 1862 revealing the face of a man stimulated and altered by an electrical shock. This early study, along with Quasthoff's (1995) and Sewel's (1984) research, implies that verbal communication is a fundamental human condition and a separating factor between humans and other animals. These early philosophies have influenced the emphasis of verbal communication in past instruction design. However, other communication techniques have an equal or greater emphasis on instructional delivery. These communication techniques should be considered for use in delivering instruction at a distance.

Listening. Listening is the receptive component of the communication process. Napier and Gershenfeld (1987) define active listening as the act of receiving and internalizing feedback from an outside stimulus—for example, a

student listening to an instructor deliver a lecture. Many times there are external stimuli causing lack of concentration and reactions to information that interfere with the listening process. In the classroom, this can be in the form of other students talking, facility and classroom noises, and many other external stimuli not synchronized with the instructor and student. Active listening encourages the listener to organize stimuli by becoming aware of both verbal and nonverbal messages being communicated through human feelings and emotions that often carry the real message (Luthans, 1989). Active listening, when executed properly, takes effort on behalf of the receiver.

In an attempt to clearly illustrate the meaning of active listening, Mills (1974) compares listening to seeing. When a person looks at an image, that image formulates in the retina of the eye. However, the act of seeing takes place in the brain because of the transfer of the image. As a parallel of this process to listening, sound produces vibrations in the ear. When the vibrations are transferred to the brain, listening takes place. Active listening is much more than hearing sounds; it is a very complex neurological and psychological process that takes place in the brain.

Nonverbal. The nonverbal communication technique is the most natural form of communication (Knapp, 1980). It is also unique because of its ability to complement other communication techniques (Knapp, 1980). Because of this capacity, it is important to look at nonverbal cues and understand their impact on instruction delivery. As stated above, nonverbal communication can be defined as gestures through which messages can be transmitted (Luthans, 1989; Ruesch

& Kees, 1956). When a person is effectively communicating, the entire body participates in the communication process (Von Raffler-Engel, 1998). Although motion sends a message, communication is also transmitted if a person is motionless. Motionless delivery of communication is similar to verbal communication (and the lack thereof) between communicators. When two people say something or, just as importantly, say nothing, communication is taking place (Hinton, 1985; Knapp, 1971). According to Hinton (1985), “No matter how one may try, one cannot not communicate. Activity or inactivity, words or silence, all have message value: they influence others and these others, in turn, cannot not respond to these communications and are thus themselves communicating” (p. 23). Therefore, the act of nonverbal communication can be considered a continuous process that can be exemplified in the standard interview process.

In an interview, two people are sending and receiving messages—both verbal and nonverbal. Nonverbal communication includes behaviors in the form of eye contact, touching, voice tone, physical behaviors, and facial expressions. Within the behavior family, nonverbal communication also includes subtle communicators. For example, external appearance, posture, and distance between two people convey subtle communication (Miller, 1986).

Henly (1977) states that nonverbal cues include how we say things with body posture, movement, facial expressions, gestures, touching, eye contact, space, and distance. An interpretation of this research can be expressed in a relationship between a mother and child. By observing nonverbal cues such as

how they look at each other, their proximity, and their facial expressions, one can draw a conclusion that special relationships are communicated nonverbally (Fast, 1970).

Nonverbal messages often work in concert with verbal messages. While the complementary ability of nonverbal cues is significant, Burgoon, Le Poire, and Rosenthal (1995) state: "No nonverbal cue is an island. It is continually surrounded by a host of nonverbal behaviors which together may delimit and clarify meaning" (p. 107). It is important to keep in mind that many nonverbal cues are sometimes projected unintentionally. They are often reflexive in nature (Fast, 1970; Miller, 1986; O'Hair & Ropo, 1994); however, other research indicates that nonverbal cues can take precedence over verbal communication (Arnold & Roach, 1989; Hinton, 1985; O'Hair & Ropo, 1994). The nonverbal message is received with more credibility because nonverbal cues carry a greater signal (Fast, 1970). Grant and Hennings' (1971) study on teacher movement supports these findings.

Grant and Hennings (1971) performed a case study measuring the amount of nonverbal communication in the classroom. In this study, the researchers videotaped instructors with at least three years of classroom experience. The purpose of this study was to quantify nonverbal cues as they relate to classroom instruction. For tracking purposes, the researchers attached values to communication actions in the categories of instruction and non-instruction. This aided in quantifying the nonverbal cues projected by the

instructors. Grant and Hennings' (1971) study revealed that 82% of communication by classroom instructors was nonverbal.

Mehrabian's (1967) ground-breaking research investigated the decoding of consistent and inconsistent communications of attitudes through facial and vocal channels. This established a foundation supporting the dominance of the nonverbal message, which agrees with Argyle's (1988) and O'Hair and Ropo's (1994) research that nonverbal cues can contradict verbal communication, and that the receivers of both verbal and nonverbal cues are more likely to accept the nonverbal message, whether it is complementing or conflicting.

These findings demonstrate that nonverbal cues play a significant role in the instructional process. The establishment of these communication theories creates a framework for future research into nonverbal communication in distance education. The remainder of this review of literature focuses on nonverbal cue categories, nonverbal cues in classroom instruction, and nonverbal cue use in two-way video instructional delivery.

Nonverbal Cue Categories

The previous information has only begun to address the role that nonverbal communication plays in instructional delivery. In fact, nonverbal cues enhance instructional delivery through complementary expression, which leads to a better-rounded interpretation process between instructor and student. The

depth of this technique is further divided into four distinct categories. These categories are proxemics, prosody, immediacy, and kinesics.

Leibman (1970) defines proxemics as personal space that moves and changes with the individual. Personal space is the core of the proxemics category, and there are different levels of space and distance. American middle class society has established four categories of personal space articulating the fluctuating levels (Hall, 1969). These levels include:

- Intimate space reserved for close relationships, sharing, protecting, and comforting
- Personal space, ranging from one and a half to four feet, reserved for conversations between friends
- Social space, ranging from four to twelve feet, reserved for interaction between strangers, acquaintances, and between teacher and student
- Public space, ranging from twelve to twenty-five feet, mostly used for one-way communications, i.e., lectures and performances

In instruction, proxemics focuses on the teacher's use of distance, motion, classroom arrangement, and space (Couch, 1993). For example, the instructor controls classroom proxemics via fixed seating, or by placing the student chairs in a close circle. The physical arrangement affects class discussion and interaction among students and teacher.

Prosody centers on voice tone, pitch, and instructor rhythm. An "effective use of prosody can convey caring, empathy, and warmth, as well as love of teaching and students" (Browers & Flinders, 1990, p. 36). Bowers and Flinders

(1990) state that teachers using this nonverbal cue philosophy know that yelling and projecting a high-pitched voice will excite rather than calm students. By understanding the philosophy of nonverbal cues in the prosody category, an instructor can assist in placing a student in the best frame of mind to receive information.

The immediacy category is the degree of perceived closeness between two people (Mehrabian, 1967, 1981). Instructors using this technique are physically close to students and use accepted touching, project warmth, and demonstrate open body posture while communicating (Mehrabian, 1971; Richmond, Gorham, & McCroskey, 1986). Bancroft (1995) states that immediacy can be best communicated through positive emotions and laughter. When involving this theory in the classroom, the instructor must pay attention to tone, pitch, loudness, and tempo when presenting material. An instructor's close proximity, sustained eye contact, inviting arm movement, touching, postural relaxation, and facial and vocal expressions can project a negative or positive attitude to students. When looking at the effect of immediacy in instruction, Gorham's (1988) study suggests a positive perception of instructor immediacy, leading to greater effective cognitive learning.

Kinesics focuses on the teacher's use of eye contact, facial expressions, and physical gestures (Fast, 1970; Jones, 1987). Nonverbal cues that fall in the kinesics category communicate strong messages with the ability for delivery from a distance. Kinesics are nonverbal movements and gestures that involve the torso, head, arms, legs, hands, and feet (Ellyson & Dovido, 1985). Jones' (1987)

definition is similar, but it also includes facial cues like smiling, frowning, a stern look (eye contact), and finger to lips. Instructors often use kinesics cues to project self-confidence and competence to students (Bancroft, 1995); warmth, spontaneity and student concerns can be conveyed as well. Instructors' use of these nonverbal cues empowers them to send effective messages in close proximity and at a distance.

Nonverbal Cues and Instruction

Research dating from 1967 to the present suggests that communication research and theories should be applicable to current practices of instructional delivery. Past studies concentrate on written, verbal, and listening techniques, but there has been limited research focusing on nonverbal cues in instructional delivery in distance education environments. Since it has been established that the use of multiple communication techniques enhances instructional delivery, and that nonverbal cues can complement other communication techniques, past studies in traditional classroom instruction should provide a framework for the pursuit of nonverbal communication research in the two-way video classroom.

Research in the communication field suggests that over 80% of a message is communicated nonverbally (Grant & Hennings, 1971; Knapp, 1971; Mehrabian, 1967). These findings make it hard to ignore the impact that nonverbal cues have on instruction delivery. When designing instruction, teachers should be aware that this high-level nonverbal communication influence

is necessary for instruction to be delivered completely, concisely, consistently, and accurately. Mehrabian's (1967) study investigated the decoding of consistent and inconsistent communication of attitudes in facial and vocal channels. He found that within a two-channel communication process, 41.4% of the message was decoded via facial expression and 19.3% was decoded via vocal channels, supporting the theory that nonverbal—in this case, facial—messages have a stronger effect than vocal messages. Moreover, the nonverbal aspect of Mehrabian's research continues to support findings that 93% of one's face-to-face communication is nonverbal.

From the late 1970's to the present, there has been an increasing amount of research performed in the area of nonverbal cues in the classroom. Grant and Hennings' (1971) research revealed that 82% of communication by classroom instructors was nonverbal. In the traditional classroom, communication is the foundation for teaching with the understanding that messages are not communicated by words alone (Arnold & Roach, 1989; Dean & Roach, 1989). Nonverbal communication in instruction incorporates behaviors that do not use words (O'Hair & Ropo, 1994). Voice tone, body posture, gestures, and eye contact are incorporated in a teacher's classroom message. Knapp (1971) suggests classroom lectures and discussions are mainly communication events because of these elements. Classroom instruction follows the fundamental steps in the communication process of stimuli, delivery medium, and a receiver. The stimuli is the instructor; the delivery medium can be as simple as a voice, tone,

gesture, or as complex as telephones, video, and the internet; and the receiver is the audience or student.

Keith, Pettigrew, Tornatzky, and Lous (1982) developed a nonverbal communication behavior rating scale designed to measure verbal and nonverbal teacher-learner classroom behaviors. The instrument rated fifty-seven behavioral variables in the areas of gestures, body acts, body orientation, facial expression, head orientation, physical orientation, visual orientation, physical contact, punishment procedures, verbal behavior, use of instructional aids, teacher-pupil interaction, and facial attraction. From a student perspective, the instrument rated verbal behavior, visual orientation, motor activity, noise-making activity, mouthing, object disturbance, and physical contact. These classroom behaviors have been identified as important in the teaching process, and identifying and quantifying these behaviors are important in understanding teacher and student classroom behaviors.

Classroom instruction can be executed very efficiently through nonverbal cues. Petrie, Lindauer, Bennett, and Gibson (1998) suggest that 75–80% of classroom instruction techniques should be nonverbal. Although their concentration was on classroom management, their research reflects that during the instruction process, if a teacher depends heavily on verbal techniques, time is subtracted from classroom instruction. With Petrie et al.'s (1998) research in mind, having an understanding of nonverbal cues is very helpful in classroom instruction. It helps the instructor become a better receiver of student messages and increases the instructor's ability to send positive nonverbal messages

assisting in instructional reinforcement. Moreover, an understanding of nonverbal cues affords the instructor the ability to stay away from nonverbal cues that can hinder learning (Hinton, 1985). Therefore, in classroom instruction, the teacher needs to understand nonverbal cues to accurately and effectively deliver information (Miller, 1978).

In classroom instruction, facial expressions are a "two-way street." Students' facial expressions inform instructors of the students' real intentions, motivations, and understandings (O'Hair & Ropo, 1994). For example, students can verbally communicate to the instructor that they understand an assignment, but their facial expressions may indicate a lack of understanding. Argyle's (1975) research suggests that teachers use nonverbal cues from the students to interpret responses to new material, instruction, and learning in general. Argyle (1975) suggests that nonverbal behavior serves four functions. These functions are: expressing emotions, conveying interpersonal attitudes, presentation of one's personality, and accompanying verbal communication. When looking at these four functions in the teaching process, Argyle states that the nonverbal message delivered can help to regulate, compliment, substitute and contradict the communication process. Research also suggests that students' facial expressions are the most visible form of communication when trying to interpret their state of mind (O'Hair & Ropo, 1994). Because the face has the ability to produce over 1,000 different expressions, it is instrumental in communicating a student's state of mind (Ekman, Friesen, & Ellsworth, 1972). O'Hair and Ropo's (1994) research presents a connection between culture and gender and the

degree of expressiveness of facial expressions. From an emotional perspective, female facial expressions are more accurate than those of males; also, facial expressions from students from different cultures can present different meanings. Moreover, when the instructor looks for nonverbal confirmation of understanding from the student, the face is one of the first places they look. This additional understanding of facial expressions as they relate to students can assist the teacher in delivering instruction and in identifying problems for resolution. An instructor's ability to recognize this nonverbal feedback and then act accordingly can improve instruction delivery.

The human eyes are an important source of communication. They reveal large amounts of information to and from the instructor. Hodge (1971) states that the eyes are the most obvious and dominant communication attribute of the face. They continuously provide a constant channel of communication. Because humans are visually oriented, eye movement and its focus on objects and other people reveal a large amount of information. When two people reach eye contact, they are searching for information as well as committing themselves to communication (Hodge, 1971; O'Hair & Friedrich, 1992). Although eye contact does not have as many expressions as a person's face, when complemented with facial expressions and other nonverbal cues, it gives an instructor a more complete picture of student's feelings and perceptions. As stated by Hinton (1985), a lack of communication is a form of communication. This research holds true in that a lack of eye contact can communicate a message to the instructor. Students who are unprepared to answer a question in class might avoid eye

contact with the instructor, hoping the instructor will not recognize or call on them (O'Hair & Ropo, 1994).

Physical cues projected by the instructor communicate a message to students (Kleinfeld, 1972). Expectations are conveyed through gestures, touch, facial expressions, and other nonverbal communication avenues. Concerned facial expressions, positive reinforcement, and acceptable touch by the instructor convey a positive expectation. Kleinfeld's (1972) study looked at the effects of instructor warmth and physical proximity by administering an adult intelligence test to fifteen Alaskan native high school students. In administering the exam, the examiner sat sixty inches away from the students while displaying a businesslike manner. Three weeks later, components of the exam were re-administered randomly; some students were sent to a "warm" testing environment and some to a "cold" testing environment. The warm environment consisted of the teacher sitting thirty inches away, at right angles and at the same level with the students. The examiners also smiled frequently when proctoring the exam. The cold testing environment consisted of the teacher sitting eighty inches away, standing upright, and not smiling. In analyzing the test results, there was significant change. The test scores of the students in the warm environment improved, while the scores from the students in the cold environment remained the same or declined.

Distance Education

Distance education is a process that connects students with a system of distributed learning resources designed to meet their educational needs. This instructional delivery system is characterized by the separation of time and/or space between instructor and student, among students, and/or between students and learning resources. One or more media platforms provides for interactions between these participants (Institute for Distributed and Distance Learning, 2001).

The beginning of distance education and external certification can be traced to the 1850's. While the development of the British Open University in the 1900's marked the beginning of the cooperative extension and extension degree programs, America's land grant universities have also played a significant role in distance education through extension and public service programs. Campbell-Coggins (1989) notes that the United States built on the British Open University cooperative extension and extension degree programs' foundation and in the 1970's developed external degree programs (including a bachelor's degree). During this period, traditional correspondence media were used, but there was also the concurrent development of new education delivery methods: television, computer-assisted instruction, audiotapes, heavily print-based instructional modules, and videotapes.

Distance education mediums have the ability to bring students together and fulfill students changing educational needs. According to the National Center

for Education Statistics (1993), there has been an increase in the numbers of part-time students and older students enrolled in college. In 1997, 45% of college enrollment was older student based. In 1991, 78% of the 25 years and older population had completed high school and 21% had completed four or more years of college. This is a larger percentage of older student enrollment than in 1980 when 69% of the 25 years and older population had completed high school and only 17% had completed four or more years of college (National Center for Education Statistics, 1993). These enrollment statistics are important because they show a 4% increase in the older student make-up, associated with an increase in distance learning needs within this group. Factors influencing this growth are the increased age in the education population and the need for adults to seek higher education and re-training, thus resulting in a growth of nontraditional college students. Because of this growth in distance education, there has been an increased development of technological platforms. This increases the demand to place the instructor and student at a distance.

Although print was the original medium, the telephone, fax machine, radio, satellite and microwave transmission, computer-mediated communication, television, one-way videotape, and two-way video have followed (Turner, 1996). With the continuous development of distance education mediums, the fundamental concept of connecting instructor to student is a routine that is always practiced. The American Council on Education (1997) created five guiding principles for distance learning:

- There is no one best instructional delivery and interaction media or method. Media and methods are selected for their contribution to the achievement of the learning outcome in a given situation.
- A true learning community is interactive where participants have the opportunity to engage information, their teacher, and their fellow students.
- All learning environments, traditional and virtual, are important to the university and will be cared for.
- A systems approach to instructional design will be modeled.
- Technology is a tool that enables distance and distributed learning to occur.

These five principles focus on many of the same attributes that have been defined in traditional classroom instruction delivery. They establish a need to provide a consistent platform for instruction using both nonverbal cues and basic instructional techniques to bridge the delivery gap between instructor and student. This prompts the question, how does the instructor use nonverbal cues to convey information to the student?

One-way video. The execution of one-way videotapes via lecture supplement for classroom experiments is the second major use of this medium in the United States (Russell, 1984). Pre-recorded videotaped demonstrations and experiments present several advantages:

- The demonstrations always work.

- The time the demonstration will take is in known in advance.
- The use of time-lapse photography drastically shortens the time of a demonstration.
- Demonstrations that occur on a scale too wide to be seen in the live lecture can be magnified by close-focus techniques (Russell, 1984, p. 866).

This philosophy of one-way video instruction supports the principle of contribution to the achievement of the learning outcome in a given situation. At the outset, one-way video systems were developed to transport knowledge and information to the recipient at a distance. At one point, videotaped lectures were used to replace live interactive instruction. Although the replacement of live interactive instruction is not popular, many institutions use one-way video to support, supplement, or complement live instruction (Barker & Singh, 1985). At the University of Illinois, videotapes are used to present lecture materials to students in small discussion sections (Enger, Toms, & Cohn, 1978; Haight, 1978).

In the classroom, using videotaped instruction, students have the opportunity to choose a time that is convenient for them to view a specific lecture. This viewing freedom can create an environment where students have an opportunity to engage in individualized instruction (Larsen, 1992). Russell's (1984) research further supports the positive effect videotape instruction brings to small classroom and self-instruction environments.

Studies conducted by Larsen (1992) and Russell (1984) suggest that one-way video has a positive effect on individual instruction due to student lecture control, convenient time review, and the promotion of an isolated study environment. The students have control of time and place of instructional delivery, potentially placing them in the most optimal environment to receive instruction. Rowntree's (1992) research supports Larsen's (1992) and Russell's (1984) research, stating that videotaped instruction allows the student to receive and review information as many times as needed. This is important in reinforcing information and repeating difficult-to-understand classroom segments, thus providing a more complete grasp and understanding of the concepts.

Two-way video. Real-time responses and the ability to send and receive nonverbal communication establish a parallel between the traditional classroom and two-way video instruction. However, there has been little research focusing on nonverbal cues and their effect in the two-way video classroom. Prior research, dating from 1967 to 2000, presupposes that communication research and theories may be applicable to current policies in two-way video instruction delivery. Moreover, the current two-way video research does address instructor presentation skills, visual aids, improvement techniques, and technical and non-technological barriers specific to this environment. From the current research in the two-way video medium that relates to the classroom, it is possible to build a framework to understand the technological aspects for instruction delivery within this medium.

Two-way video is a distance education platform that provides a face-to-face environment where students and faculty can see and hear each other and engage in discussion while in separate locations (Collins & Berge, 1998). Instruction via two-way video offers the instructor and student the ability to engage in real-time interaction between remote sites throughout the education exchange. Real-time communication is defined as the ability for student and instructor to engage in activities at remote sites as if they were located in the same room. The two-way video medium has the ability to address important needs in distance education, "including education for the handicapped, disabled, homebound, English-as-a-second language…" (Day, 1994, p. 26), and provide a benefit to senior citizens (Day, 1994). Although many times instructors and students may not take full advantage of this capability, the technology is available in this medium.

Bowman (1997) and Cyrs et al. (1997) concur that teaching in a two-way video environment is very different from teaching in a traditional classroom. Many instructors think that they can take a normal classroom lecture, teach it in a two-way video environment, and receive the same results. The creation of distance education is not that simple; not only is this environment different, but in some cases the addition of a camera, and instructors conforming to their surroundings, will influence instruction delivery (Von Raffler-Engel, 1998). Kalke, Massey, McRoberts, and Strand (1997) performed two case studies looking at ways to improve interactive video courses. They found that technology and instructor performance were key areas that needed improvement. Furthermore, they found

that the students played an important role in the improvement of interactive video instruction. Students needed more training on the technology, and support technicians needed to be readily available. Students who are unfamiliar with hardware, interactive procedures, and technological processes slow instruction delivery and classroom interaction. Kalke et al. (1997) also found that teaching via two-way video presents unique challenges that are significantly different from traditional delivery modes.

Stenberg and Trout (1994) found that teaching improved in two-way video when instructors moved from one technique to another every 30–45 minutes. This switch in teaching style helped hold student attention. Although these findings are very important, Kalke et al.'s (1997) research indicates that face-to-face contact was important in the remote sites. This contact had an impact on the students' connection with the instructor. When teaching in a two-way video classroom, instructors should make an effort to visit and teach from all of the remote cites when possible (Stenberg & Trout, 1994). Massoumian's (1989) research suggests that a teacher's lack of physical presence at remote sites can lead to supervisory and classroom management problems. Classroom management problems can expand to instruction delivery problems, which can lead to larger education issues. Therefore, instructors embarking on the two-way video delivery medium need direction in enhancing presentation, developing new classroom management techniques, and adapting instructional delivery skills for optimal success (Massoumian, 1989).

Bowman (1997) states that instructors are rarely taught the proper skills needed to teach in a two-way video environment. How to use the classroom technology, visual aid changes, and overall instructor presence are rarely taught thoroughly to instructors. As stated earlier, many instructors take for granted that teaching in this environment is similar to the traditional classroom, and they close their minds to new skill training. Granted, instruction delivery skills and practices are still being identified and developed, but the limited skills that have been identified are not readily used. Bowman's (1997) research is an example of an instructor practice that can improve delivery. He found that relaxed delivery is key to effective instruction. Because of the camera presence, instructors who can present their materials in a relaxed manner have proven to be the most successful when teaching in a two-way video classroom.

Massoumian's (1989) and Stenberg and Trout's (1994) research resulted in twelve tips for success when teaching in a two-way video classroom. This research identified specific points to assist the teacher in instructional delivery. However, Stenberg and Trout's (1994) tip, "Show enthusiasm for the course content and the telecommunication system," (p. 17) and Massoumian's (1989) tip, "Teaching strategies that compensate for lack of presence
(p. 18) are the only suggestions that begin to address the nonverbal cue factor.

Barriers. The two-way video classroom has many barriers that influence the instruction delivery process. These barriers have been categorized as non-technological and technological hurdles. The instructor can be a non-technological barrier in the two-way video classroom. The shortage in both the

number and ability of teachers to operate two-way video delivery systems efficiently can influence the quality of instruction delivery (Massoumian, 1989). Instructors often have had little or no experience with telecommunication equipment, which is often limited to educational technology areas in colleges and universities. Since Massoumian's (1989) article, instructor training and development is more widespread, but there is still a learning curve problem among teachers that present a instructional delivery barrier in the two-way video classroom.

Other non-technological barriers, such as the physical structure, fixed seating, and a theater-style setting, take away from classroom movement and an inclusive circular environment promoting classroom discussion (Stenberg & Trout, 1994). Stahl's (1999) two-way video research involving class discussion revealed that this medium did not allow time and opportunities for students to engage in collective dialogue and group activities, suggesting that student-to-student collaboration is lost in a two-way video environment. However, Stenberg and Trout's (1994) article, "Team Teaching via Two-Way Interactive Video" contradicts this point by suggesting that the two-way video classroom is ideal for class discussion. Stenberg and Trout (1994) found that often class discussions taking place in the two-way video classroom are more active and unique because this medium created an environment for both young and experienced students to engage in class discussions with one another.

Another non-technological barrier addressed in Stahl's (1999) research is the "shy student factor." Because of the student control in classroom

involvement, students who were shy tended to keep themselves out of discussions. In a traditional classroom, nonverbal indicators from the students, as well as the teacher, can entice a student to get involved. In two-way video, this enticement and nonverbal feedback can be controlled by the student, thus perpetuating this "shy factor." Camera shyness was also a factor in student evaluations. Having a camera on the students made some of them self-conscious and reluctant to participate in class lectures. Stenberg and Trout's (1994) research points out that regardless of shyness, "seeing oneself on a t.v. monitor can be startling and unnerving" (p. 15).

Stenberg and Trout's (1994) and Stahl's (1999) research points out that many technological barriers, including the postal service, voice and electronic connections, microphone procedures, and the camera, can impede the delivery of instruction. In the two-way video classroom, the camera has a finite range of motion and does not have the ability to view teachers who are very mobile and move throughout the classroom (Stenberg & Trout, 1994). Instructors moving out of the camera's range will be cut off from the students' view from the remote sites in a two-way video classroom. This visual limitation constrains the instructor's nonverbal delivery.

Spontaneous delivery of class lecture materials to remote locations is another technological barrier in the two-way video classroom. Because not all of the students are at one location, handouts and course materials must be planned and mailed in advance to remote sites. With the availability of fax machines and

other technological advancements, spontaneous handouts are possible, but not all remote sites are equipped with such devices (Stenberg & Trout, 1994).

Massoumian's (1989), Stahl's (1999) and Stenberg and Trout's (1994) research is significant because they identify barriers from both technological and non-technological perspectives, supporting past research that the two-way video classroom has unique challenges quite different from traditional classroom instruction. Identifying these challenges and developing strategies to overcome them can make improvements in two-way video instruction delivery.

Summary

This review of literature identified the fundamental communication techniques: written, verbal, listening, and nonverbal. Nonverbal communication techniques are complex and are further divided into the categories of proxemics, prosody, immediacy, and kinesics. Research has established that these nonverbal categories, more specifically nonverbal cues, play a significant role in instructional delivery. In reviewing literature from 1967-2000 in the areas of communication, classroom instruction, and distance education, research has established a significant connection between the use of nonverbal cues in instructional delivery (Arnold & Roach, 1989; Kleinfeld, 1972; Massoumian, 1989; Rosenthal & Jacobson, 1968; Stahl, 1999: Stenberg & Trout, 1994).

Previous research in the traditional classroom has established the use of nonverbal cues in instructional delivery. Although there is limited research

identifying nonverbal cues used by teachers when delivering instruction in the two-way video classroom, the similarity in formats between the traditional and two-way video classrooms make the studies performed in the traditional classroom important.

Some research on the two-way video classroom touched on the use of presentation skills and visual images, implying that nonverbal communication is apparent, but it did not measure the use of nonverbal cues in this medium. In fact, specific nonverbal cues are seldom addressed when discussing instructional delivery. When discussing instructional delivery in the two-way video classroom, the current literature focuses on technological exchange and instructor presentation skills. Again, nonverbal cue use is implied within these broad categories, but an implication of this important communication technique is not sufficient. Nonverbal cue use should be looked at in more depth, and research similar to that conducted in the traditional classroom should be performed.

Two-way video is a relatively new medium used increasingly as a vehicle to deliver instruction. Because of the newness of this medium, there are theories that need to be established, among them the role of nonverbal messages. Nonverbal cues influence communication, and communication affects instruction delivery. Because the two-way video classroom is a growing platform for education, the use of nonverbal cues within this medium needs to be observed, identified, quantified, and addressed. By studying nonverbal cues used in the two-way video classroom, the education community can gain understandings of the two-way video teaching process and identify and develop knowledge and

skills in two-way video instructional delivery. This knowledge can be used for teacher training and for developing new theories in this distance education medium.

Chapter 3
Descriptive Observation Methodology

Research Question and Approach

Nonverbal cues are often natural and reflexive occurrences that take place during normal communication actions (Fast, 1970; Miller, 1986; O'Hair & Ropo, 1994). In the teaching process, instructors subconsciously use many nonverbal cues to deliver a message to their students. Moreover, the greater percentage of nonverbal communication is visual and requires receiver presence during the communication exchange. Therefore, when measuring the use of nonverbal cues in the communication process, the receiver must have a presence in the communication environment.

These points made it ideal to use descriptive observation as the research method to answer the research question. Descriptive observation is the best way to collect data in the participants' natural field setting and represents "a first hand encounter with the phenomena of interest rather then a secondhand encounter of the world obtained in an interview" (Merriam, 1998, p. 94).

The purpose of this study was to identify the use of nonverbal cues used by engineering and chemistry teachers when instructing in a two-way video classroom. This chapter outlines the methodology and research design of the study. This chapter also describes the research design of descriptive observation and the method of data collection and analysis used in conducting this research.

Research Question

The purpose of this study was to identify the use of nonverbal cues by engineering and chemistry teachers when instructing in the two-way video classroom. With this specific purpose in mind, the research focus was the investigation of the following question: What nonverbal cues do teachers use when delivering instruction in a two-way video classroom?

Sample Group

Participants for the study were chosen from Virginia Tech instructors who had archived lectures, of them, teaching in the two-way video classroom. Letters of request for participation in the study were sent to more then fifty Virginia Tech faculty, in the areas of chemistry, engineering, business, and animal science. The first six qualified participants, who agreed to participate, were used for the study. The participants included six engineering and chemistry professors with a minimum of six month experience teaching in a two-way video classroom. This requirement provided the participants with time to develop nonverbal cue delivery skills and to overcome the technological learning curve associated with the two-way video classroom (Stenberg & Trout, 1994). Five 50-minute lectures from each instructor were chosen, equaling 250 minutes of lecture time. This lecture time was multiplied by six instructors for a total of 1,500 minutes of observed instruction.

Virginia Tech instructors, in engineering and chemistry disciplines, with experience teaching in both two-way video and traditional classrooms were sent an official letter from the researcher stating the purpose of the study and asking for their assistance in this project (see Appendix A). This process was repeated until six instructors were confirmed via receiving the instructor approval form (see Appendix B). The participants were asked to sign and return to the researcher the approval form authorizing their videotaped lectures to be used for this dissertation project. Anonymity was maintained by using coding for the participants. Personal identifiers such as department and discipline were removed. The participant's personal information was known only to the researcher and was kept confidential. The decision to use six participants for this research was based upon procedures found in previous research by Roshong (1979) and Stauch (1986). In addition, Borg and Gall (1979) indicated that a small sample group is appropriate when "time-consuming measurement techniques are employed" (p. 197).

Data Collection and Instrument Development

The data reported in this study were obtained through a descriptive observation method that involved reviewing and recording instructors' nonverbal cues while teaching in their natural two-way video instruction setting. Contributions from Keith et al.'s (1982) Communication Behavior Rating Instrument and Magliaro's (1981) ALT-RR/RC Instrument were used to develop

the Two-way Video Nonverbal Cue Observation Instrument (TV-NCOI) (see Appendix D).

The ALT-RR/RC Instrument contributed to the formatting, operation, and organization of the TV-NCOI. Keith et al.'s (1982) communication behavior rating instrument was used to incorporate six categories and the content in the TV-NCOI. The seventh category, "other nonverbal cues", was implemented to seek additional information on nonverbal cues that might have been developed by the instructor when delivering instruction in the two-way video classroom. The nonverbal cue categories included:

1. Directional gesture category. These were nonverbal behaviors delivered by the instructor when teaching a class. There were five gestures identified and defined as movement pointing to a present object(s) or waving motion of hand(s) or arm(s). Examples of directional gestures included pointing to item(s) on the blackboard/screen, computer screen displays and materials, waving motion of hand or arm, including motions signaling stop, approach, or withdraw.

2. Accent gesture category. These were nonverbal occurrences administered by the instructor defined as movement that accents or emphasizes words or phrases. There were six accent gestures identified. Examples included hand slicing through the air, fist thumping an object, finger to lips signaling quiet, finger to ear signaling listen, hand(s) upturned with open palm, and counting and/or showing fingers.

3. Teacher movement category. A total of four variables were coded to describe specific levels of teacher movement. These levels included large movement, small movement, no movement, and squatting/sitting. The space used in the classroom defined the degree in which any teacher movement occurred.

4. Facial expression category. Two variables were coded to describe facial expressions. These categories were smile and frown movement. The smile category was defined as smile or non-smile occurrences by the instructor's position of the mouth in an upturned expression. Frown occurrences were defined as the instructor's position of their eyebrows in knitted expression and/or forehead wrinkled.

5. Head movement category. Two variables were coded to describe instructor head movement. These variables were head nod and head turn. Head nod occurrences were defined as the degree in which the instructor exhibited up-down motion of the head relative to axis of the shoulders, while looking at or toward student(s). Head turn occurrences were defined as the degree in which the instructor exhibited side-to-side motion of the head relative to axis of the shoulders, while looking at or toward the student(s).

6. Teacher action category. These variables quantified instructor actions relating to instructor gaze and touch. These included the instructor's gaze toward the students' faces or other specific area in the classroom and the act of the instructor touching a student in the classroom.

7. Other nonverbal cues category. The other nonverbal cue category was an open-ended category allowing the observer to describe the nonverbal cues reviewed in the classroom lectures or identified in the TV-NCOI. Some of these nonverbal cues might include noises, unique physical motion such as jumping or clapping, and nonverbal cues specific to the two-way video classroom. By design, there were not many examples of this category presented to the observer to allow for maximum unguided collected data.

As the dissertation project evolved, one of the goals was to discover new nonverbal cues developed by instructors that were two-way video classroom specific. For this reason the category “other nonverbal cues” was developed and incorporated in the instrument, giving the observer the opportunity to identify and record nonverbal cues delivered by the instructor yet not outlined by the nonverbal cue instrument.

Incorporated from the ALT-RR/RC Instrument was the use of an interval recording system. This instrument employed a 12-second interview time with five seconds allotted for observations and seven seconds for recording. The interval recording system was ideal because interval recorded data allowed for consistency and accuracy when multiple observers review multiple lectures. Although this instrument implemented a twelve-second interval, because of the lecture length, the unique other nonverbal cue category, and the number of participants, the interval was changed to 20 seconds with five seconds allotted for observations and fifteen seconds for recording.

The content for the nonverbal cue observational instrument was adopted from Keith et al.'s (1982) communication behavior rating instrument. This resulted in the development of six categories and 21 variables designed to identify nonverbal cues used by instructors in the classroom. Those variables included:

1. Board pointing (BP). The motion of pointing to a board or screen to emphasize the visual status of the board or screen to the student while teaching. Examples may include pointing to an item or items on the blackboard or screen, using the computer cursor to highlight points in the lecture, and the continuous display of the computer screen and lecture notes as the dominant lecture focus point.

2. Material pointing (MP). The motion of pointing to and using a present object or objects while teaching. Examples include pointing to an instruction book, using a model for discussion and explanation, transferring lecture notes and materials in front of the camera, and creating and developing hand written materials while delivering instruction.

3. Waving (W). The motion of waving hand(s) or arm(s) in a rhythmic manner while teaching. Examples include waving motion of hand or arm independently to express a point(s).

4. Approach waving (AW). The motion of waving hand(s) or arm(s), signaling the students to approach, while teaching. Examples include waving motion of hand or arm to signal students to approach or withdraw.

5. Stop waving (SW). The motion of waving hand(s) or arm(s), signaling the action stop, while teaching. Examples include waving motion of hand or arm to signal stop.

6. Hand slicing (HS). The motion of the hand slicing emphatically through the air in a vertical non-rhythmic manner strongly accenting a point.

7. Fist thumping (FT). The instructor's up and down motion of thumping his/her fist on an object to express or accent a point.

8. Fingers to lips (FL). The instructor's action of placing his/her fingers to his/her lips to signal quiet and/or to accent a point.

9. Fingers to ears (FE). The instructor's action of placing his/her fingers to his/her ears to signal listen and/or to accent a point.

10. Hands upturned (HU). The instructor's action of his/her hands upturned with an open palm to accent a point.

11. Counting fingers (CF). The instructor's use of showing fingers while counting each one to accent or make a point.

12. Large movement (LM). The instructor's movement during the lecture in the distance of three or more desks or approximately seven steps while teaching.

13. Small movement (SM). The instructor's movement during the lecture quantified by the distance of less then two desks or approximately two steps.

14. No movement (NM). The instructor's lack of movement during the lecture quantified by the distance of no steps.

15. Squatting/Sitting (SS). The position of the instructor's body with reference to a squatting or sitting position beside student(s). One unit of squatting/sitting is counted when the instructor arises.

16. Smile movement (SM). Movement occurrences by the instructor's position of the mouth in an upturned expression. Count one unit of smile when the mouth returns to non-smile position.

17. Frown movement (FM). Movement occurrences defined by the instructor's position of eyebrows in knitted expression and/or forehead wrinkled administered when dissatisfied.

18. Head nod (HN). The degree of occurrences in which the teacher exhibits up-down motion of the head relative to axis of the shoulders, while looking at or toward student(s). Count one discrete unit of a head nod when up-down motion of the head stops for two of more consecutive seconds.

19. Head turn (HT). The degree of occurrences in which the instructor exhibits left-to-right motion of the head relative to axis of the shoulders, while looking at or toward student(s). Count one discrete unit of a head turn when side-to-side motion of the head stops for two of more consecutive seconds.

20. Teacher gaze (TG). This action is defined as the instructor's extended look toward the students' faces or in another direction in the classroom. The observers will count the number of occurrences for gaze toward a student's face and other-directed gazes exhibited by the teacher. This does not include overlooking the classroom while teaching.

21. Touch student (TS). The act of the instructor making body contact with a student in the classroom. Count the number of occurrences of the teacher touching a student. One discrete touch is counted when the teacher removes their body part that was used to touch a student.

Observation instrument design. Magliaro's (1981) development of a behavioral observation recording instrument that was instrumental in measuring academic learning time of resource room students. Through the development of an Academic Learning Time of resource room (ALT-RR) observational recording instrument, the use of interval recording techniques, and the observer training manual, a reliable observation instrument was developed to measure academic learning time of resource room students.

Magliaro's findings led to many implications for improvements needed for teacher effectiveness with resource room students. She found that the content in the resource room was different than what was taught in the classroom. This difference may be due to a remediation focus of the content or to travel time from resource room to the classroom; the common denominator is a lack of communication from instructor to student. Other areas that need to be addressed to improve the effectiveness of the resource room program include increased listening time with classroom students, more application time with resource room students, task success, and teacher training.

Magliaro's (1981) behavioral observation recording instrument was instrumental in the development of the Two-way Video Nonverbal Cue Observation Instrument (TV-NCOI). The TV-NCOI was designed to identify

nonverbal cues used by instructors when teaching in a two-way video classroom. The observation procedure for using the TV-NCOI is described in the following section.

An interval recording system was adopted for the Two-way Video Nonverbal Cue Observation Instrument. The interval durations were 20 seconds. Five seconds were allotted for observation of the participants, and 15 seconds were allotted for recording the identified nonverbal cues onto the coding sheet. Six Virginia Tech instructors were observed teaching five 50-minute two-way video lectures. Each observation session lasted 50 minutes, totaling thirty sessions. This resulted in an observation cycle of 120 seconds in duration. A pre-recorded cueing tape was used to ensure that both recording and observation times were consistent. This tape played simultaneously with the videotaped lectures and signaled to the observer the beginning observing time and the beginning recording time. The researcher used a stopwatch to set the cueing tape precisely at five- and fifteen-second intervals. This ensured that the observers were reviewing and recording instructor nonverbal cues in the same interval. The cueing tapes were duplicated from a master tape to ensure exact interval length for all observers.

The TV-NCOI was used to collect data for analysis is shown in Appendix D. The top of the observation instrument has spaces for the observer to record general information about the observation. Under each category level are the codes from which the observer must describe the instructor behavior in the interval. Each column corresponds with each interval and was numbered to

match the cueing tape. This was important because in the event that an observer lost their place while viewing the videotaped lectures, they could quickly find the correct interval by listening to the tape. Moreover, if an observer missed or failed to complete an interval, they were instructed to leave it blank and get ready for the next observation interval. If the observer discovered that he or she was not in sequence with the cueing tape, the observer was instructed to began to code again in the next interval matching the cueing tape to the nonverbal cue coding sheet.

The nonverbal cue coding sheet was designed to facilitate the task of the observer and to provide precise descriptive codes for the observer to select. The coding sheet was divided into thirty intervals and facilitated the observation of two instructors, equaling ten lectures. Based on the interval division over ten lectures, the observer used fifty coding sheets.

Data Collection Procedure

Observers reviewed videotaped lectures of the participants, simultaneously allowing the observers to be unobtrusive and the participants to present a natural and authentic lecture. Promoting a natural delivery environment for the instructor increased the reliability of the nonverbal cue data received.

The researcher facilitated descriptive observations recording six instructors' nonverbal cues while teaching five 50-minute lectures in a two-way video classroom. The researcher reviewed videotaped lectures of the teachers,

which promoted a non-foreign environment that included the physical setting, the participants, activities, interactions, conversations, and subtle instructor factors (Merriam, 1998). This research technique promoted capturing the teachers delivering instruction in their most natural state.

Three observers were trained for the study. A Nonverbal Cue Observation Guide was developed to assist the observers in data collection preparation. The observers had to complete all five steps of the training guide successfully before data could be collected for final analysis. The nonverbal cue observation training guide was explained to the observer by the researcher to ensure complete understanding (see Appendix C). The selected observers were required to have experience taking college-level classes and to complete the five-step observation training process.

The observation protocol involved observer 1, 2, and 3 reviewing two Virginia Tech Professor's video taped lecture sets and recording their finding using the Two-way Video Nonverbal cue Observation Instrument. The observers protocol is indicated by O_1, O_2, and O_3. And the professors' protocol is indicated by T_1, T_2, T_3, T_4, T_5, and T_6. A lecture set consisted of five 50-minute two-way video classroom lectures. Below is a diagram of the observation protocol for the study.

Observation Protocol

Lecture	1	2	3	4	5
O_1	T_1 T_2	T_1 T_2	T_1 T_2	T_1 T_2	T_1 T_2
O_2	T_3 T_4	T_3 T_4	T_3 T_4	T_3 T_4	T_3 T_4
O_3	T_5 T_6	T_5 T_6	T_5 T_6	T_5 T_6	T_5 T_6

Reliability and Validity

The observers reviewed videotapes of two instructors teaching five 50-minute lectures in a two-way video classroom. They recorded their observations using the TV-NCOI. This communication-behavior identification instrument was developed from contributions from Keith et al.'s (1982) communication behavior rating instrument and Magliaro's (1981) ALT-RR/RC Instrument (see Appendix D).

The observers were trained by following the general guidelines articulated in observation research materials that included the communication-behavior rating scale and content used for this study (Borg & Gall, 1979; Capani & McGlaughlin, 1981; Keith et al., 1982; Wilson, 1982). The observers were given

the opportunity to learn and become familiar with the instrument categories and the observation protocol by completing a five-step process prior to collecting the data. Completing the five-step process promoted consistency, content understanding, observation accuracy and reliability of the collected data. The five-step process involved understanding the nonverbal cue behavior definitions, reviewing examples of the nonverbal cue categories, viewing pre-recorded video taped lectures with examples of instructor nonverbal cues, and observing and coding forty minutes of instructor nonverbal cues using the Two-way Video Nonverbal Cue Observation Instrument. The 40-minute observation sample was used to achieve observer reliability at .80 level prior to data collection.

To promote observation consistency, an observation training guide was developed and implemented for the study. This training guide involved five steps that each observer had to complete successfully, providing him or her with the fundamental skills to serve as an observer for the study. The observers were given the flexibility to complete each step individually or collectively with the guidance and supervision of the researcher. The Nonverbal Cue Observation Training Guide steps are described below.

Step 1. The observers studied the 22 behavioral definitions, their corresponding categories, and coding symbols.

Step 2. The observers completed a test where the category and the symbol must be identified with the behavioral definition. The observers had to answer 20 of 22 items correctly before successfully completing this step.

Step 3. The research reviewed each category with the observers and provided examples of the 22 behavioral definitions. The observers then completed a test involving videotaped examples of instructors delivering nonverbal cues that included all categories and recording symbols. The observers had to identify 20 of the 22 nonverbal cue categories and symbols before successfully completing this step.

Step 4. The researcher and the observers viewed a pre-recorded videotaped lecture. The tape was stopped at various intervals, and the observer was given 10 seconds to record the behavior on the nonverbal cue instrument. This was performed until each observer had an opportunity to use every category as well as become completely familiar with the TV-NCOI.

Step 5. The observers reviewed and coded 40 minutes of two-way video instruction delivery using the TV-NCOI. The coding sheets were collected and compared with the other completed observer coding sheets to ensure reliability at the .80 level. Please see Appendix C for more detailed information about the nonverbal cue observation training guide.

Borg and Gall's (1979) understanding of inter-observer reliability was adopted for this study. Their statement of inter-observer reliability is:

> For tallying highly specific descriptive behavior…the percentage of agreement between observers should be about 90 percent. When observers must make inferences or evaluations about the behaviors he observes, however, 70 to 80 percent is usually considered satisfactory.

To determine the level of agreement … divide the number of agreements by the total number of agreements and disagreements (p. 340).

However, a minimum inter-observer reliability score of .80 was established for acceptance of the TV-NCOI to ensure a high level of observer agreement.

This study used the scored-interval reliability determination method to ensure inter-observer reliability. Magliaro's (1981) research collected similar data using this method. The scored-interval (S – I) method involved not calculating the intervals in which the observers did not record the target behavior as occurring. Agreement was defined as any interval in which all three observers recorded the target behavior as occurring. Disagreement was defined as any interval in which only one of the observers recorded the target behavior as occurring in the interval.

$$S - I = 100 \times \frac{\text{Agree (yes)}}{\text{Agree (yes)} + \text{Disagree}}$$

As previously stated, to establish inter-observer reliability, this study incorporated a scored-interval reliability determination method. To further assist in inter-reliability, other safeguards implemented to ensure the development of a reliable recording instrument and observer were:

1. Observer training. A previously used and successful training program was adapted to the focus of this study.

2. Observer trust. Only observers who had classroom experience, from a student perspective, and an interest in the study were asked to serve as an observer.
3. Reliability estimates taken throughout the testing period. The observers were constantly monitored to ensure consistency and reliability of the data recording. This helped from the outset to identify the factors that might influence observer reliability.

The observers were checked for reliability at various stages of the study. Since each observer reviewed two instructors, reliability was determined by using the coded data collected from one lecture from each instructor. A second observer reviewed this lecture and recorded their findings. These findings were checked against the original observer's findings using the scored-interval reliability method. Scored-interval reliability checks were performed on six different data collected lectures. Each observer is identified by the codes O_1, O_2, and O_3 and each professor is indicated by the codes T_1, T_2, T_3, T_4, T_5, and T_6. Below is a diagram outlining the observer reliability check processes adopted for this study.

Observer Reliability Protocol

O_1	Observing	T_3	to check	O_2
O_2	Observing	T_2	to check	O_1
O_2	Observing	T_5	to check	O_3
O_3	Observing	T_4	to check	O_2
O_1	Observing	T_6	to check	O_3
O_3	Observing	T_1	to check	O_1

Data Presentation

The data will be presented in the forms of frequency response charts, category bar graphs, and a summary of the major findings by the 7 nonverbal cue categories. The frequency response charts will include each instructor's use of the 21 nonverbal cue variables. The category bar graphs will be organized in the form of each instructor's use of nonverbal cues by category. Finally, a summary of the major findings from all of the instructors will be discussed. The data will be presented in Chapter Four.

Chapter 4
Results

The results of the Two-way Video Nonverbal Cue Observation Instrument (TV-NCOI) were collected from the perspective of a remote site student taking a two-way video class with a single monitor. This perspective was chosen because it is the perspective often provided when a student misses a live lecture and has to review the videotaped lecture at a later date. This perspective also promotes specific two-way video classroom procedures often delivered by engineering and chemistry professors.

The two-way video classroom teaching process for engineering and chemistry instructors' followed the format of delivering a lecture segment via PowerPoint slides, Elmo ™, and a discussion segment with instructor visual presence at both the on-site and remote-site classes. Upon completion of the discussion segment, instructors' entertain questions from the class. This was done in the camera presence of both the on-site and remote-site classes.

The results of the TV-NCOI are reported in three sections. Section One includes the score-interval reliability agreement percentages from the three observers. Section Two includes instructor nonverbal cue frequencies detailing the 22 nonverbal cue variables used in each lecture, to include a listing of the "other nonverbal cue" delivery actions delivered by the instructors. Section Three includes individual instructor graphs revealing the frequency of nonverbal cues organized in the seven categories outlined in the TV-NCOI. This section concludes with a summary of the six instructors' nonverbal cue frequency as well

as a summary of the major findings and common themes identified by the TV-NCOI.

Validity and Reliability

Inter-observer reliability determinations confirmed that the TV-NCOI used in the data-collecting procedures produced a reliable source of data. Observer reliability measurements were taken through the research process. This was performed to reinforce established nonverbal cue definitions and interpretations, and assist observers in reaching a collective minimum reliability score of .80. Performing the score-interval reliability test, which included calculations from six 50-minute lectures between three observers, yielded a reliability score of .89. Listed below are the score-interval reliability formula, the reliability protocol, and the results of the observer inter-reliability tests. In the reliability protocol, each observer is identified by the codes O1, O2, and O3 and each professor is indicated by the codes T1, T2, T3, T4, T5, and T6.

$$\text{S-I} = 100 \times \frac{\text{Agree (yes)}}{\text{Agree (yes)} + \text{Disagree}}$$

Observer Reliability Protocol

O_1	Observing	T_3	to check	O_2
O_2	Observing	T_2	to check	O_1
O_2	Observing	T_5	to check	O_3
O_3	Observing	T_4	to check	O_2
O_1	Observing	T_6	to check	O_3
O_3	Observing	T_1	to check	O_1

Inter-reliability Scores

Observer 001

Agreements = 325 Disagreements = 95 Inter-reliability = .77

Observer 002

Agreements = 531 Disagreements = 32 Inter-reliability = .94

Observer 003

Agreements = 380 Disagreements = 27 Inter-reliability = .93

Total Observer inter-reliability

Agreements = 1,236 Disagreements = 154 Inter-reliability = .89

Data Analysis of Direct Observations

The 30 videotaped lessons from six instructors from Virginia Tech's engineering and chemistry departments were used for the study. Each teacher taught five 50-minute lectures in a two-way video classroom for a total of thirty observed fifty-minute lectures. Three trained observers used the TV-NCOI to record the instructor's nonverbal cues used while teaching. The TV-NCOI was divided into seven categories with 22 variables that equaled 4,500 observed intervals. The seventh category, "other nonverbal cues," provided the observers the opportunity to record nonverbal cues that were delivered by instructors but not identified by the TV-NCOI. The inclusion of this category resulted in an additional 192 entries of observed nonverbal cues and classroom actions delivered by instructors in the two-way video classroom. The data are presented in three groups:

1. Major findings of instructor nonverbal cue use, reported by category.
2. Frequency response charts of instructor nonverbal cues recorded by the TV-NCOI.
3. Bar graphs quantifying instructor nonverbal cues reported by category.

Summary of Major Findings by Category

A summary of the major findings from the TV-NCOI used to observe teachers instructing in the two-way video classroom are organized into 7 categories—directional gestures, accent gestures, teacher movement, facial

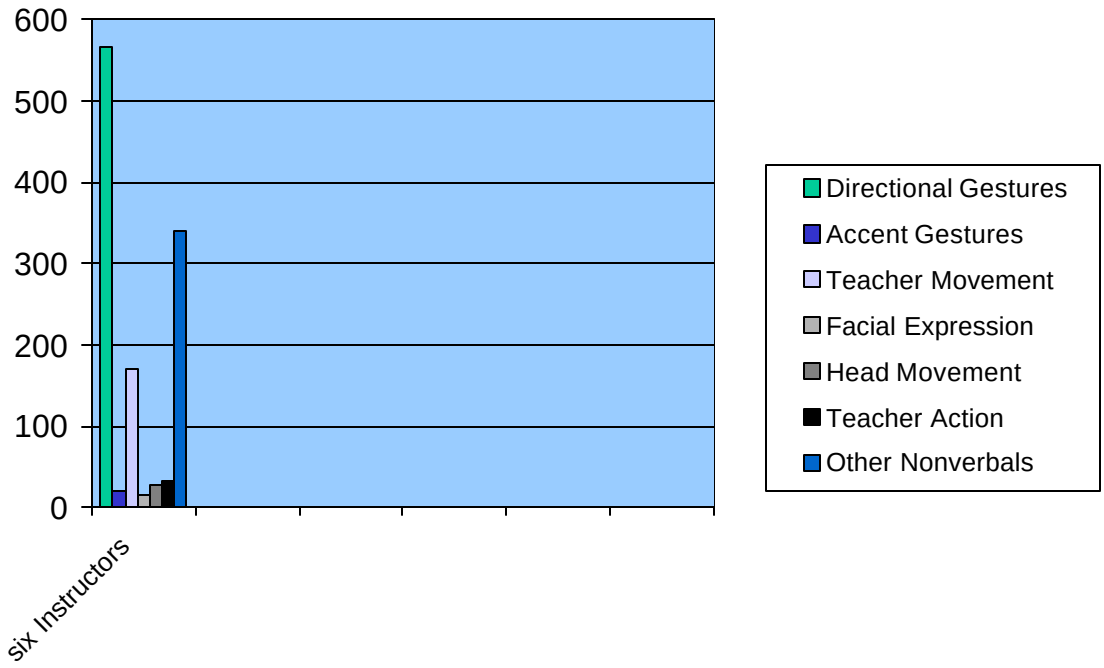
expressions, head movement, teacher action, and other nonverbal cues are reviewed below.

Directional gestures. The directional gesture category involved board pointing, material pointing, hand waving, approach waving, and stop waving. Board pointing was defined as the movement of an instructor pointing to the board or the presentation of information on the screen by the instructor. Instructors' nonverbal cues in the directional gesture category were heavily directed to the board or screen. In fact, 68% of instructor nonverbal cues were delivered from the screen (see Figure 1). The instructors' use of materials made up 19% of lecture nonverbal cues. The gestures of waving, approach waving, and stop waving made up 13% of the instructional delivery process in the two-way video classroom (see Figure 2).

The results revealed that the instructors delivered 87% of their nonverbal cues from the board/screen and 13% of their nonverbal cues by the instructors' hands. On the surface, one might think that this high board/screen percentage may reduce detailed nonverbal cue activity from the instructors. However, within the board/screen and material cues, there were many electronic, nonverbal cues identified as two-way video technology based nonverbal cues delivered by the instructors. The two-way video technologically based nonverbal cues included colorful slides, hand-held models, cursor movement, eye-catching slide backgrounds, diagrams, hand inclusions, unique PowerPoint transitions, web access, and text manipulation. Two-way video technically based nonverbal cues

delivered by the instructor in the directional gesture category were plentiful in the two-way video classroom.

Figure 1. A category representation of the nonverbal cues used by six Virginia Tech instructor's.



Accent gestures. The accent gesture category involved hand slicing, fist thumping, fingers to lips, fingers to ears, hands upturned, and counting fingers. The computer cursor played a large role in the accent gesture category during instructional delivery. The instructors used the computer cursor to deliver accent gestures normally performed by the instructors' hands. For example, many times the instructor counted frequencies on a graph or slide with the cursor, similar to counting on their fingers. Instructors used the cursor drawing tool to highlight key

words or phrases and underline or emphasize important lecture points on the board/screen in a way similar to using his/her hands in a slicing, thumping, and upturned motions to accent and emphasize lecture points in a traditional classroom.

Teacher movement. The teacher movement category involved large movement, small movement, no movement, and squatting/sitting. Instructors displayed very little movement when teaching in the two-way video classroom. The data reveal that the instructors' large and small movement was only 14% of the instructor total movement. The instructors' non-movement, or standing in one place during the teaching process, made up 86% of the instructor movement category, while there were no occurrences of teachers' squatting/sitting movement (see Figure 2). This suggests that instructor movement in the two-way video classroom is almost non-existent. In the two-way video classroom, instructor movement occurred primarily during the question and answer segments of the lecture. When instructor movement occurred, the instructor made an effort to stay in the camera's view. This high percentage of non-movement can be attributed to the restricted area of the camera, Elmo ™ (a camera used to project materials on the screen), and the instructors' need to navigate the two-way video classroom controls. These classroom management responsibilities associated with the two-way video classroom promoted very little instructor movement during instructional delivery.

Figure 2. Nonverbal cue frequency totals, by category, for six Virginia Tech instructor's.

Directional Gesture	
Board Pointing	2851
Material Pointing	804
Waving	598
Approach Waving	0
Stop Waving	1
Total	**4,254**
Accent Gestures	
Hand Slicing	46
Fist Thumping	1
Fingers to Lips	24
Fingers to Ears	6
Hands Upturned	35
Counting Fingers	7
Total	**119**
Teacher Movement	
Large Movement	22
Small Movement	48
No Movement	957
Squatting/Sitting	0
Total	**1,027**
Facial Expression	
Smile Movement	78
Frown Movement	12
Total	**90**
Head Movement	
Head Nod	49
Head Turn	115
Total	**164**
Teacher Action	
Teacher Gaze	200
Touch Student	0
Total	**200**
Grand Total	**5,854**

Facial expression. The facial expression category involved smiles and frown actions displayed by the instructors. The instructors' use of facial expressions was 1.6% of nonverbal cues used in instructional delivery. This minimal use may be attributed to the instructors' personality and lack of student-to-teacher visual interaction. During a 50-minute two-way video lecture, the average instructor's visual time to the students was fourteen minutes. This low instructor visual time reduces the number of facial expression opportunities between teacher and student. Moreover, the two-way video classroom set-up and operation do not allow the instructor to create a continuous visual interactive exchange with the on-site and remote-site students that may result in classroom exercises, projects, and interactive activities promoting facial expression activity.

Head movement. The head movement category involved head nods and head turns executed by the instructors. The instructors' head movement was 2.8% of the nonverbal cues administered during instructional delivery. Although head movement was very limited, it appeared to be a natural characteristic of each instructor. Instructors that tended to use head movement during a lecture segment were consistent throughout their teaching. By the same token, instructors who tended to use less head movement consistently used less head movement when teaching. When reviewing the data, one would think that head nods occurred from the instructor during the question and answer segments and the confirmation and delivering of information throughout the lecture. However, head nods in this sequence were not the case for all instructors. As the low frequency count revealed, many instructors had very little head movement during

question and answer and confirming information periods. The majority of the time instructors confirmed and delivered information to the class with their voice only. The two-way video classroom does not place restrictions on instructor head movement during the teaching process. However, the cameras, control board, Elmo ™ and two-way video equipment restricts instructor lateral and classroom movement when teaching. The instructor's are free to move their heads and lecture to the students very similar to the traditional classroom. The teaching delivery method, sometimes called a "talking head," appears to be a characteristic of the instructor's teaching style and not a direct result of teaching in the two-way video classroom.

Teacher action. Teacher action nonverbal cues involved teacher gaze and student touch. In the teacher action category, 3.4% of the total nonverbal cues were used in the two-way video classroom. This low percentage was due to the separation of teacher and student created by the two-way video classroom and the lack of student and instructor visual opportunities. As stated earlier, student and teacher visual time in the two-way video classroom averaged fourteen minutes, or 28% of the lecture. Of this visual time, less was devoted to student-to-teacher interaction. This presented very little opportunity for teacher gazes to take place. Furthermore, the teacher action of touching a student did not take place at all in the two-way video classroom. This was a direct result of classroom set-up, equipment layout, and the distance between instructor and student. In the two-way video classroom, the instructor is positioned in the front of the classroom for camera presence and to navigate the technological

equipment. This location impedes the instructor's ability to travel throughout the classroom and interact with the on-site students. Moreover, the distance of the remote-site students makes it impossible for the teacher to physically touch them.

The cues observed in this study were characterized as low contact, presenting significant distance between teacher and student. These points combine with an average of 14-minute visual presentation time from the instructor for the result of 3.4% teacher action during instructional delivery in the two-way video classroom.

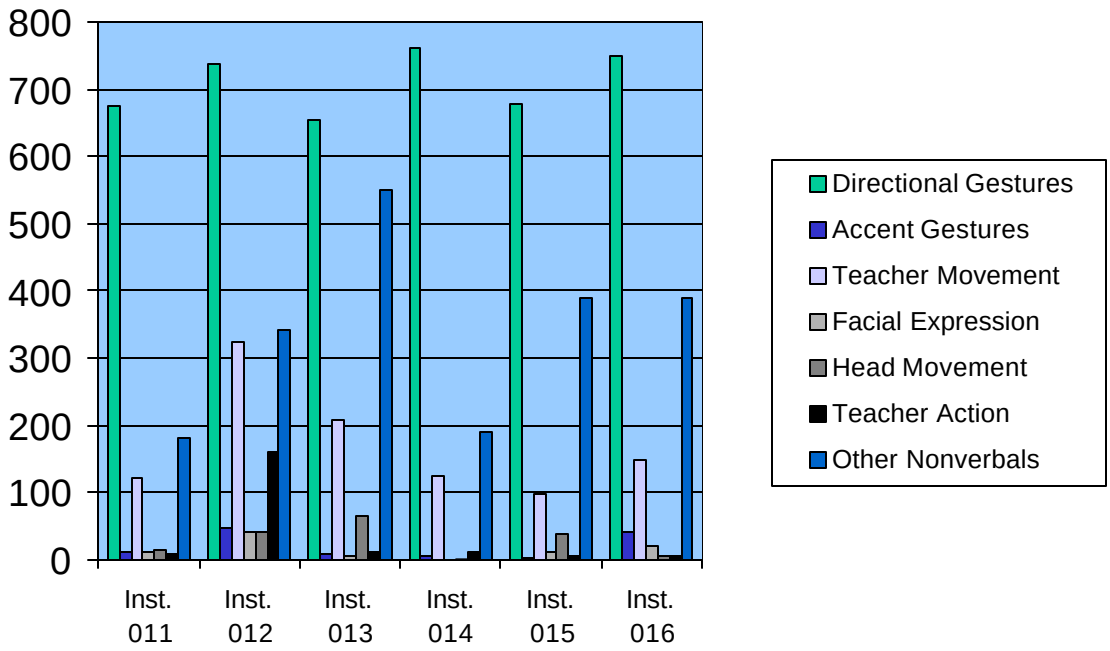
Figure 3 presents nonverbal cue description and frequency counts to include the 21 nonverbal cue variables, separated by the 7 categories, presented by the 6 instructors.

Figure 3. Nonverbal cue frequencies from 21 variables and 7 categories by 6 Virginia Tech instructors.

	Instructor 011	Instructor 012	Instructor 013	Instructor 014	Instructor 015	Instructor 016	
Directional Gesture							
Board Pointing	194	441	496	611	549	560	**2851**
Material Pointing	407	40	65	88	103	101	**804**
Waving	74	256	94	61	25	88	**598**
Approach Waving	0	0	0	0	0	0	
Stop Waving	0	0	0	0	0	1	**1**
Accent Gestures							
Hand Slicing	5	9	7	0	0	25	**46**
Fist Thumping	0	0	0	1	0	0	**1**
Fingers to Lips	2	16	0	3	0	3	**24**
Fingers to Ears	1	4	0	0	1	0	**6**
Hands Upturned	1	17	0	0	3	14	**35**
Counting Fingers	4	1	1	1	0	0	**7**
Teacher Movement							
Large Movement	1	0	0	9	11	1	**22**
Small Movement	12	11	7	9	4	5	**48**
No Movement	109	312	200	108	84	144	**957**
Squatting/Sitting	0	0	0	0	0	0	**0**
Facial Expression							
Smile Movement	12	31	4	0	12	19	**78**
Frown Movement	0	11	1	0	0	0	**12**
Head Movement							
Head Nod	8	29	7	0	4	1	**49**
Head Turn	7	13	58	1	31	5	**115**
Teacher Action							
Teacher Gaze	7	159	11	11	7	5	**200**
Touch Student	0	0	0	0	0	0	**0**
Total	**844**	**1350**	**951**	**903**	**834**	**972**	**5854**

Figure 4 presents the 6 instructors' nonverbal cue usage by the categories directional gestures, accent gestures, teacher movement, facial expression, head movement, teacher action, and other nonverbal cues.

Figure 4. Nonverbal Cue Frequencies by category for Six Instructors



Other nonverbal cues. Teaching in the two-way video classroom creates an environment for instructors to develop nonverbal cues that are technical in nature. However, this category yielded the discovery of cues that were not purely nonverbal or technical in nature. Some of the cues developed in this category had a technical base with aspects of nonverbal delivery. These cues are referred to as technically-based two-way video cues, specific to the two-way video classroom. These cues assisted and enhanced instruction delivery. Instructors may have developed technically-based nonverbal cues accidentally or by necessity to assist verbal and written communication techniques when teaching in the two-way video classroom. The majority of these technically-based two-way video cues took place at such a high level in the directional and accent gesture categories, that they were interpreted as a subset of these categories.

Listed below are the technically-based two-way video cues identified and placed in the nonverbal cue categories established for this study.

Directional Gestures

1. Multiple colored slides, up to five colors
2. Multiple colored slide backgrounds
3. Multiple colored slide text
4. Multiple size text
5. Instructors' use of models, documents, and paper to explain lecture points in detail
6. Detailed diagrams incorporated in lecture slides

7. Instructors' use of the computer cursor to highlight lecture points
8. Characters and graphics incorporated in lecture slides

Accent Gestures

9. Instructors' use of colored markers to underline screen text and lecture materials
10. Instructors' use of pens and pointers, hands, to highlight lecture points
11. Instructors' use of hands and fingers to highlight lecture points
12. Instructors' raising of voice levels when talking to remote-site students

These 12 technically-based "two-way video" cues related only in the directional gesture and accent gesture categories of the TV-NCOI. The data revealed that the instructors quite often used these technically based cues to direct the lecture via board/screen or materials, as well as accent lecture material via colored markers, pens and pointers, hand movement, and voice levels. The technically-based cues revealed no connection in the teacher movement, facial expression, head movement, and the teacher action categories. However, through the use of these technically-based nonverbal cues, the instructors' were able to communicate with the on-site and remote-site students on a nonverbal plane and assist with making a personal connection with the students during the instruction delivery process.

Summary

The instructors' use of technical nonverbal cues in board pointing and material pointing took precedence over traditional nonverbal cues in the two-way video classroom. This is reflected in the large percentage of board pointing and material pointing cues used in comparison to traditional nonverbal cues by the instructors. As reflected in the data, when teaching in the two-way video classroom, the instructors used two-way video nonverbal cues 87% of the time and traditional nonverbal cues 13% of the time. This high percentage of board pointing and material pointing cue use is a direct result of the classroom layout, two-way video operation, and the overall infrastructure of the two-way video classroom.

Chapter V
Summary and Conclusions

The purpose of this study was to identify nonverbal cues used by instructors when teaching in a two-way video classroom. More specifically, answer the research question, what nonverbal cues do teachers use when delivering instruction in a two-way video classroom? This study found that teachers used nonverbal cues when delivering instruction in a two-way video classroom. However, the findings also reflect that in the two-way video classroom, there are large amount of technically-based cues used in instruction delivery. These cues included the use of multiple colored pens, computer cursor, color highlighting, colorful slides, pointers, and computer inserted models and diagrams on the board or screen.

Research supports the significant role that nonverbal cues play in classroom instruction (Arnold & Roach, 1989; Cyrs et al., 1997; Rosenthal & Jacobson, 1968). This use is supported, in the two-way video classroom, by the 5,854 nonverbal cue actions executed by instructors and the more then 200 “other nonverbal cue” actions administered when teaching. These nonverbal cues were identified and quantified by the Two-way Video Nonverbal Cue Observation Instrument (TV-NCOI). Furthermore, nonverbal cues performed in the two-way video classroom were used to complement instructional delivery. As in the traditional classroom, instructors use nonverbal cues to emphasize lecture points, make additional points, and capture and maintain student attention (Grant & Hennings, 1971). However, while the act of enhancement between the two-

way video and the traditional classroom is similar, presentation and delivery of these cues are quite different. In the traditional classroom, the nonverbal cues used for lecture enhancement originate from the hands, extremities, and the physical movement of the instructor. In the two-way video classroom, the nonverbal cues used for lecture enhancement originate from a technically delivery base such as the computer cursor, computer screen, Elmo ™ and inserted models and graphics. The difference in the instructor's technical and physical delivery base, when teaching in the two-way video and traditional classrooms, promotes different presentation and delivery methods when enhancing a lecture.

Limitations

The limitations of this study involved teaching operations in the two-way video classroom and the use of engineering and chemistry professors in the sample. Therefore, the fundamental operation of the two-way video teaching procedure with engineering and chemistry instructors should be considered when reviewing the study's findings. Engineering and chemistry instructors' two-way video teaching process followed the format of delivering a lecture segment via PowerPoint slides, Elmo ™, and a discussion segment with instructor visual presence at both the on-site and remote-site classes. Concluding the discussion segment, the instructors asked the class if they had any questions, and if so, provided the answers while still visually present to the on-site and remote-site

classes. However, due to the timing and length of questions from the students, the instructors did not have the camera focused on them during the majority of the class questions and answers. Moreover, during the question and answer period, the majority of the class questions came from students present in the on-site classroom; the remote-site students asked far fewer questions of the instructor. This lack of questioning from the class added to the lack of visual presence from the instructor to the students.

The switching of the camera from the board to the instructor is another procedure identified creating a limitation in the two-way video classroom. When the teacher performed this procedure, they would explain a concept on the board, than switched the camera to themselves to explain a concept or point in more detail. The visual presence periods generated from detailed explanations and question and answers were the times when the teacher had the greatest opportunity to deliver traditional nonverbal cues. Low visual presence time reduced the opportunity for the instructors to execute traditional nonverbal cues.

Summary

This study found that teachers instructing in the two-way video classroom delivered 87% of their lecture via screen and Elmo ™ due to the physical arrangement, equipment layout, remote site perspective, technological transfer, and infrastructure of the two-way video classroom. Moreover, teaching by this method allowed a large amount of material to be transferred efficiently to both

on-site and the remote-site classrooms. However, teaching with such a large screen focus required the development of technically-based cues that could be delivered from the screen. This encouraged the instructors to develop and implement technically-based cues, defined as “two-way video” cues, such as the computer cursor, color highlighting, colorful slides, computer diagrams and models to assist in instruction delivery. This development was recorded in the “other nonverbal cue” category throughout the study. These findings suggest when teaching in a two-way video classroom, teacher’s should prepare the majority of their instructional material for delivery via computer screen or Elmo ™. This will provide the teacher with the greatest opportunity to transfer the majority of their instructional material.

Traditional nonverbal cues that involve hand slicing, accent gestures, teacher movement, facial expressions, head movement, and teacher action were very limited in the two-way video classroom. In fact, cues from these areas were only 13% of the nonverbal cue activity. The development and implementation of technically-based and “two-way video” cues were plentiful in the instruction delivery process. Technically-based cues in these areas made up 35% of instruction delivery. In this study, these cues were delivered in the form of multiple colored pens, the computer cursor, hand drawing, color highlighting, colorful slides, detailed diagrams, models, pointers, instructor materials, and many other miscellaneous nonverbal cues.

The technical-based cues that involved multiple colored slides, backgrounds, multiple text size, and diagrams were projected constantly

throughout the instruction process and were the dominant cues. However, the technically-based cues, colored markers, the instructors use of pointers and hands, characters and graphics, the computer cursor, models and visuals via Elmo, ™ and instructor voice level when speaking to remote site students, varied in usage. Listed below is a percentage breakdown of the usage of these technically-based two-way video cues, by the instructors, in the two-way video classroom.

1. Instructors' use of colored markers to underline screen text and lecture materials, 10%
2. Instructors' use of pens and pointers to highlight lecture points, 10%
3. Instructors' use of hands and fingers to highlight lecture points, 5%
4. Instructors' use of characters and graphics incorporated in lecture presentation slides, 5%
5. Instructors' use of the computer cursor to highlight lecture points, 33%
6. Instructors' use of models, documents, and paper to explain lecture points in detail, 25%
7. Instructors' raising voice level when talking to remote-site students, 6%
8. Miscellaneous cues involving classroom shots, student questions, unexpected screen displays, and technical difficulties, 24%

The data reflect that engineering and chemistry instructors deliver a large amount of their lecture material via computer and Elmo ™, thus presenting the

information on the two-way video screen. This appears to be by design with some consideration for the assets and restrictions of the two-way video classroom. Through trial and error, and the evolution of teaching in this environment, 12 two-way video cues were developed. These technically-based cues allowed the instructors to enhance their two-way video lectures nonverbally as well as to make efforts to connect with the students when teaching.

As reflected in the Chapter IV results, students attending a 50-minute lecture, on average, viewed the instructor for only 14-minutes. This short instructor visual presence reduces the teacher's opportunity to connect personally and communicate nonverbally with students through traditional nonverbal cues. While the instructors' visual presence and a personal connection with students were reduced, hand on screen, writing with markers, and model/object placement, were cues that promoted additional contact with the students. The development and implementation of "two-way video" nonverbal cues assisted instructors' information transfer and lecture enhancement, but decreased their personal connection with the students. The observers felt that the student-to-teacher personal connection was lacking in the two-way video classroom.

While research has established the existence of nonverbal cues in traditional instruction delivery, the results of this study confirm their existence in the two-way video classroom. Furthermore, although the nonverbal communication existence is similar, the form and delivery methods are very different. The two-way video classroom has moved the execution of nonverbal

cues from the instructors' physical delivery platform to a technological delivery platform. This new placement promoted nonverbal cues to be delivered predominantly from a computer screen and Elmo ™. This altering of the nonverbal cue delivery platform has changed the presentation and execution of nonverbal cues in the two-way video classroom.

Future Research

This study found that nonverbal cue use does exist in the two-way video classroom. However, this study also found that teachers use a large number of technically-based cues when delivery instruction in the two-way video classroom. There are over 2,000 occurrences of technically-based cues that fell in the "other nonverbal cue" category. This quantity established that teachers heavily use technically-based cues in the two-way video classroom. Moreover, in the two-way video classroom, there were few questions asked from remote sites students and an instructor camera presence of only 14-minutes per 50-minute lecture. These findings support the need to perform future research in the two-way video classroom to understand technically-based cue use and the impact of instructor presence in the two-way video classroom. Future studies should focus on observing technically-based cues with the purpose of identifying, categorizing, and quantifying specific "two-way video" cues used by teachers when delivering instruction in a two-way video classroom. By identifying and categorizing these

cues, their impact and importance can be clearly defined leading to gaining knowledge that can positively affect the two-way video teaching process.

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Appendix A

Participant Invitation Letter

Mr. Myron Anderson
4489 Preston Forest Dr.
Blacksburg, VA 24060

Dear _____:

The purpose of this letter is to obtain your approval in securing five videotaped lectures that you have delivered via two-way video as apart of my doctoral dissertation. The study will focus on observing nonverbal cues used by teachers while delivering instruction in a two-way video classroom.

I am asking for your permission to observe five videotaped fifty-minute lectures that you teach via two-way video. The observers and I will be the only persons with the knowledge of the teachers. All participants will be given coded numbers for all statistical calculations and text within the dissertation.

My dissertation committee and Virginia Polytechnic Institute and State University's research department has given me permission to perform this study. They affirmed a need to identify nonverbal cues used in two-way video instruction delivery.

I hope that you agree in the significance of this research project by signing the permission form and returning it in the enclosed envelope.

If you have any further questions concerning the research project, please contact me at (540) 231-7887 or myron@vt.edu.

Thank you for your time and cooperation.

Sincerely,

Myron Anderson

Appendix B

Instructor Observation Approval Form

Dear Mr. Anderson:

I agree to allow observers to review videotaped lectures of my instruction in a two-way video classroom and to record and use the data in the dissertation project, “An Examination of Nonverbal Cues Used By University Professors When Delivering Instruction in a Two-Way Video Classroom.” Myron will contact the Institute for Distance and Distributed Learning (IDDL) and retrieve archived videotaped lectures for review.

This data and my name will be coded anonymously and kept confidential.

_____
(Teacher Signature)

_____
(Date)

Appendix C

Nonverbal Cue Observation Training Guide

Nonverbal Cue Observation Training Guide

To promote observation consistence, a nonverbal cue observation training guide was developed and implemented for the study. This training guide involved five steps that each observer had to complete successfully, providing him or her with the fundamental skills to serve as an observer for the study. The observers were given the flexibility to complete each step individually or collectively with the guidance and supervision of the researcher. The Nonverbal Cue Observation Training Guide steps are described below.

Step 1. The observer studied the 22 behavioral definitions, their corresponding categories, and coding symbols.

Step 2. The observer completed a test where the category and the symbol must be identified with the behavioral definition. The observer had to answer 20 of 22 items correctly before successfully completing this step.

Step 3. The research reviewed each category with the observer and provided examples. The observer then completed a test involving videotaped examples of instructors delivering nonverbal cues that included all categories and recording symbols. The observer had to identify 20 of 22 nonverbal cue categories and symbols before successfully completing this step.

Step 4. The researcher and the observer viewed a pre-recorded videotaped lecture. The tape was stopped at various intervals, and the observer was given ten seconds to record the behavior on the nonverbal cue instrument.

This was performed until the observer had an opportunity to use every category as well as become completely familiar with the nonverbal cue instrument.

Step 5. The observer reviewed and coded forty minutes of two-way video instruction delivery using the Two-way Video Nonverbal Cue Observation Instrument. The coding sheets were collected and scored with the minimum requirement of a .70 reliability rating needed before the observers were authorized to collect data.

The observers were allowed to choose the location for their training, which promoted a convenient and comfortable environment. However, the proper videotape viewing equipment was provided by the researcher if needed.

Nonverbal Cue Behavior Definitions

Step 1

On the next two pages you will find 22 nonverbal cue behavioral definitions to be used in the instructor Two-way Video Nonverbal Cue Observation Instrument. These definitions should be studied carefully until you can identify each behavior category, its coding symbol, and the corresponding behavioral definition.

After you have learned the behavioral definition, coding symbols, and behavioral categories, proceed to Step 2.

I. Directional Gestures

BP = Board Pointing: the movement of pointing to a present object(s) while teaching. Examples include pointing to item (s) on the blackboard or screen.

MP = Material Pointing: the movement of pointing to a present object(s) while teaching. Examples include pointing to an instructor book, paper or instruction materials.

W = Waving: the motion of waving hand(s) or arm(s) in a rhythmic motion while teaching. Examples include waving motion of hand while carrying on a dialog with the class.

AW = Approach Withdraw: the motion of waving hand(s) or arm(s) while instructing students to approach or withdraw. Examples include waving motion of hand or arm to signal students to approach or withdraw.

SW = Stop Waving: the motion of waving hand(s) or arm(s) while teaching indicated the students to stop. Examples include waving motion of hand or arm to signal stop.

II. Accent Gestures

HS = Hand Slicing: the instructor's emphatic non-rhythmic motion of slicing hand(s) through the air accenting a point.

FT = Fist Thumping: the instructor's motion of thumping fist on an object accenting a point.

FL = Fingers to Lips: the instructor's action of placing fingers to lips to signal quiet and/or to accent a point.

FE = Fingers to Ears: the instructor's action of placing fingers to ears to signal listen and/or to accent a point.

HU = Hands Upturned: the instructor's action of hands upturned with an open palm to accent a point.

CF = Counting Fingers: the instructor's use of counting or showing fingers to quantify a point.

III. Teacher Movement

L = Large Movement: the instructor's movement during the lecture in the distance of three or more desks or approximately seven steps.

S = Small Movement: the instructor's movement during the lecture quantified by the distance of less then three desks or approximately four steps.

N = No Movement: the instructor's lack of movement during the lecture quantified by the distance of no steps.

SS = Squatting/Sitting: the position of the instructor's body with reference to squatting or sitting position beside student(s). Count the number of occurrences of instructor squatting or sitting beside student(s). One discrete unite of squatting/sitting is counted when the instructor arises.

IV. Facial Expression

SM = Smile Movement: movement occurrences by the instructor's position of the mouth in an upturned expression. Count a smile movement without directionality to any target. Count one discrete unit of smile when the mouth returns to non-smile position.

FR = Frown Movement: movement occurrences defined by the instructor's position of eyebrows in knitted expression and/or forehead wrinkled position signifying dissatisfaction.

V. Head Movement

HN = Head Nod: occurrences in which the instructor exhibits up-down motion of the head relative to axis of the shoulders, while looking at or toward student(s). Count one discrete unit of a head nod when up-down motion of the head stops for two or more consecutive seconds.

HT = Head Turn: occurrences in which the instructor exhibits left-to-right motion of the head relative to axis of the shoulders, while looking at or toward the student(s). Count one discrete unit of a head turn when left-to-right motion of the head stops for two or more consecutive seconds.

VI. Teacher Action

TG = Teacher Gaze: the instructor's gaze toward the students' faces or other area in the classroom for two or more seconds. The observers will count the number of occurrences for gaze toward a student's face and other-directed gazes exhibited by the instructor.

TS = Touch Student: the act of the instructor touching a student in the classroom. Count the number of occurrences of the instructor touching a student. One discrete unite of touch is counted when the instructor removes the body part used to touch a student.

VII. Other Nonverbal Cues

OC = Other Nonverbal Cues: the instructor may present nonverbal cues not identified by the nonverbal cue instrument. The observer will describe the nonverbal cues observed that are not identified in the nonverbal cue instrument. Some of these nonverbal cues might include noises, physical motion such as jumping and clapping, and much more.

Step 2

Listed below you will find the nonverbal cue behavioral definitions as they appear from the list you have studied. Read each definition and write the behavior category and the specific coding symbol in the space provided to the right.

To complete this step successfully and move to Step 3, you must have 20 out of 22 answered correctly.

Definition	Category & Code
1. The position of the instructor's body with reference to squatting or sitting next to a student.	1. _____
2. The degree in which the instructor exhibits up-down motion of the head relative to axis of the shoulders, while looking at or toward the student(s).	2. _____
3. Instructor's movement or position of eyebrows in knitted expression and/or forehead wrinkled position with instructors mouth in a downward expression.	3. _____
4. The instructor's movement of pointing toward a board or screen while teaching.	4. _____
5. The motion of the instructor emphatically slicing their hand(s) through the air in a non-rhythmic motion accenting a point.	5. _____
6. The instructor's action of their hand(s) upturned with an open palm accenting a point to the class.	6. _____
7. The motion of waving hand(s) or arm(s) instructing students to approach or withdraw.	7. _____
8. The instructor's movement during the lecture at a distance of approximately seven steps.	8. _____
9. The instructor's action of placing his/her fingers to ears to signal listen and/or to accent a point.	9. _____

Definition	Category & Code
10. Movement occurrences by the instructor's position of the mouth in an upturned expression.	10. _____
11. The motion of waving your hand(s) or arm(s) in a rhythmic manner accenting a point.	11. _____
12. The instructor's use of counting or showing fingers to quantify a point.	12. _____
13. The act of instructor's presenting nonverbal cues not identified in the observation instrument.	13. _____
14. The act of the instructor touching a student in the classroom.	14. _____
15. The instructor's movement during the lecture quantified by the distance of less then four steps.	15. _____
16. The instructor's movement of pointing to a present object(s) or materials while teaching.	16. _____
17. This act is performed when an instructor looks toward the students face or in another directed in the classroom for two or more seconds.	17. _____
18. This act is performed by the instructor executing a left-to-right motion of the head while looking toward the student(s).	18. _____
19. The instructor's lack of movement during the lecture quantified by the distance of no steps.	19. _____
20. The instructor's motion of waving his/her hand(s) or arm(s) while teaching, indicating the students to stop.	20. _____
21. The instructor's action of placing his/her fingers to lips to signal quiet or accent a point.	21. _____
22. The instructor's motion of thumping his/her fist on an object to accent a point.	22. _____

Step 3

The researcher will review each category with you and provide examples of each category as it may be seen in a classroom setting. After developing an understanding of each category, complete the written test below. Read each example that describes instructor nonverbal cue behavior and write the specific coding symbol in the space provided to the right.

To complete this step successfully and move to Step 4, you must have 20 out of 22 answered correctly.

Instructor Examples	Code
I. Directional Gestures	
1. The instructor is pointing to lecture examples on the screen to present a visual aid, thus complementing the lecture.	1. _____
2. The instructor is pointing to a notebook and computer to complement a point in the lecture.	2. _____
3. The instructor is executing a waving motion of his/her hand(s) or arm(s) in a rhythmic manner during the lecture to the class.	3. _____
4. The instructor is waving his/her hand(s) or arm(s) asking a student to approach his/her desk.	4. _____
5. The instructor is waving their hand(s) or arm(s) asking a group of students to stop reviewing their notes.	5. _____
II. Accent Gestures	
6. The instructor is slicing his/her hand(s) emphatically through the air in a non-rhythmic manner accenting a important lecture point.	6. _____
7. The instructor is thumping his/her fist on the desk to express how important this lecture point is in relationship to their exam.	7. _____
8. The instructor is placing his/her fingers to their lips to asking the class to quiet down.	8. _____

9. The instructor is placing his/her fingers to his/her ears asking the students to listen closely to this lecture point. 9. _____

10. The instructor is upturning their hands with an open palm informing students of the rising capabilities of a lecture point. 10. _____

11. The instructor is counting or showing fingers clarifying the number of pages needed to complete an assignment. 11. _____

III. Teacher Movement

12. The instructor is moving during the lecture at a distance of three or more desks, approximately seven steps. 12. _____

13. The instructor is moving during the lecture at a distance of less then three or more desks, approximately four steps. 13. _____

14. The instructor stands behind the lecture podium and does not move. 14. _____

15. The instructor is displaying a squatting or sitting position beside a student to review materials and listen closely. 15. _____

IV. Facial Expression

16. The instructor positions his/her mouth in an upturned expression in agreement with a student answer. 16. _____

17. The instructor's eyebrow forms a knitted expression and/or forehead is wrinkled signifying dissatisfaction. 17. _____

V. Head Movement

18. This instructor is moving his/her head in an up and down motion signaling to a student that they have answered the question correctly. 18. _____

19. The instructor is moving their head in a left-to-right motion signaling to a student that they do not have the right answer. 19. _____

VI. Teacher Action

20. The instructor looks toward the back area of the classroom for two or more seconds. 20. _____

21. The instructor touches a student's shoulder while teaching. 21. _____

VII. Other Nonverbal Cues

22. The instructor makes loud verbal noises and jumping motions not identified in the Nonverbal Cue Instrument. 22. _____

Step 4

The researcher and the observer will view a pre-recorded videotaped lecture. The tape will be stopped at various intervals, allowing the observer ten seconds to record the behavior on the nonverbal cue coding sheet. This will be performed until the observer has an opportunity to use every category and become completely familiar with the nonverbal cue instrument.

Step 5

The observer will review and code forty minutes of a two-way video lecture using the Two-way Video Nonverbal Cue Observation Instrument. The coding sheet will be collected by the researcher and scored with the other observers' coding sheets, with a minimum of .80 reliability rating needed before the observers will be authorized to collect data.

Appendix D

Two-way Video Nonverbal Cue Observation Instrument

Observer _____ **(ID Code #**_____ **) Teacher** _____ **(ID Code #**_____ **)**

Lecture #_____ **Start Time**_____ **Stop Time**_____ **Total Minutes**_____

Directional Gestures

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
BP	BP	BP	BP	BP	BP	BP	BP	BP	BP	BP	BP	BP	BP	BP
MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP
W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
AW	AW	AW	AW	AW	AW	AW	AW	AW	AW	AW	AW	AW	AW	AW
SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW

Accent Gestures

HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS
FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT
FL	FL	FL	FL	FL	FL	FL	FL	FL	FL	FL	FL	FL	FL	FL
FE	FE	FE	FE	FE	FE	FE	FE	FE	FE	FE	FE	FE	FE	FE
HU	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU
CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF

Teacher Movement

L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS

Facial Expression

SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM
FR	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR

Head Movement

HN	HN	HN	HN	HN	HN	HN	HN	HN	HN	HN	HN	HN	HN	HN
HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS

Teacher Action

TG	TG	TG	TG	TG	TG	TG	TG	TG	TG	TG	TG	TG	TG	TG
TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS

Other Nonverbal Cues

_____

_____

_____

_____

_____

Observer _____ **(ID Code #_____) Teacher** _____ **(ID Code #_____)**

Lecture #_____ Start Time_____ Stop Time_____ Total Minutes_____

Directional Gestures

16	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
BP	BP	BP	BP	BP	BP	BP	BP	BP	BP	BP	BP	BP	BP	BP
MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP
W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
AW	AW	AW	AW	AW	AW	AW	AW	AW	AW	AW	AW	AW	AW	AW
SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW

Accent Gestures

HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS
FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT
FL	FL	FL	FL	FL	FL	FL	FL	FL	FL	FL	FL	FL	FL	FL
FE	FE	FE	FE	FE	FE	FE	FE	FE	FE	FE	FE	FE	FE	FE
HU	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU
CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF	CF

Teacher Movement

L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS

Facial Expression

SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM
FR	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR

Head Movement

HN	HN	HN	HN	HN	HN	HN	HN	HN	HN	HN	HN	HN	HN	HN
HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS

Teacher Action

TG	TG	TG	TG	TG	TG	TG	TG	TG	TG	TG	TG	TG	TG	TG
TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS

Other Nonverbal Cues

_____

_____

_____

_____

_____

Appendix E

Nonverbal Cue Individual Instructor Frequencies

Frequency Response Charts

Tables 1 through 6 quantify the nonverbal cues used by the six Virginia Tech instructors and a listing of the “other nonverbal cues” recorded by the TV-NCOI. Table 7 presents a complete summary of the nonverbal cue frequencies delivered by the six instructors in the two-way video classroom.

Table 1. Nonverbal cue frequencies by instructor 011

	Lecture 1	Lecture 2	Lecture 3	Lecture 4	Lecture 5	
Directional Gesture						
Board Pointing	131	13	3	35	12	**194**
Material Pointing	3	126	134	29	115	**407**
Waving	14	5	6	37	12	**74**
Approach Waving	0	0	0	0	0	**0**
Stop Waving	0	0	0	0	0	**0**
Accent Gestures						
Hand Slicing	0	2	0	2	1	**5**
Fist Thumping	0	0	0	0	0	**0**
Fingers to Lips	0	0	0	1	1	**2**
Fingers to Ears	0	0	0	0	1	**1**
Hands Upturned	0	0	0	1	0	**1**
Counting Fingers	0	1	0	3	0	**4**
Teacher Movement						
Large Movement	0	0	0	0	1	**1**
Small Movement	0	3	0	4	5	**12**
No Movement	20	5	17	54	13	**109**
Squatting/Sitting	0	0	0	0	0	**0**
Facial Expression						
Smile Movement	0	0	0	8	4	**12**
Frown Movement	0	0	0	0	0	**0**
Head Movement						
Head Nod	2	0	0	1	5	**8**
Head Turn	7	0	0	0	0	**7**
Teacher Action						
Teacher Gaze	5	2	0	0	0	**7**
Touch Student	0	0	0	0	0	**0**
			0			
Total	**182**	**157**	**160**	**175**	**170**	**844**

Table 1. (Cont.) Other Nonverbal Cues

The instructor uses his finger as a pointer when describing items on the screen
The instructor inadvertently touched his nose during the lecture
The screen is blurry during the lecture
The instructor places laminated material over paper in front of Elmo ™ to write and make comments to the class
The instructor uses color markers to enhance the lecture
The instructor uses color markers to enhance the lecture
The instructor uses a pen as a pointer on the screen to direct student attention
During the lecture the accidentally screen went blank
The instructor uses colored markers to accent the lecture
A class shot appeared on the screen
The screen went blank on three occasions during the lecture
The instructor touched his face, but not in the areas identified for this instrument
The instructor showed (6) videotapes to enhance the lecture
The instructor touched his glasses
The classroom was observed for a six interval period
The screen was blurry during the lecture
There were several class shots during the lecture
The instructor pointed at the class with his finger during the lecture

Table 2. Nonverbal cue frequencies by instructor 012

	Lecture 1	Lecture 2	Lecture 3	Lecture 4	Lecture 5	
Directional Gesture						
Board Pointing	106	68	78	83	106	**441**
Material Pointing	2	1	11	8	18	**40**
Waving	44	53	61	61	37	**256**
Approach Waving	0	0	0	0	0	**0**
Stop Waving	0	0	0	0	0	**0**
Accent Gestures						
Hand Slicing	0	0	2	3	4	**9**
Fist Thumping	0	0	0	0	0	**0**
Fingers to Lips	2	4	2	5	3	**16**
Fingers to Ears	1	0	1	2	0	**4**
Hands Upturned	0	0	1	14	2	**17**
Counting Fingers	0	0	0	0	1	**1**
Teacher Movement						
Large Movement	0	0	0	0	0	**0**
Small Movement	7	0	2	1	1	**11**
No Movement	42	78	73	68	51	**312**
Squatting/Sitting	0	0	0	0	0	**0**
Facial Expression						
Smile Movement	1	11	15	1	3	**31**
Frown Movement	0	10	0	1	0	**11**
Head Movement						
Head Nod	3	7	8	3	8	**29**
Head Turn	1	0	7	1	4	**13**
Teacher Action						
Teacher Gaze	15	43	43	22	36	**159**
Touch Student	0	0	0	0	0	**0**
Total	**224**	**275**	**304**	**273**	**274**	**1350**

Table 2. (cont.) Other Nonverbal Cues

The instructors slides included three different colors
The instructor is very stationary, maybe because of the two-way video equipment
The instructor displays a slight rocking movement
The instructor did not depend on the cursor to accent the lecture, he used his voice
The students did not ask questions during the lecture
The instructors slides had four or more colors with a large arrow pointing at key points
When a student asked a question, his voice was only heard
Many times when a student asked a question of the instructor, they asked the instructor to refer to the slide for the answer
The instructor uses his cursor to accent lecture points
The camera went to a classroom shot when a student asked a question
Although there are many "BP's" in this lecture the instructor used pens, props, and colors on the board/screen
The cursor was used to present and accent information on the board/screen
The instructor is in a sitting position
The camera went to a classroom shot during the lecture
There were several classroom shots during this lecture due to student questions
The instructor used colors during the board pointing cue of the lecture to explain material
The camera went to a class shot without questions from the class
The cursor was used extensively to explain lecture points
The instructors slides have a blue background with multiple colors integrated in them
Many times when a student asked a question of the instructor, they asked the instructor to refer to the slide for the answer
The camera went to a class shot without questions from the class
The instructor received many questions from the class
This lecture produces many class questions, however, most questions came from the on-site classroom not remote-sites
While teaching from a standing position, the instructor rocked back and forth
The instructor is using his cursor to accent lecture points
This lecture had many questions from the class
The instructor made an effort to make sure the camera was pointed on him when answering questions
The instructor appeared to be very efficient with the technology
The instructor went to the "BP" when answering some questions
The instructor has very elaborate slides detailing the lecture and brining out additional talking points
The instructor places the camera on him a lot during the lecture
This was a very interactive lecture
There were classroom shots during this lecture because of student questions
The instructor had very detailed notes and graphics

Table 3. Nonverbal cue frequencies by instructor 013

	Lecture 1	Lecture 2	Lecture 3	Lecture 4	Lecture 5	
Directional Gesture						
Board Pointing	115	81	107	105	88	**496**
Material Pointing	15	42	5	2	1	**65**
Waving	13	6	32	19	24	**94**
Approach Waving	0	0	0	0	0	**0**
Stop Waving	0	0	0	0	0	**0**
Accent Gestures						
Hand Slicing	2	0	3	1	1	**7**
Fist Thumping	0	0	0	0	0	**0**
Fingers to Lips	0	0	0	0	0	**0**
Fingers to Ears	0	0	0	0	0	**0**
Hands Upturned	0	0	0	0	0	**0**
Counting Fingers	0	0	1	0	0	**1**
Teacher Movement						
Large Movement	0	0	0	0	0	**0**
Small Movement	2	0	1	4	0	**7**
No Movement	23	28	39	48	62	**200**
Squatting/Sitting	0	0	0	0	0	**0**
Facial Expression						
Smile Movement	1	0	0	0	3	**4**
Frown Movement	0	0	1	0	0	**1**
Head Movement						
Head Nod	0	4	1	1	1	**7**
Head Turn	7	9	16	12	14	**58**
Teacher Action						
Teacher Gaze	2	2	3	1	3	**11**
Touch Student	0	0	0	0	0	**0**
Total	**180**	**172**	**209**	**193**	**197**	**951**

Table 3. (cont.) Other Nonverbal Cues

The instructor spent the majority of this lecture instructing to the class via Elmo ™
Because of impromptu information, the instructor used a black marker on white paper to deliver lecture material
Impromptu information oftentimes is written by hand and delivered via Elmo ™
The instructor continues to exit and enter paper materials in front of Elmo ™ to give project guidelines and schedules to the class
The instructor uses his pen to emphasize lecture points on the materials
The prepared materials are very colorful and well designed which may capture student attention
In some ways, the two-way video classroom appears to provide a format to deliver large amounts of information
The instructor performs "house keeping" duties with remote sites and this takes a large amount of time
The instructor uses the cursor to follow the board/screen and explain information to the class
Most questions asked during the lecture take place while the instructor is teaching from the board/screen
Many of the nonverbal cues used in the traditional classroom are not being used in the two-way video classroom
The instructor places updated information on Elmo ™ to communicate class updates
The instructor is communicating with the remote sites and there is a delay in this communication process
When the instructor performs role call to the remote sites, this takes time
This instructor tends to raise his voice, as if the remote sites are far away, when taking to students from remote sites
When the instructor communicates with remote sites asking if they have received materials, it takes time
This appeared to be the first lecture in the semester due to the amount of class "housekeeping" taking place
The instructor executed a class shot during this lecture
The instructor states that students from remote sites might experience isolation when attending a two-way video class
The instructor uses the cursor to navigate the course website. The course website had the latest course and class information
This class was spent reviewing the course and expectations from the instructor
The instructor presents himself in a traditional/nonverbal communication way when the camera is on them
The instructor has integrated many colors and logos to his course slides
The instructor shifts his eyes a lot monitoring the two-way video equipment
The instructor uses the cursor and placed materials in front of Elmo ™ to assist in the teaching process
The instructors PowerPoint slides have multiple colors and are detailed
The instructor raises his voice when the camera is on him
The computer cursor is serving as an extension of the instructors hand
The instructor had all of his formulas prepared and used the cursor to assist in explaining them to the class
There was a technical problem that paused the lecture for a short time
Many times the instructor asked questions received no answers, or forgot to click the "camera pad" turning the camera on them
When making long explanations the instructor often turned the camera on himself to address the class
The instructor asked the class if they had any questions and received none
The eyes of the instructor are continuously shifting looking at two-way video equipment and monitors
The instructor used the computer cursor and a pointer to express lecture points and accent formulas
The instructors slides had multiple colors
The instructor used the board/screen to deliver the majority of the lecture
The cursor and the board/screen served as the main communication instruction delivery method
The board/screen instruction method worked in concert with the instructors voice
The cursor acts as an extension of the instructors hand. Most of the time the instructors voice remains at normal tone
The instructor shifts his eyes a lot, monitoring the controls of the two-way video equipment
The instructor moved his hand to move the camera to the board two (2) times
The instructor spoke to the class in a normal voice
The instructor used his cursor to make lecture points
The instructor placed his hands firmly on the desk when teaching
The instructor stayed stationary throughout this lecture
Verbal communication appears to be the main mode for instruction delivery
The instructor used his cursor to make points
The instructor transferred the camera from the board/screen to himself to give the remote-site students an instructor visual

Table 4. Nonverbal cue frequencies from by instructor 014

	Lecture 1	Lecture 2	Lecture 3	Lecture 4	Lecture 5	
Directional Gesture						
Board Pointing	125	126	113	121	126	**611**
Material Pointing	10	19	37	11	11	**88**
Waving	13	9	12	17	10	**61**
Approach Waving	0	0	0	0	0	**0**
Stop Waving	0	0	0	0	0	**0**
Accent Gestures						
Hand Slicing	0	0	0	0	0	**0**
Fist Thumping	1	0	0	0	0	**1**
Fingers to Lips	1	0	1	1	0	**3**
Fingers to Ears	0	0	0	0	0	**0**
Hands Upturned	0	0	0	0	0	**0**
Counting Fingers	0	1	0	0	0	**1**
Teacher Movement						
Large Movement	1	3	2	1	2	**9**
Small Movement	1	3	1	0	4	**9**
No Movement	30	14	17	29	18	**108**
Squatting/Sitting	0	0	0	0	0	**0**
Facial Expression						
Smile Movement	0	0	0	0	0	**0**
Frown Movement	0	0	0	0	0	**0**
Head Movement						
Head Nod	0	0	0	0	0	**0**
Head Turn	0	0	0	1	0	**1**
Teacher Action						
Teacher Gaze	2	0	3	6	0	**11**
Touch Student	0	0	0	0	0	**0**
Total	**184**	**175**	**186**	**187**	**171**	**903**

Table 4. (cont.) Other Nonverbal Cues

The instructor uses the computer cursor to point and work problems on the screen
The instructor uses the computer cursor to point and work problems on the screen
The instructor uses multiple colored markers to express points on the screen
The instructor uses the computer to show different charts (many in color) to teach from
The instructor uses the cursor to point to the problem while performing the task on completion
The instructor uses different color markers when solving problems on the screen
These color distinctions served in expressing different paths the students could take in solving the problem
The camera was focused on the classroom while waiting for questions throughout the lecture
The instructor used a pen as a pointer on the screen to direct student attention
The instructor uses colored markers while communicating with the class on the screen to indicate change
The instructor often cleared his throat while waiting for students to ask questions
The camera focused on the classroom while waiting for students to answer questions
The camera remained focused on a specific student when a question was asked
The instructor places his hands to his eyes and on hips when teaching
The camera showed a classroom shot at points in the lecture
The instructor placed his hands in his pockets while teaching
The instructor uses a pointer to accent lecture points
The instructor uses a pointer to accent lecture points
The instructor uses a pointer to accent lecture points
The instructor pointed to his head and hair while teaching

Table 5. Nonverbal cue frequencies by instructor 015

	Lecture 1	Lecture 2	Lecture 3	Lecture 4	Lecture 5	
Directional Gesture						
Board Pointing	84	115	104	113	133	**549**
Material Pointing	24	20	23	20	16	**103**
Waving	6	3	7	3	6	**25**
Approach Waving	0	0	0	0	0	**0**
Stop Waving	0	0	0	0	0	**0**
Accent Gestures						
Hand Slicing	0	0	0	0	0	**0**
Fist Thumping	0	0	0	0	0	**0**
Fingers to Lips	0	0	0	0	0	**0**
Fingers to Ears	0	0	1	0	0	**1**
Hands Upturned	0	0	1	1	1	**3**
Counting Fingers	0	0	0	0	0	**0**
Teacher Movement						
Large Movement	4	2	0	2	3	**11**
Small Movement	1	1	2	0	0	**4**
No Movement	35	11	19	8	11	**84**
Squatting/Sitting	0	0	0	0	0	**0**
Facial Expression						
Smile Movement	7	1	3	0	1	**12**
Frown Movement	0	0	0	0	0	**0**
Head Movement						
Head Nod	1	0	0	2	1	**4**
Head Turn	10	4	4	7	6	**31**
Teacher Action						
Teacher Gaze	2	1	2	0	2	**7**
Touch Student	0	0	0	0	0	**0**
Total	**174**	**158**	**166**	**156**	**180**	**834**

Table 5. (cont.) Other Nonverbal Cues

Fingers to nose was observed while talking about class activities
The instructor used the computer cursor as a pointer to assist in the lecture
At the beginning of the class there was a classroom picture shot taking the camera off the instructor
There were many classroom camera shots as well as cursor drawing by the instructor
The instructor used the cursor to explain points in his lecture
Much time was spent drawing equations and the instructor asking questions to the students
The camera would briefly focus on the instructor when changes were made to the screen
The instructor would change the camera to a classroom shot sometimes when information was on the board/screen
The instructor drew on the board/screen to present information to the class
The instructor uses the cursor as a pointer as well as an instrument to draw
There were 20 seconds where there was nothing taking place on the screen or with the instructor
There was a brief period with nothing on the screen
The instructor passed materials around to the students for observation
The instructor used his cursor to draw diagrams for the students
There was a lecture segment where the screen focused on the classroom while the instructor waited for answers to his question
Instructor showed a classroom shot
Questions from remote sites are seldom asked
The computer cursor was used to accent diagram points
The camera displayed a classroom shot
The instructor drew with difference color pens on the board
Student asked a question which led to a classroom camera shot
The instructor asked a question to the class a student answered turning the camera on the class briefly
The camera showed a student waiting for a question to be asked by the instructor
The instructor used the cursor while on the computer screen to circle and underline key points
The instructor circled multiple equations that were on the board/screen
A student asked a question while projected on the screen, then the instructor drew the explanation on the board/screen
The instructor pulled the computer menu on the board/screen and taught from the computer
The instructor used a pen to circle board/screen equations
There was one occurrence where a student was viewed on the screen
There was one occurrence where there was no information on the screen
There was one occurrence where the class was viewed on the screen
The instructor used his pencil to write and draw information to the class
There were multiple occurrences of nothing on the screen
There was an occurrence where the camera showed the classroom
There was an interval where nothing was on the screen
The instructor used a second object as a model or material to assist with delivery
There was a camera shot on the classroom during this sequence

Table 6. Nonverbal cue frequencies by instructor 016

	Lecture 1	Lecture 2	Lecture 3	Lecture 4	Lecture 5	
Directional Gesture						
Board Pointing	108	118	103	109	122	**560**
Material Pointing	28	10	24	25	14	**101**
Waving	29	15	15	5	24	**88**
Approach Waving	0	0	0	0	0	**0**
Stop Waving	0	1	0	0	0	**1**
Accent Gestures						
Hand Slicing	10	3	5	3	4	**25**
Fist Thumping	0	0	0	0	0	**0**
Fingers to Lips	2	0	0	0	1	**3**
Fingers to Ears	0	0	0	0	0	**0**
Hands Upturned	5	0	2	3	4	**14**
Counting Fingers	0	0	0	0	0	**0**
Teacher Movement						
Large Movement	0	1	0	0	0	**1**
Small Movement	1	0	1	0	3	**5**
No Movement	42	27	27	21	27	**144**
Squatting/Sitting	0	0	0	0	0	**0**
Facial Expression						
Smile Movement	7	3	1	3	5	**19**
Frown Movement	0	0	0	0	0	**0**
Head Movement						
Head Nod	0	0	1	0	0	**1**
Head Turn	1	2	0	0	2	**5**
Teacher Action						
Teacher Gaze	4	1	0	0	0	**5**
Touch Student	0	0	0	0	0	**0**
Total	**237**	**181**	**179**	**169**	**206**	**972**

'able 6. (cont.) Other Nonverbal Cues

'he instructor uses the cursor to draw accent lecture points
'he instructor uses different color pens to underline points on the screen
'he instructor wrote extensively on the screen and used the computer cursor to assist in explaining points
'he instructor uses the cursor to draw, explain, and underline material
'he instructor uses his hands placed in the view of "Elmo ™" to express and explain points to the students at remote sites
'he instructors hands were formed in many ways, i.e. cupping, and flattening to express a point
'he instructor used his hands in a pressing manor to illustrate a point. This was done via Elmo ™ to be seen by remote-site students
'he instructor uses the computer cursor and hand expressions in front of the camera to illustrate and express lecture points
'he instructor used the cursor to draw, explain, and underline material
'he instructor used his hands placed in the view of "Elmo ™" to express and explain lecture points to students at remote sites
'he instructors hands entered the screen to hold materials still during lecture
'he instructor placed his hands in front of the camera to express lecture points
'he instructor uses different color pens to express and emphasize lecture points
'he instructor uses multiple pens to emphasize, underline and point at screen materials capture the attention of remote-site students
'he instructor raises his voice at times to emphasize lecture points
'he instructor wrote formulas and drew arrows on the screen explaining lecture points
'he instructor used the cursor to draw, explain, and underline class material
'he instructor used his hands placed in the view of "Elmo ™" to express and explain lecture points
'he instructor used his hands in front of the camera to demonstrate lecture points
'he instructor used his hands in front of the camera to express points and demonstrate lecture points to the students
'he instructor shook his pen in front of Elmo ™ while drawing and writing formulas. This appeared to maintain student attention
'he model used to demonstrate this portion of the lecture had a liquid substance that moved throughout the lecture
'he instructors hands touched all parts of the model during the lecture
'he instructor is drawing many points with a pen while working with materials
'he instructor was seen pointing outward at times
'he instructor changed color markers when making a point. He sometimes used two pointers, one stationary and the other mobile
'here were no questions asked from the students
'he instructor uses multiple pens and colors to capture student attention
'he instructor wrote multiple formulas and equations on the screen
'he instructor uses the screen as a traditional blackboard with the attitude of sitting down and teaching one-on-one to a person
'he instructor used pen writing and the computer cursor to express lecture points to the class
'he instructor drew formulas and lecture materials on the screen
'he instructor wrote with the computer cursor to deliver information to the class
'he instructor expressed lecture points with the computer cursor and used his hands via Elmo ™ when accenting lecture points

Table 7. Nonverbal cue summary of frequencies for six instructors

	Instructor 011	Instructor 012	Instructor 013	Instructor 014	Instructor 015	Instructor 016	
Directional Gesture							
Board Pointing	194	441	496	611	549	560	**2851**
Material Pointing	407	40	65	88	103	101	**804**
Waving	74	256	94	61	25	88	**598**
Approach Waving	0	0	0	0	0	0	**0**
Stop Waving	0	0	0	0	0	1	**1**
Accent Gestures							
Hand Slicing	5	9	7	0	0	25	**46**
Fist Thumping	0	0	0	1	0	0	**1**
Fingers to Lips	2	16	0	3	0	3	**24**
Fingers to Ears	1	4	0	0	1	0	**6**
Hands Upturned	1	17	0	0	3	14	**35**
Counting Fingers	4	1	1	1	0	0	**7**
Teacher Movement							
Large Movement	1	0	0	9	11	1	**22**
Small Movement	12	11	7	9	4	5	**48**
No Movement	109	312	200	108	84	144	**957**
Squatting/Sitting	0	0	0	0	0	0	**0**
Facial Expression							
Smile Movement	12	31	4	0	12	19	**78**
Frown Movement	0	11	1	0	0	0	**12**
Head Movement							
Head Nod	8	29	7	0	4	1	**49**
Head Turn	7	13	58	1	31	5	**115**
Teacher Action							
Teacher Gaze	7	159	11	11	7	5	**200**
Touch Student	0	0	0	0	0	0	**0**
Total	**844**	**1350**	**951**	**903**	**834**	**972**	**5854**

Table 7. (cont.) Other Nonverbal Cues

Instructor 011

The instructor uses his finger as a pointer when describing items on the screen
The instructor inadvertently touched his nose during the lecture
The screen is blurry during the lecture
The instructor places laminated material over paper in front of Elmo ™ to write and make comments to the class
The instructor uses color markers to enhance the lecture
The instructor uses color markers to enhance the lecture
The instructor uses a pen as a pointer on the screen to direct student attention
During the lecture the screen went blank
The instructor uses colored markers to accent the lecture
A class shot appeared on the screen
The screen went blank on three occasions during the lecture
The instructor touched his face, but not in the areas identified for this instrument
The instructor showed (6) videotapes to enhance the lecture
The instructor touched his glasses
The classroom was observed for a six interval period
The screen was blurry during the lecture
There were several class shots during the lecture
The instructor pointed at the class with his finger during the lecture

Instructor 012

The instructors slides included three different colors
The instructor is very stationary, maybe because of the two-way video equipment
The instructor displays a slight rocking movement
The instructor did not depend on the cursor to accent the lecture, he used his voice
The students did not ask questions during the lecture
The instructors slides had four or more colors with a large arrow pointing at key points
When a student asked a question, his voice was only heard
Many times when a student would ask a question of the instructor, they asked the instructor to refer to the slide for the answer
The instructor uses his cursor to accent lecture points
The camera went to a classroom shot when a student asked a question
Although there are many "BP's" in this lecture the instructor used pens, props, and colors on the board/screen
The cursor was used to present and accent information on the board/screen
The instructor is in a sitting position
The camera went to a classroom shot during the lecture
There were several classroom shots during this lecture due to student questions
The instructor used colors during the board pointing cue of the lecture to explain material
The camera went to a class shot without questions from the class
The cursor was used extensively to explain lecture points
The instructors slides have a blue background with multiple colors integrated in them
Many times when a student would ask a question of the instructor, they asked the instructor to refer to the slide for the answer
The camera went to a class shot without questions from the class
The instructor received many questions from the class
This lecture produces many class questions, however, most questions came from the on-site classroom not remote-sites
While teaching from a standing position, the instructor rocked back and forth
The instructor is using his cursor to accent lecture points
This lecture had many questions from the class
The instructor made an effort to make sure the camera was pointed on him when answering questions
The instructor appeared to be very efficient with the technology
The instructor went to the "BP" when answering some questions
The instructor has very elaborate slides detailing the lecture and brining out additional talking points
The instructor places the camera on him a lot during the lecture
This was a very interactive lecture
There were classroom shots during this lecture because of student questions

Table 7. (cont.) Other Nonverbal Cues

Instructor 013

The instructor spent the majority of this lecture instructing to the class via Elmo ™
Because of impromptu information, the instructor used a black marker on white paper to deliver lecture material
Impromptu information oftentimes is written by hand and delivered via Elmo ™
The instructor continues to exit and enter paper materials in front of Elmo ™ to give project guidelines and schedules to the class
The instructor uses his pen to emphasize lecture points on the materials
The prepared materials are very colorful and well designed which may capture student attention
In some ways, the two-way video classroom appears to provide a format to deliver large amounts of information
The instructor performs "house keeping" duties with remote sites and this takes a large amount of time
The instructor uses the cursor to follow the board/screen and explain information to the class
Most questions asked during the lecture take place while the instructor is teaching from the board/screen
Many of the nonverbal cues used in the traditional classroom are not being used in the two-way video classroom
The instructor places updated information on Elmo ™ to communicate class updates
The instructor is communicating with the remote sites and there is a delay in this communication process
When the instructor performs role call to the remote sites, this takes time
This instructor tends to raise his voice, as if the remote sites are far away, when taking to students from remote sites
When the instructor communicates with remote sites asking if they have received materials, it takes time
This appeared to be the first lecture in the semester due to the amount of class "housekeeping" taking place
The instructor executed a class shot during this lecture
The instructor states that students from remote sites might experience isolation when attending a two-way video class
The instructor uses the cursor to navigate the course website. The course website had the latest course and class information
This class was spent reviewing the course and expectations from the instructor
The instructor presents himself in a traditional/nonverbal communication way when the camera is on them
The instructor has integrated many colors and logos to his course slides
The instructor shifts his eyes a lot monitoring the two-way video equipment
The instructor uses the cursor and placed materials in front of Elmo ™ to assist in the teaching process
The instructors PowerPoint slides have multiple colors and are detailed
The instructor raises his voice when the camera is on him
The computer cursor is serving as an extension of the instructors hand
The instructor had all of his formulas prepared and used the cursor to assist in explaining them to the class
There was a technical problem that paused the lecture for a short time
Many times the instructor asked questions, receiving no student answers, or forgot to click the "camera pad" redirecting the camera
When making long explanations the instructor often turned the camera on himself to address the class
The instructor asked the class if they had any questions and received none
The eyes of the instructor are continuously shifting looking at two-way video equipment and monitors
The instructor used the computer cursor and a pointer to express lecture points and accent formulas
The instructors slides had multiple colors
The instructor used the board/screen to deliver the majority of the lecture
The cursor and the board/screen served as the main communication instruction delivery method
The board/screen instruction method worked in concert with the instructors voice
The cursor acts as an extension of the instructors hand. Most of the time the instructors voice remains at normal tone
The instructor shifts his eyes a lot, monitoring the controls of the two-way video equipment
The instructor moved his hand to move the camera to the board two (2) times
The instructor spoke to the class in a normal voice
The instructor used his cursor to make lecture points

Table 7. (cont.) Other Nonverbal Cues

The instructor placed his hands firmly on the desk when teaching
The instructor stayed stationary throughout this lecture
Verbal communication appears to be the main mode for instruction delivery
The instructor used his cursor to make points
The instructor transferred the camera from the screen to himself to give the remote-site students an instructor visual

Instructor 014

The instructor uses the computer cursor to point and work problems on the screen
The instructor uses the computer cursor to point and work problems on the screen
The instructor uses multiple colored markers to express points on the screen
The instructor uses the computer to show different charts (many in color) to teach from
The instructor uses the cursor to point to the problem while performing the task on completion
The instructor uses different color markers when solving problems on the screen
These color distinctions served in expressing different paths the students could take in solving the problem
The camera was focused on the classroom while waiting for questions throughout the lecture
The instructor used a pen as a pointer on the screen to direct student attention
The instructor uses colored markers while communicating with the class on the screen to indicate change
The instructor often cleared his throat while waiting for students to ask questions
The camera focused on the classroom while waiting for students to answer questions
The camera remained focused on a specific student when a question was asked
The instructor places his hands to his eyes and on hips when teaching
The camera showed a classroom shot at points in the lecture
The instructor placed his hands in his pockets while teaching
The instructor uses a pointer to accent lecture points
The instructor uses a pointer to accent lecture points
The instructor uses a pointer to accent lecture points
The instructor pointed to his head and hair while teaching

Instructor 015

Fingers to nose was observed while talking about class activities
The instructor used the computer cursor as a pointer to assist in the lecture
At the beginning of the class there was a classroom picture shot taking the camera off the instructor
There were many classroom camera shots as well as cursor drawing by the instructor
The instructor used the cursor to explain points in his lecture
Much time was spent drawing equations and the instructor asking questions to the students
The camera would briefly focus on the instructor when changes were made to the screen
The instructor would change the camera to a classroom shot sometimes when information was on the board/screen
The instructor drew on the board/screen to present information to the class
The instructor uses the cursor as a pointer as well as an instrument to draw
There were 20 seconds where there was nothing taking place on the screen or with the instructor
There was a brief period with nothing on the screen
The instructor passed materials around to the students for observation
The instructor used his cursor to draw diagrams for the students
There was a segment of the lecture where the screen focused on the classroom while the instructor waited for student answers
nstructor showed a classroom shot

Table 7. (cont.) Other Nonverbal Cues

Questions from remote sites are seldom asked
The computer cursor was used to accent diagram points
The camera displayed a classroom shot
The instructor drew with difference color pens on the board
Student asked a question which led to a classroom camera shot
The instructor asked a question to the class, a student answered turning the camera on the class briefly
The camera showed a student waiting for a question to be asked by the instructor
The instructor used the cursor while on the computer screen to circle and underline key points
The instructor circled multiple equations that were on the board/screen
A student asked a question while projected on the screen, then the instructor drew the explanation on the board/screen
The instructor pulled the computer menu on the board/screen and taught from the computer
The instructor used a pen to circle board/screen equations
There was one occurrence where a student was viewed on the screen
There was one occurrence where there was no information on the screen
There was one occurrence where the class was viewed on the screen
The instructor used his pencil to write and draw information to the class
There were multiple occurrences of nothing on the screen
There was an occurrence where the camera showed the classroom
There was an interval where nothing was on the screen
The instructor used a second object as a model or material to assist with delivery
There was a camera shot on the classroom during this sequence

Instructor 016

The instructor uses the cursor to draw accent lecture points
The instructor uses the cursor to draw accent lecture points
The instructor uses different color pens to underline points on the screen
The instructor wrote extensively on the screen and used the computer cursor to assist in explaining points
The instructor uses the cursor to draw, explain, and underline material
The instructor uses his hands placed in the view of "Elmo ™" to express and explain points to the students at remote sites
The instructors hands were formed in many ways, i.e. cupping, and flattening to express a point
The instructor used his hands in a pressing manor to illustrate a point. This was done via Elmo ™ to be seen by remote-site students
The instructor uses the computer cursor and hand expressions in front of the camera to illustrate and express lecture points
The instructor used the cursor to draw, explain, and underline material
The instructor used his hands placed in the view of "Elmo ™" to express and explain lecture points to students at remote sites
The instructors hands entered the screen to hold materials still during lecture
The instructor placed his hands in front of the camera to express lecture points
The instructor uses different color pens to express and emphasize lecture points
The instructor uses multiple pens to emphasize, underline & point at screen materials capture the attention of remote-site students
The instructor raises his voice at times to emphasize lecture points
The instructor wrote formulas and drew arrows on the screen explaining lecture points
The instructor used the cursor to draw, explain, and underline class material
The instructor used his hands placed in the view of "Elmo ™" to express and explain lecture points
The instructor used his hands in front of the camera to demonstrate lecture points
The instructor used his hands in front of the camera to express points and demonstrate lecture points to the students
The instructor shook his pen in front of Elmo ™ while drawing and writing formulas. This appeared to maintain student attention

Table 7. (cont.) Other Nonverbal Cues

The model used to demonstrate this portion of the lecture had a liquid substance that moved throughout the lecture
The instructors hands touched all parts of the model during the lecture
The instructor is drawing many points with a pen while working with materials
The instructor was seen pointing outward at times
The instructor changed color markers when making a point. He sometimes used two pointers, one stationary and the other mobile
There were no questions asked from the students
The instructor uses multiple pens and colors to capture student attention
The instructor wrote multiple formulas and equations on the screen
The instructor uses the screen as a traditional blackboard with the attitude of sitting down and teaching one-on-one to a person
The instructor used pen writing and the computer cursor to express lecture points to the class
The instructor drew formulas and lecture materials on the screen
The instructor wrote with the computer cursor to deliver information to the class
The instructor expressed lecture points with the computer cursor and used his hands via Elmo ™ when accenting lecture points

Bar Graphs

Tables 8 through 13 display the level nonverbal cues used by the six Virginia Tech instructors within the seven categories recorded by the TV-NCOI. This presents a visual representation of the nonverbal cue usage in relation to the seven nonverbal cue categories. Table 14 presents a complete summary of the nonverbal cue levels delivered by the six instructors in the two-way video classroom.

Table 8. Nonverbal Cue Frequency Results by Category for Instructor 011

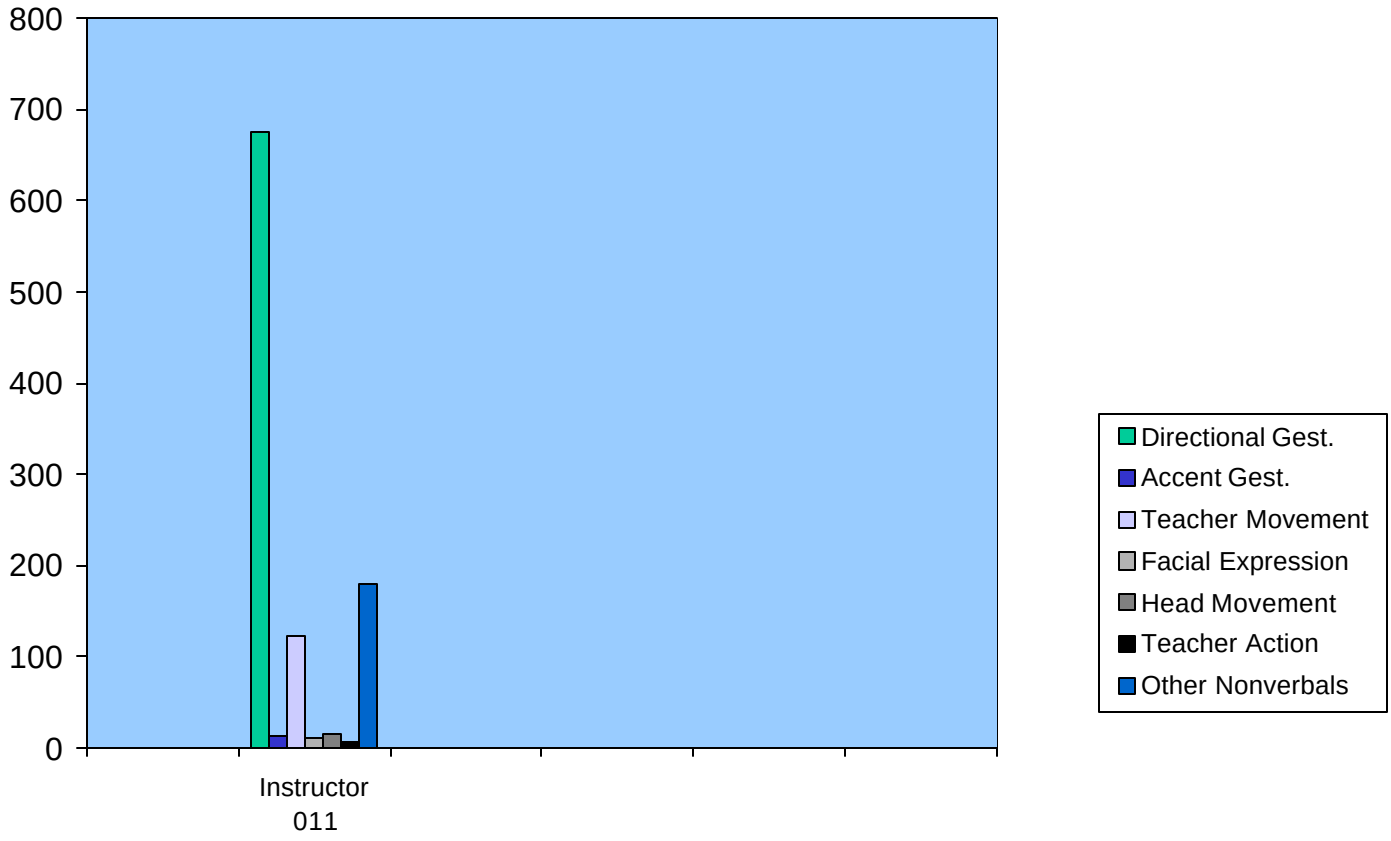

Table 9. Nonverbal Cue Frequency Results by Category for Instructor 012

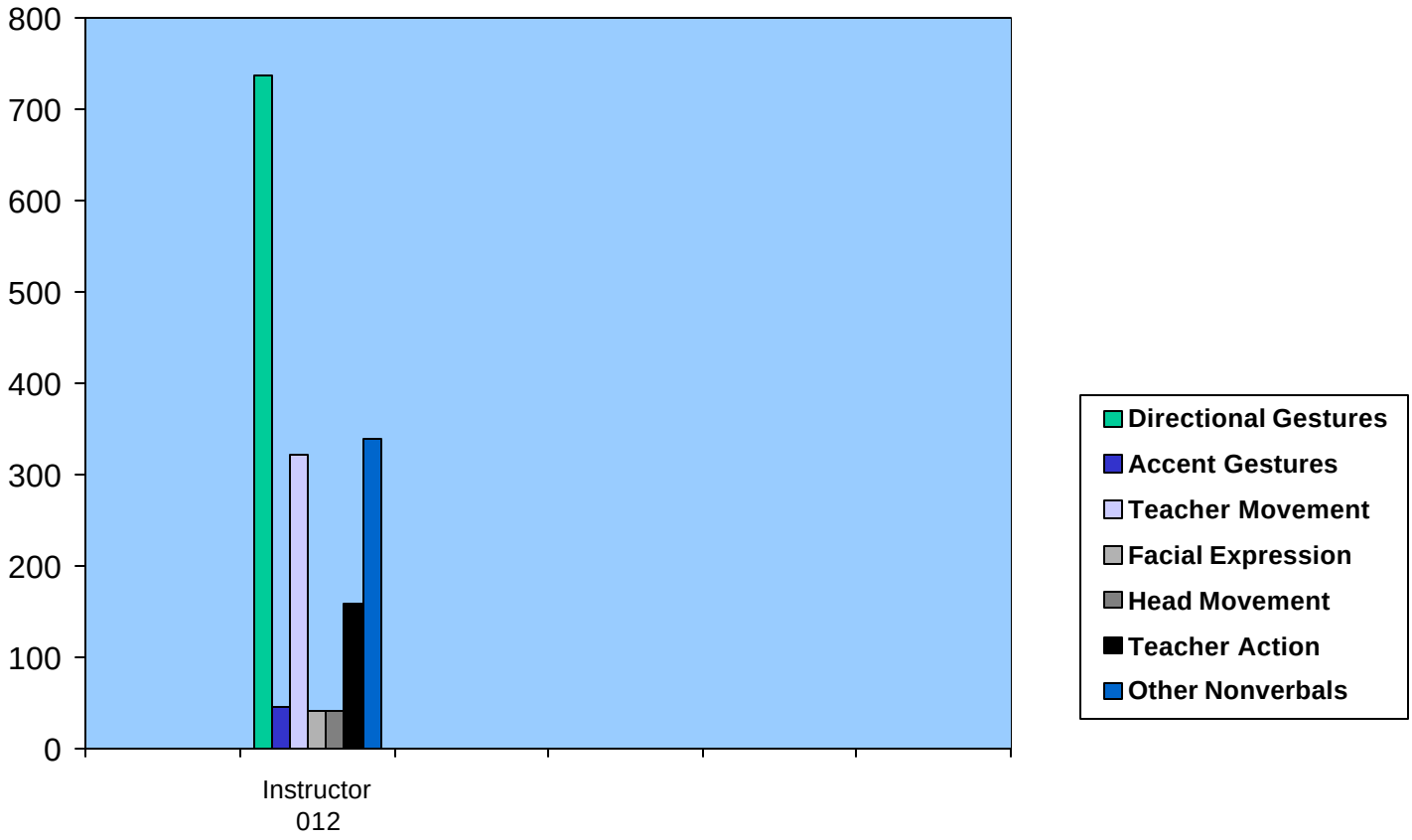

Table 10. Nonverbal Cue Frequency Results by Category for Instructor 013

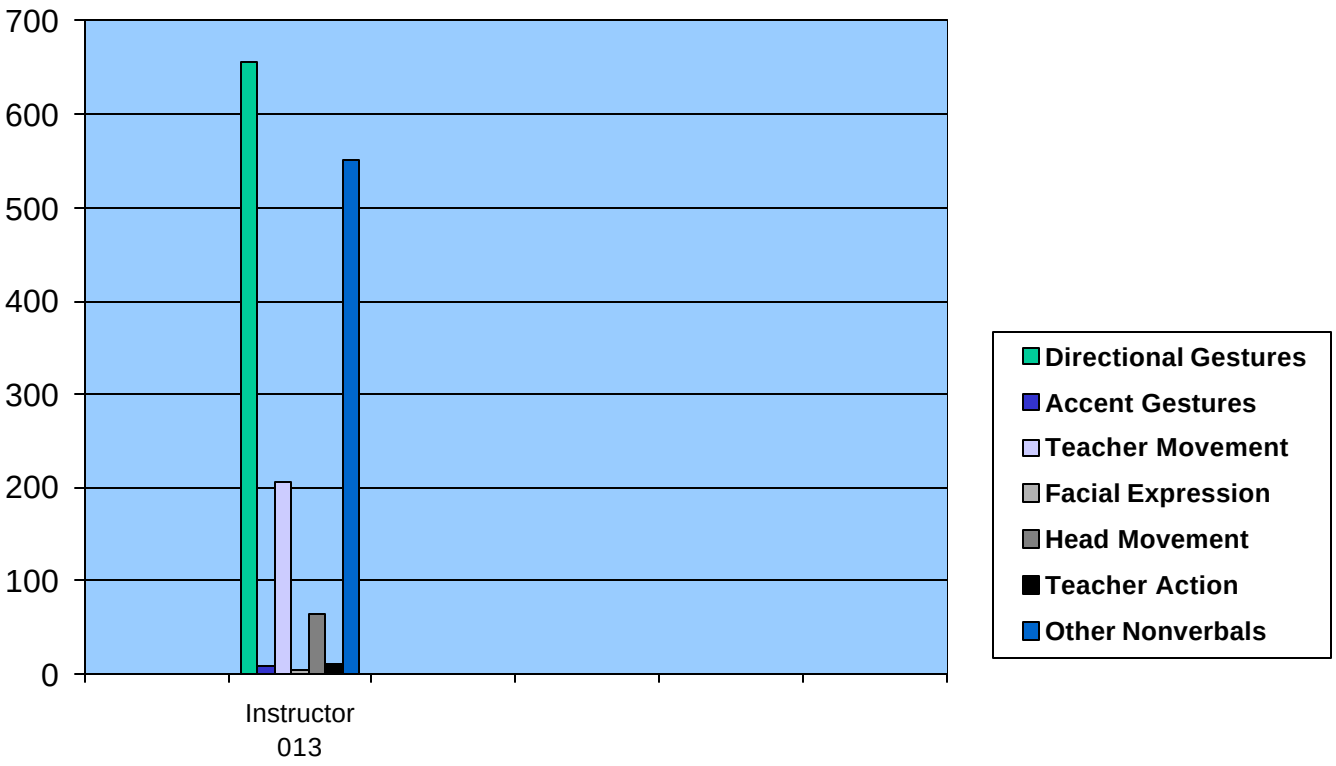

Table 11. Nonverbal Cue Frequency Results by Category for Instructor 014

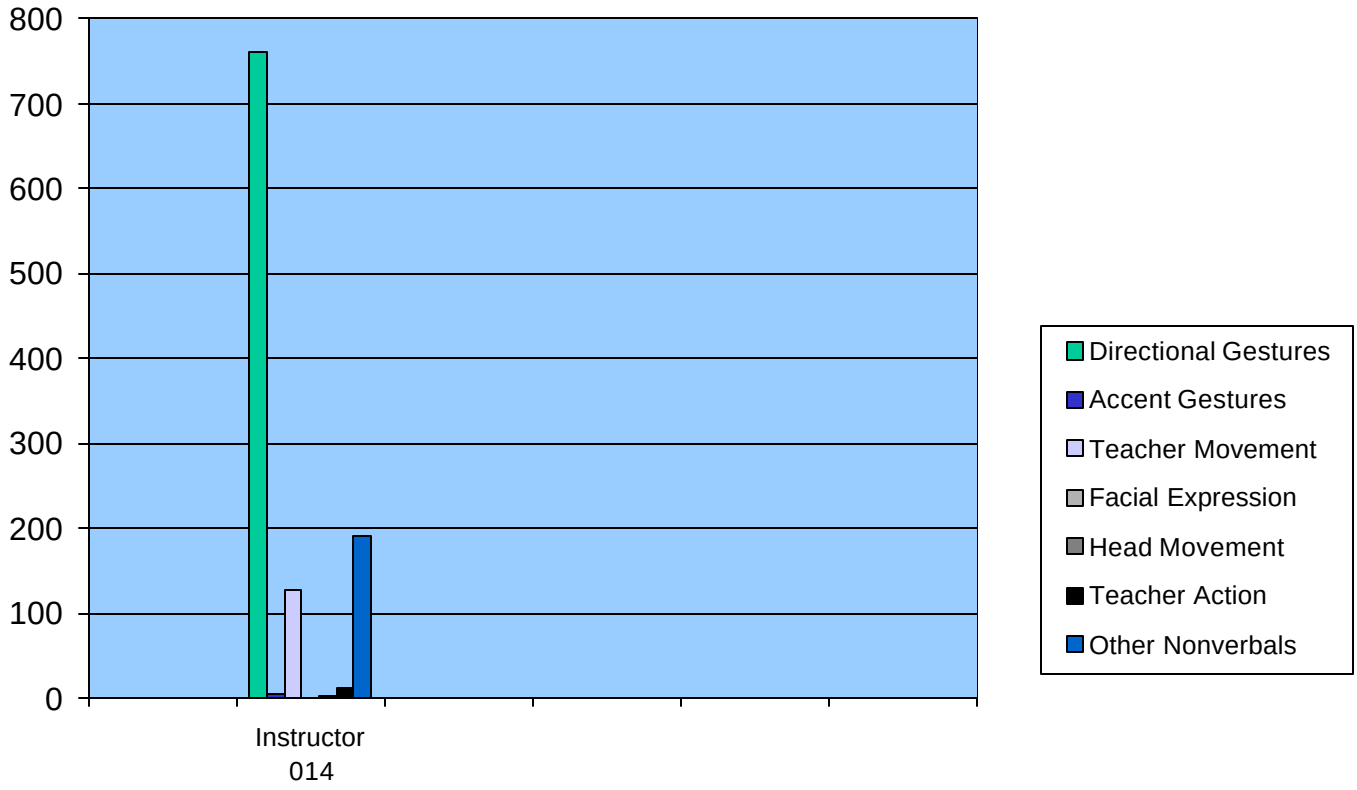

Table 12. Nonverbal Cue Frequency Results by Category for Instructor 015

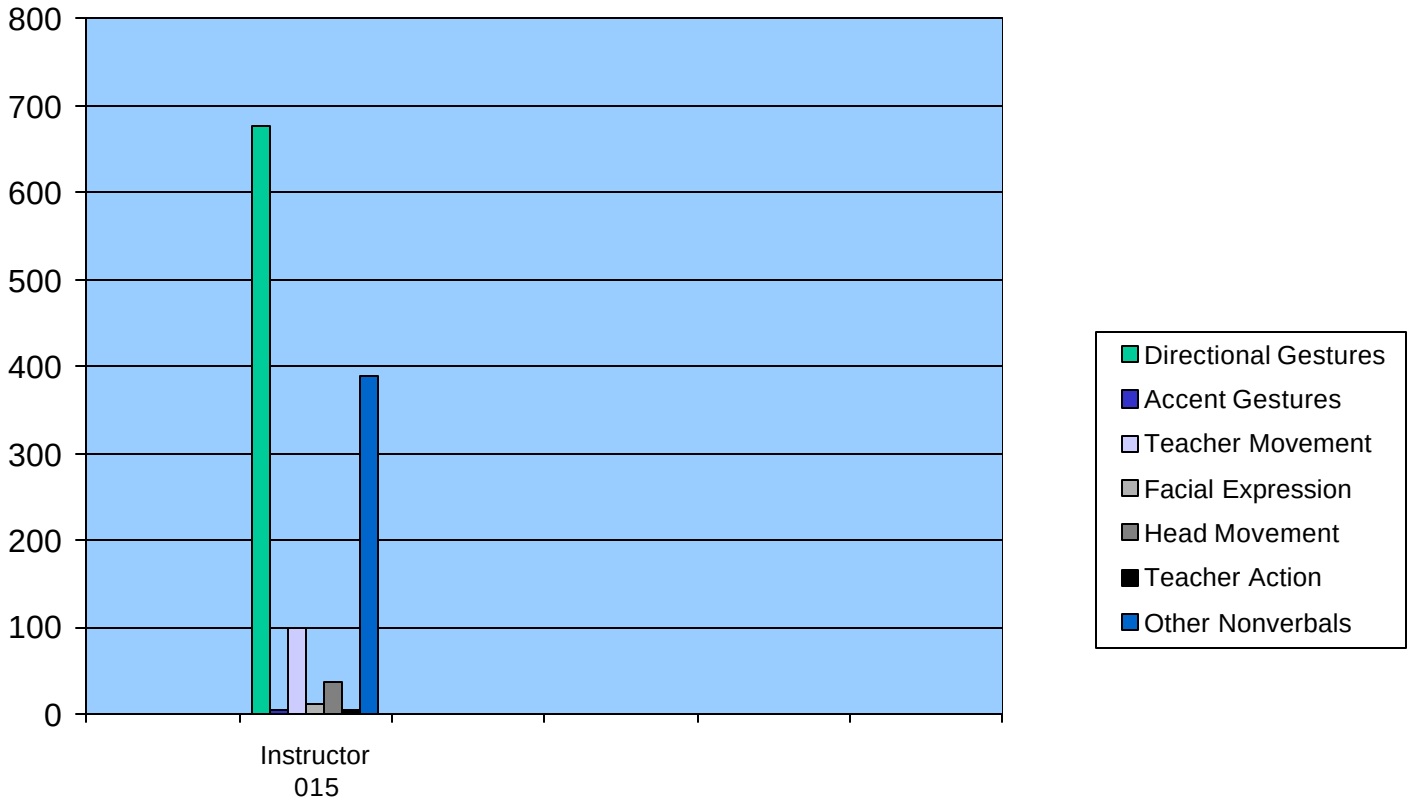

Table 13. Nonverbal Cue Frequency Results by Category for Instructor 016

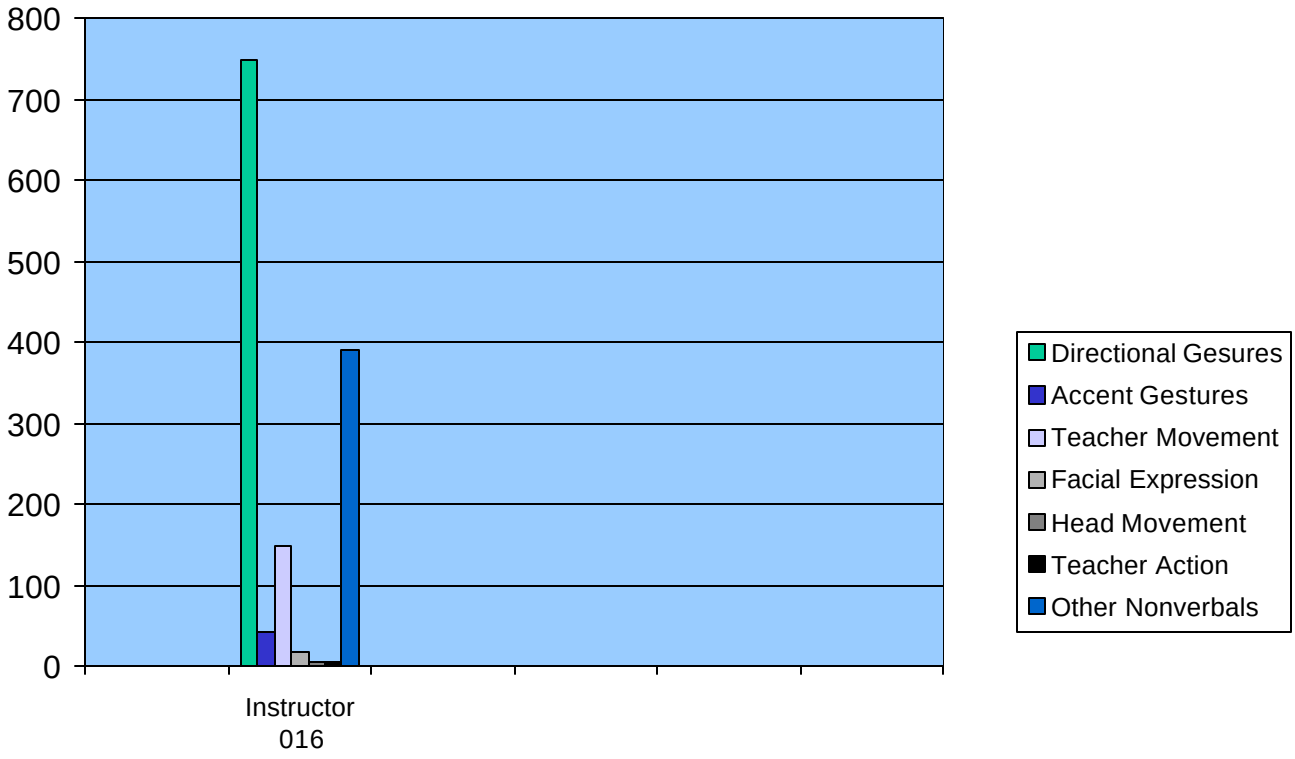

Table 14. Nonverbal Cue Frequency Results by Category for all Six Instructors