Fall 2008

Show and Tell: Learning with Interactive Videoconferencing in Kindergarten

Debra Piecka

SHOW AND TELL: LEARNING WITH INTERACTIVE VIDEOCONFERENCING IN KINDERGARTEN

A Dissertation

Submitted to

Instructional Technology Program

Department of Instruction and Leadership in Education

Duquesne University

In partial fulfillment of the requirements for

the degree of Doctor of Education

By

Debra C. Burkey Piecka

December 2008

DUQUESNE UNIVERSITY
SCHOOL OF EDUCATION

Dissertation

Submitted in Partial Fulfillment of the Requirements
For the Degree of Doctor of Education (Ed.D.)

EdDIT Doctoral Program

Presented by:

Debra C. Burkey Piecka

M.B.A., Business Administration, University of Pittsburgh, 1984
B.S., Administration and Management Science, Mathematics, and Economics,
Carnegie Mellon University, 1980

SHOW AND TELL: LEARNING WITH INTERACTIVE
VIDEOCONFERENCING IN KINDERGARTEN

October 23, 2008

Approved by:

____, Chair
James B. Schreiber, Ph.D.
Associate Professor, Department of Foundations and Leadership, School of Education

____, Member
Rodney Hopson, Ph.D.
Hillman Distinguished Professor
Associate Professor, Department of Foundations and Leadership, School of Education

____, Member
Connie Moss, Ed.D.
Associate Professor, Department of Foundations and Leadership, School of Education

Program Director
Joseph C. Kush, Ph.D.
EdDIT Program

ABSTRACT

SHOW AND TELL: LEARNING WITH INTERACTIVE VIDEOCONFERENCING IN KINDERGARTEN

By

Debra C. Burkey Piecka

December 2008

Dissertation Supervised by Professor James B. Schreiber

The research investigated how kindergartners make meaning using interactive videoconferencing. The study explored two research questions: 1) What types of meanings are being formed by the kindergartners during interactive videoconferences and, 2) What are the nature of young children's emerging inquiries and dialogue surrounding their use of interactive videoconferencing in their classroom? The study embodied a Vygotskian perspective as the theoretical framework in order to meet demands associated with the young participants' vulnerability, developmental appropriateness, and the students' interactive learning environment. Employing an ethnographic, participant observation methodology, the research design was informed by three criteria: 1) a pilot study, 2) Miles and Huberman's (1994a) recurring themes in qualitative data analysis, and 3) literature review results emphasizing the nuances of contemporary culture. Field observation occurred from October 2007 through February 2008 in a Southwestern Pennsylvania kindergarten classroom. Students participated in 7 videoconferences with distant peers or content experts. Data from a gingerbread and puppetry videoconference and an astronomy program were selected for further analysis based on their ability to illustrate poignant examples of how the kindergartners formed meaning during collaborations. Data analysis procedures involved the importing of dialogue from videoconferencing transcriptions, field notes, and other artifacts into the ATLAS.ti qualitative data analysis software for open coding, data display, and grounded theory development.

Results developed from open coding and concept maps in ATLAS.ti informed the following theory development. First, learning with interactive videoconferencing in kindergarten supports meaning making from four Vygotskian tenets: 1) the social origins of learning, 2) sign and tool use through mediated activity, 3) the importance of language, and 4) support for the zone of proximal development. Additionally, the students' meaning making involved the tenets' entwinement rather than the solitary occurrence of individual tenets. Regarding the kindergartners' emerging inquiries, during sustained interactive videoconferencing levels, children's inquiries and dialogue evidenced exploratory talk that was purposeful, reflective and self-directed. It also indicated comfort with the technology. This study is unique in its multidisciplinary application of Vygotskian learning theory to kindergartners' meaning making with videoconferencing and provides a foundation for extended use of qualitative methods to examine young children's' learning with technology.

DEDICATION

I dedicate this dissertation to my parents, Forrest S. and Janet M. Crawford. Their love, encouragement, and respect provided a nurturing environment where I was free to explore, dream, learn, fail, and succeed. My parents' enthusiasm for my educational and professional endeavors continues to foster my love for learning.

I also dedicate this dissertation to my three daughters, Shannon, Lauren, and Julia. You inspire me to continue my educational research.

I told the kindergartners that I was going to write a story about them. Therefore, I offer this study to my participating kindergarten teachers and students.

ACKNOWLEDGMENTS

It is with great gratitude that I thank the many members of my family who partook in my journey of earning my doctoral degree. Some of these members are no longer with me, although I know they are with me in mind and spirit. My mother Janet passed away unexpectedly during my first year of study. I miss our daily conversations, but I constantly perceive Mom's influence. Likewise, my grandmother Mama died during my studies. These losses are my gains as I remember the times we shared and their enthusiastic support of my academic and other pursuits. I have had the wonderful experience of unconditional support and love from my parents, grandparents, husband, and children during the pursuit of my degree.

I want to thank my husband Dave for stepping in to fill in the gaps while I finished my homework and writing. The workload quickly became old for my family members as I became absorbed in my research. My daughters Shannon and Lauren graduated from high school and became my distance-learning buddies during my time at Duquesne University. In the late night hours, we instant messaged back and forth—gleeful, worried, and sorrowful about our workloads. However, we learned to persevere together. Although we were separated by hundreds of miles, we kept in close touch with one another. Julia, you kept me young while I was going through this experience, and you always brought me back to reality. Dad, thanks for always listening and encouraging me. It was hard not being able to talk with Mom, and I valued your undivided time when I needed to talk. Sally, I appreciated your unbridled enthusiasm for my work. My family was always there to pick me up when I needed it the most. Your kind words, love,

laughter, and smiles were instrumental in helping me to overcome my dissertation hurdles.

I sincerely thank the members of my dissertation committee: James B. Schreiber, Rodney K. Hopson, and Connie M. Moss, for their knowledge, tenacity, patience, and guidance during the dissertation process. Their willingness to let me pursue my research agenda while offering insightful recommendations afforded me great freedom to create a meaningful study. I especially appreciated your confidence.

To my cohort members and instructors at Duquesne University, thank you for helping me in my scholarly pursuits. I am grateful for my distance-based experiences as well as my face-to-face encounters in the classroom. I extend a special note of appreciation to Elaine and Michelle who were always there when I needed them.

I want to extend my gratitude to my pilot study participants. Ms. Yeager and Ms. Oppen invited me into Green Elementary School with open arms. I appreciated your willingness to have a stranger in your classroom, and it demonstrated your wonderful, imaginative attitude towards learning with technology. Thank you to Ms. Yeager for assisting me to obtain the permission, consent, and assent forms so necessary to commence the research process. The 15 students in Ms. Yeager's kindergarten class welcomed me with warming smiles, and I want to thank Sydney, Gretchen, Bill, Zoe, Christina, Emily, Justin, Graham, Donovan, Taylor, Todd, Caroline, Justin, Bridget, and Mark for their kindness. I hope this study is the beginning of many opportunities for these kindergartners to collaborate and interact with other classrooms around the world.

Interactive videoconferencing involves local and remote participants and I would not have been able to observe Ms. Yeager's class without the contributions of the remote

subjects. Thank you to Ms. Jackson at Morton Elementary School and all of her 2007-2008 kindergarten students. Mr. Lane and Liz, please accept my sincere appreciation for your shark videoconferencing contribution. In addition, I want to express my gratitude to Green Elementary School District's principal and superintendant for their permission and vision associated with the pilot study. I also appreciate the efforts of the Intermediate Unit who put me in touch with Ms. Oppen.

For my dissertation study, the thank you list is quite extensive, so I will begin with the local kindergarten classroom. Mrs. Hartman, thank you for inviting me into your classroom. You perpetuated my desire to continue classroom-based research and to first-handedly witness the impact of learning with interactive videoconferencing in a kindergarten classroom. You were patient with me as I learned, played, took notes, and began to piece together the meaning making of your students when learning with technology. I valued your assistance in helping me to secure the important consent, permission, and asset forms. I also extend my sincerest thanks to Mrs. Sullivan and the kindergarten students: Chloe, Sophie, Christine, Maria, Taylor, Jamie, Emily, Jasmine, Haley, Rachel, Madison, Jade, Steve, Mark, Nathan, Jonathon, Kevin, Elliot, George, Joel, Andrew, Ben, Michael, Noah, and Deon. To Lovand Catholic School's principal, thank you for supporting my research.

Next, I wish to express my gratitude to the remote participants in the study. Thanks to Mrs. Walsh and her kindergarten class at St. Rose Catholic School for the backyard bird, birdfeeder, and polar world videoconferences. Mr. Thomas and Mrs. Jones, it was wonderful collaborating with your primary students in the U.K about astronomy. Thank you Laura and Elizabeth for setting up the astronomy program and

please keep reaching for the stars. Miss Peterson, thank you for making the gingerbread boy come alive and run away. And once again Liz, I appreciated the chance to learn about sharks with Mrs. Hartman’s class.

TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

In today's society marked by global markets, spontaneous communications, ubiquitous computing, and prevalent electronic and digital society, there is a mismatch between students' use of tools and technology experiences in academic settings versus outside of school. In the 1980s, personal computers became popular both at home and at school, causing researchers and educators to further investigate the impact of technology on learning in schools (Marsh, 2000). Technologies became more dynamic, permitting more interaction with the computer, the instructor, and other learners. Classrooms were inundated with content as more and more schools hooked up to the Internet through the World Wide Web. New cultures emerged that were based on the connections and meaning making of people who were exploring the capabilities of this cyber world. This information explosion resulted in amazing changes to our daily lives including the opportunity to communicate with and see other people that would previously have been too cumbersome, expensive, or technologically sophisticated to consider. These augmented communication capabilities also brought about changes to fundamental skills required by learners, especially in the form of necessary literacy competencies (North Central Regional Educational Laboratory [NCREL], 2003).

Leading educational research organizations (International ICT Literacy Panel, 2002; International Society for Technology in Education [ISTE], 2007; NCREL, 2003) emphasize the need to address 21st century literacy skills in today's classrooms in order to succeed in the knowledge intensive and global society. However, the definition of literacy is changing both nationally and globally. For present day primary and secondary students as well as for adults, literacy is more than just being able to read and write. The United Nations Educational, Scientific and Cultural Organization (UNESCO) views literacy as being at the "heart of human development" (Lutz & Scherbov, 2006, p. 4) and pivotal to international education and development. In order to define literacy from a global perspective, it is important to examine the UNESCO designation of the term due to their widespread impact in the fields of education, social and natural science, culture, and communication. During a 2003 meeting of international experts at UNESCO, they put forth the following definition of literacy:

> Literacy is the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts. Literacy involves a continuum of learning enabling an individual to achieve his or her goals, develop his or her knowledge and potentials, and to participate fully in the community and wider society. (Literacy Assessment and Monitoring Programme [LAMP], 2004, p. 2, as cited in Nordtveit, 2005, p. 4)

In addition, NCREL identified three significant things that need to occur in to prepare students to be literate in the global society. These included (a) acknowledgement that 21st century skills are vital to the education of our students, (b) recognition that schools must adopt new learning models based on emerging research about how people learn combined with the implementation of technology and academic content in pedagogically appropriate ways, and (c) policymakers must include assessment of 21st century literacy skills along with academic appraisals (NCREL, 2003, p. 2). According to NCREL(2003) eight different categories of literacy are needed by students in the digital age. These eight categories of literacy skills include basic, scientific, economic, technological, visual, informational, multicultural, and global awareness. Their descriptions appear in Table 1.

Technological tools such as the Internet, point to point and multisite videoconferencing, e-mail, asynchronous and synchronous discussion boards, listservs, chats, instant messaging, blogs, and podcasting provide teachers with a formidable set of instructional approaches (Heath & Holznagel, 2002) to reach the literacy requirements of the digital natives (Prensky, 2001) of today's classrooms.

During the last 2 decades, opportunities for collaborative learning activities using technology greatly increased. Students and teachers of all ages began to explore the capabilities of the Internet. In these situations, students and teachers jointly construct their knowledge, teachers engage in more facilitator types of roles as opposed to didactic ones, and the learning environment focuses on student centered approaches offering opportunities for reflection and critical thinking. These advances in information sharing tipped the focus of the classroom away from a teacher-centered environment towards a learner-focused setting (American Psychological Association Work Group, 1997).

Online learning opportunities also burgeoned during the past two decades due to increased interest in using the Internet (Reiser, 2001). Alternate forms of delivering educational content such as electronic asynchronous discussion boards, synchronous course chats, videoconferencing, podcasting, voice delivery systems, and other virtual learning systems challenged traditional face to face methods of instruction (Hayden, 1999; Heath & Holznagel, 2002).

Table 1

21st Century Digital Literacy Areas for Today's Students

No.	Literacy skill area for 21st century learners	Description
1.	Basic Literacy	Language proficiency (reading, writing, listening, speaking) and numeracy skills using conventional or technology-based media to adequately meet one's goals (student or professional) (NCREL, 2003).
2.	Scientific Literacy	Knowledge and understanding of scientific concepts and processes in order to use and apply the information, to identify questions, and to make evidence-based conclusions for decision making, participation in the natural world, and economic productivity (NCREL, 2003).
3.	Economic Literacy	The ability to identify economic problems, alternatives, costs, and benefits. Understand that money is a tool to be used wisely whether saved or invested for the future, used for purchases, or given away (NCREL, 2003).
4.	Technological Literacy	"Knowledge about what technology is, how it works, what purposes it can serve, and how it can be used efficiently and effectively to achieve specific goals" (NCREL, 2003, p. 15).
5.	Visual Literacy	The ability to interpret, use, appreciate, and create images and video using both conventional and 21st century media in ways that advance thinking, decision making, communication, and learning" (NCREL, 2003, p. 15).
6.	Information Literacy	The ability to evaluate information across many media platforms; know when there is a need for information; be able to identify, locate, evaluate, and effectively use information for the issue or problem at hand; and accomplish these functions using technology, communication networks, and electronic resources (National Forum on Information Literacy, 2007) (NCREL, 2003)

Table 1 (*continued*)

No.	Literacy skill area for 21st century learners	Description
7.	Multicultural Literacy	"The ability to understand and appreciate the similarities and differences in the customs, values, and beliefs of one's own culture and the cultures of others" (NCREL, 2003, p. 15)
8.	Global Awareness	"The need to recognize, wrestle with, and reconcile diversity and unity as an integral part of citizenship" (Florida International University College of Education, 2003, para. 1). The celebration of our differences while exploring our similarities.

These instructional approaches are often termed as forms of e-learning, or educational content delivered by electronic means such as the Internet, local and wide area networks, audio and digital technologies, satellite broadcast, interactive TV, CD-ROMs, DVDs, and more (American Society for Training & Development [ASTD], 2008).

The definition of distance education encompasses that of e-learning but also addresses the roles of the students and teacher. Distance education may be described as an organized, instructional program characterized by physical separation of the teacher and learner, utilization of technology mediums, and two-way communication (Cavanaugh, 2001; Cole, Ray, & Zanetis, 2004). Distance learning refers to student outcomes associated with distance education. According to the United States Distance Learning Association, distance learning is defined as "the acquisition of knowledge and skills through mediated information and instruction, encompassing all technologies and other forms of learning at a distance" (United States Distance Learning Association, 2005, as cited in Bedard & Knox-Pipes, 2006). Thus, distance learning can be envisioned as a process that encapsulates considerations about teaching and learning strategies, pedagogy, and curriculum decisions. Definitions appearing in this paragraph as well as throughout the paper are located in Appendix A. Traditionally, distance learning was associated with higher education and secondary education. However, increased cost efficiencies, higher bandwidths, and other favorable progress promoted online educational situations for younger learners, even those in elementary school.

Interactive videoconferencing represents a growing form of distance learning technology for K-12 students and teachers that requires implementation of new teaching strategies (Amirian, 2003; Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004; Hayden, 1999; Newman, Du, Bose, & Bidjerano, 2006; Özkan, 2005; Sweeney, 2007). Interactive videoconferencing technology permits two or more people situated in different geographical locations to see and hear one another at the same time while engaging in live, two-way communication ("Digital Bridges," 2005). This may also include the supplemental use of computers, interactive white boards, digital video cameras, and document cameras. While interactive videoconference sessions are commonplace in the commercial marketplace and even in higher education, implementations in Grades K-12 are less frequent.

Interactive videoconferencing is not specific to one content area. Instead, the technology is used as a cross-curricular tool that cuts across many subject borders. Current case studies identify many benefits of interactive videoconferencing in K-12 schools such as learning about other cultures and their differences, appealing to different learning styles, providing interaction with experts, increasing motivation to learn and work with technology, and promoting and improving literacy skills. In addition, teachers can integrate content provider programs that align with their school's curriculum. Interactive videoconferencing entails active learning strategies designed to engage the learner in the social setting of the classroom. Videoconferencing also permits teachers to model technology literacy to an entire classroom. Other forms of information and communication technologies often require clustering of students around the equipment, such as computers, to work collaboratively. This does not permit whole class experiences. Videoconferencing permits whole class participation and interaction with the technology medium. Interactive videoconferencing sessions improve diversity issues encountered in the classroom by virtue of inclusion of all types of students. Entire classrooms can learn together, despite variances in learning ability and learning styles. Children also enjoy seeing their image on the screen as well as hearing there own voices.

Theoretical Framework for Meaning Making

Emphases on meaning making, developmentally appropriateness, concern for young learners, social context, culture, and the role of language necessitate a line of inquiry based on Vygotsky's sociocultural perspective. Vygotsky (1978, 1986) described learning as being embedded in social contexts where a child interacts with other people, objects, and the events in social surroundings. For Vygotsky (1978, 1986), the integral component of cognition and meaning making was the development of the use of tools and signs to mediate human activity. He viewed learning as a process of triggers from symbolic reference points on a social plane to the intramental understanding of an individual. Children internalize cultural tools that are communicated by adults and other knowledgeable peers. From a Vygotskian perspective, learning is a student-centered activity where shared, meaning-making opportunities create the beginnings of abstract concepts. Collaboration and interaction with teachers, adults, and other knowledgeable peers, assists learners to perform at higher levels with their support. Vygotsky viewed learning as a precursor to higher order development, or in other terms, he argued that learning precedes or is “in advance of” (1978, p. 89) development. Likewise, Vygotsky conceptualized the relationship between learning and development with the concept of the zone of proximal development (ZPD) where the term zone described the range of ability transferred from a more competent adult or peer to the learner (1978, 1986). The ZPD represented the advances in problem-solving ability resulting from the support or scaffolding of a more capable individual while working to address the problem at hand.

The Vygotskian perspective accentuated the importance of the social context in learning. Rather than separating social and cognitive theory, Vygotsky (1978, 1986) emphasized the interaction and relationship between the two. According to Vygotsky’s social-development theory, several principles established the tenets for sociocultural-learning theory. First, Vygotsky emphasized that children have and use higher order mental processing skills in addition to their innate abilities to learn. To put it another way, children possess the capability to construct their own knowledge (Bodrova & Leong, 2007). The second tenet related to the development environment—individual development is rooted within a social context. (Vygotsky, 1978, 1986). A third bases of sociocultural theory emphasized that human action (both individual and shared) is mediated by tools and signs (Vygotsky, 1978). A fourth foundational idea centered on the importance of language in mental development (Vygotsky, 1978, 1986). Another focal tenet of Vygotskian theory, and contrary to Piagetian theory, is that language precedes development for children (Vygotsky, 1978). Before examining these major tenets in more detail, a discussion about the historical context of Vygotsky's research describes the extension of the Vygotskian perspective.

It is important to consider the historical context of Vygotsky's (1978) learning theory in order to properly align his conceptual framework with those of today's educational system (Cole & Scribner, 1978). Vygotsky lived during a period of great turbulence in Russia including the Russian Revolution and the formation of the Soviet Union. His research during the 1920s and 1930s veered from the more traditional, behavior-oriented psychology studies associated with animal and human activities. Application of his sociocultural framework remained absent from the American educational system except to those that could read the original Russian texts. Even today, the sociocultural approach to investigating student learning is relatively new in the classroom (Vásquez, 2006)

The sociocultural lens is founded on the works of Lev Vygotsky who stressed the importance of the social context on cognition. As a theoretical learning theory for framing a study about learning with interactive videoconferencing in kindergarten, there are several characteristics than align well with both the age of the children in this study and the nature of the technology. First, Vygotsky (1978, 1986) stressed that learning is a developmental process, not just a series of step-oriented developmental phases promoted through Piaget. Vygotsky believed that the best way to investigate learning as a development process was through a historical examination of the progression in cognitive progress. As part of the sociocultural-learning theory, the historical process represented not a determinant of the theory itself, but also a methodological framework for investigating the developmental process using a natural setting rather than a laboratory focused experiment. This viewpoint countered many of Vygotsky's Russian psychologist counterparts of the 1920s and 1930s such as Piaget. Like the historical process, this study calls for an extended observation period that is delineated further in chapter three.

The second sociocultural-learning theory characteristic that lends itself well to the theoretical framework of this study rests on the prominence of Vygotsky's (1978, 1986) investigation of the development in young children. Unlike Piaget, Vygotsky's outlook on development did not depend on individual stages of development that served as a yardstick for development. Instead, Vygotsky's sociocultural theory supported dual planes in the process of learning. One represented the social, cultural, or interpsychological plane and the other representing the individual or intrapsychological plane. Like Vygotsky's studies with children, this study investigates the meaning-making progress of kindergartners using videoconferencing for more than half of their school year.

A third element of this study that aligns with the tenets of Vygotskian theory is the meaning making of young children working with interactive videoconferencing. In today's culture, children are surrounded by the impacts of digital technology. However, few studies explore how children make sense of the images, sounds, and communications capabilities as it relates to their world. According to Vygotsky (1978), higher order mental functions are employed during collaborative activity and later become internalized processes.

Statement of the Problem

Despite the growing usage of distance learning technologies, K-12 teachers are slow to embrace the benefits of this technology and shy away from integrating it into their daily lesson plans (Hayden, 1999; Newman et al., 2006). Many teachers are unsure about how to use the equipment, search for programs, plan for collaboration sessions, and assess their experiences. There is a lack of information about best and developmentally appropriate practices for technology and especially videoconferencing in the early primary classroom.

Purpose of the Research

Therefore, the purpose of this study was to understand how children make meaning using interactive videoconferencing technology in a kindergarten classroom. Kindergarten is the first level of formal schooling in most USA schools. Likewise, it is the first stage of education where the foundation for lifelong learning and development is laid (Samuelsson & Kaga, 2008). Therefore, this grade level was selected for the study in order to have the greatest potential impact for using interactive videoconferencing in the K-12 environment. The value of the study was to better understand how interactive videoconferencing contributed to the literacy of children and whether the technology assisted youth in making connections to real world experiences. The relevancy of these educational experiences and practices contributed to the literacy of students and supported 21st century curriculum and best practices. Considering the advancement of technology in the last 10 years, its impact on our culture, and how children are raised, the study also provided data for extended work in K-12 and higher education.

There is a growing recognition of the many different ways that information and communications technologies can contribute to, or transform, the pursuits, roles, and associations experienced by children and adults in early primary education environments (Clements & Sarama, 2003a, 2003b; Lankshear & Knobel, 2003; Learning and Teaching Scotland, 2002; Plowman & Stephen, 2005; Yelland, 2005). It is difficult to separate the daily technological experiences encountered by children from their learning and development. Information and communications technology studies are impeccably intertwined with literacy and learning studies for young children (Lankshear & Knobel; Yelland). Every day, children experience technology as they wake up to digital alarm clocks, encounter a television program, work with their favorite software program, call their grandparents, and watch their families navigate the roads with a global positioning device. Children make meaning of their lived experiences with technology while in and out of their school setting. Therefore, this study may be viewed as an extension of early childhood research about the effects information and communications technologies and its impact on early childhood learning.

Research Questions

In order to understand how children make meaning using interactive videoconferencing, two research questions are posed.

1. What types of meanings are being formed by the kindergartners during the interactive videoconferences?

In relation to how the kindergarteners form meanings, the second research question is

2. What is the nature of young children's emerging inquiries and dialogue surrounding their use of interactive videoconferencing in their classroom?

Emerging inquiries refers to the questions children ask while participating in the interactive videoconference. A similar research question to the latter one originated from a study about kindergartners' conversations surrounding their computer use (Hyun & Davis, 2005). More information about the study appears in the literature review chapter.

Historical Background

Reluctance to Implement Technology in Early Childhood Classrooms

Despite the proliferation of technology in the elementary school classroom, primary educators still shy away from integrating it in their daily lessons. Interestingly, the reluctance for early childhood educators to consistently include information and communications technology as an instructional strategy does not originate due to a lack of preservice-teacher education or professional development (Becker, Ravitz, & Wong, 1999; Betrus & Molenda, 2002; Laffey, 2003; Van Scoter & Boss, 2002) about teaching with technology. The increased prevalence of personal computers in the 1980s and 1990s and recommendations from the National Education Technology Plan (2004) brought about increased and renewed interest in training teachers about instructional technology concerns. Programs such the U.S. Department of Education's Preparing Tomorrow's Teachers to Use Technology (2006) to and countless other private and state initiatives were produced to help teachers learn how to use technology, enhance teacher and learner attitudes, increase teacher and student technology literacy, and ultimately increase student achievement (Betrus & Molenda, 2002).

In a study about appropriation, mastery and resistance to technology in early childhood preservice-teacher settings, Laffey (2003) found that “field experiences, especially those that structure first-hand experience with children successfully using technology, are critical to appropriating and overcoming resistance to using technology in teaching” (p. 378). Thus, teachers must not only receive instruction about how to pedagogically teach and integrate technology into their teaching repertoire, they must also experience its successful implementation first hand. Turbill (2001) found resistance to using technology in her ethnographic study about using computers in kindergarten. While her original research question was “How are teachers of young children incorporating technology into their early literacy curriculums?” (Turbill, p. 255), based on the evidence of her data, she changed her focus to the question “Why do teachers of early literacy find it difficult to implement technology into their literacy curriculum?” (Turbill, p. 255). Turbill highlighted that a lack of understanding of and confidence in the potential of the use of technology in the early years impeded its implementation.

Position Statements Involving Technology Use and Early Childhood Education

National organizations affiliated with early childhood education stress the importance of research positioned to portray the benefits of technology use with young children has benefits when used in a developmentally appropriate ways. The National Association for the Education of Young Children (NAEYC) and the National Association of Early Childhood Specialists in State Departments of Education (NAECS/SDE) jointly released a position statement to explain their views about early learning standards. They cautioned that young learners might be at developmental and educational risk if learning standards are not well developed and applied. Specifically, they advised that learning standards may hinder young learners unless they

> (1) Emphasize significant, developmentally appropriate content and outcomes; (2) are developed and reviewed through informed, inclusive processes; (3) use implementation and assessment strategies that are ethical and appropriate for young children; and (4) are accompanied by strong supports for early childhood programs, professionals, and families. (NAEYC, 2002, p. 2)

Kindergarten Has Changed

Kindergarten Foundations

In 1840, Friedrich Froebel termed his new school for young children in Germany, *kindergarten* (Allen, 2006). The German translation for the term literally means "garden of children" (p. 173). Froebel's pedagogy founded on educational play and cognitive development exuded eight philosophical tenets:

> 1) humans are creative beings, 2) play is the engine that drives true learning, 3) children can only learn what they are ready to learn, 4) education means to "lead someone to knowledge," 5) kindergarten was meant to be a prepared environment, 6) activities are a window into a child's inner world, 7) mathematical work is not just for instruction, it also emphasizes order, and 8) teaching should always be joyful, fun and easy. (Froebel Foundation USA, 2007, para. 1-8)

Froebel envisioned a nurturing environment where children were safe to learn, played with others, inquired about many things, created and molded their own artifacts, and talked with others around them. Froebel's ideals mirror many of the benefits of interactive videoconferencing where children may learn in a guided, two-way learning environment in a cross-disciplinary fashion. Froebel "did not differentiate his curriculum according to the ability, race, gender or social status of his pupils" (Allen, 2006, p. 187) but instead believed that all children needed a foundation of knowledge about the natural and social worlds (Allen). A study investigating the learning of kindergarten age students with interactive videoconferencing befits the Froebel's model of inquiry for young children.

Conflict Between Developmentally Appropriate Practices and Standards in Kindergarten

Teachers face challenges in meeting levels of achievement designated by the No Child Left Behind Act (2001) in the form of mastery of academic skills, the attainment of predetermined learning outcomes, and the need for accountability (Goldstein, 2007, p. 39). Attaining standards remains in the forefront of educators' and administrations' responsibilities yet this emphasis must be balanced with developmentally appropriate activities for all learners, but especially vulnerable young children. In Pennsylvania, statewide standardized tests begin in the third grade (Pennsylvania Department of Education, 2006). However, teachers face pressure to prepare young learners well before the third grade. These demands funnel down to the kindergarten classroom creating a dilemma about achieving an appropriate balance between addressing the developing needs of young learners and preparing students for academic success. Since the introduction of kindergarten in the United States almost 100 years ago, there has been a commitment to creating a learning environment that supports young children's development in the cognitive, social, physical, and emotional areas (Goldstein). Changes in national and state legislation during recent years challenge the historical foundation of these priorities (Goldstein).

Developmentally appropriate digital environments.

In order for children to seek information with digital technology, the developmental level of the students must be considered so that their interaction with the technology fulfills their information needs (Cooper, 2005). Cooper remarked, “Principles of child development and learning that inform developmentally appropriate practice must be considered when designing digital environments for the very young” (p. 286). Thus, digital learning environments for children parallel a concern meeting the cognitive, social, physical, and emotional needs in a developmentally appropriate manner. Indeed, NAEYC (1996) appealed for technology to be integrated in the curriculum of young learners in this same way. The International Society for Technology in Education accentuated this same concern in their standards for teachers (ISTE, 2000a) and leaders (ISTE, 2008a). Table 2 delineates the verbiage concerning the implementation of developmentally appropriate learning environments for children.

Table 2

Responsibility for Developmentally Appropriate Technology

Responsibility area	ISTE technology standard
NETS for Teachers	II. Planning and Designing Learning Environments and Experiences Teachers plan and design effective learning environments and experiences supported by technology. Teachers: A. design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners. (ISTE, 2000a)
NETS for Leaders	Technology Leadership Standard II. (TL-II) II. Planning and Designing Learning Environments and Experiences. Educational technology leaders assist by planning, designing, and modeling effective learning environments and experiences supported by technology at the district/state/regional level. Educational technology leaders: A. Design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners. Candidates: 1. Research and disseminate project-based instructional units modeling appropriate uses of technology to support learning. (ISTE, 2008a, TL-II)

Cooper (2005) further summarized the recommendations of child development experts in regards to appropriate digital environments for young children. A synopsis of these suggestions is shown in Table 3.

Table 3

Cooper's Summary of Digital Environment Concerns for Young Students

Digital environments should
Support the child as a unique individual;
Be child controlled;
Be open-ended rather than close-ended;
Be active rather than passive;
Involve many senses;
Encourage exploration, experimentation, and risk taking;
Encourage critical thinking, decision making, and problem solving;
Offer quick feedback, be interruptible, and keep records;
Balance familiarity with novelty;
Be user friendly;
Be progressively leveled, offering new challenges;
Be responsive to child input;
Build on previous learning;
Encourage reflection and metacognition;
Support social interaction (Cooper, 2005, p. 298).

She stressed that it was important for children to receive monitored opportunities in using technology for communication, information gathering, entertainment, and imaginative expression. Cooper (2005) further concluded that responsible and well-considered design and content decisions played an essential role in creating digital environments for young children that demonstrated respect for their intelligence and creativity in addition to increasing the easy usability and maintaining the high interest of children.

Significance of the Study

This dissertation research is significant for several reasons. First, today's kindergartners belong to the Generation i, "the first generation to grow up with the Internet" ("Generation i", 1999). Second, statistics reported by the National Education and Statistics Bureau show that computer and Internet usage by nursery school and kindergarten age children in terms of percentages of total children are increasing. In 2001, the U.S. Census Bureau did not even report statistics for nursery school age children while the 2003 data includes such a break down. Third, parents are clamoring for schools to ensure technological literacy for even the youngest of students. Fourth, student perspectives included in the National Educational Technology Plan 2004 recognize that younger students are on the fast track to becoming greater technology advocates. Fifth, interactive videoconferencing represents a multicultural tool that can reach distance learners in a society of changing demographics. Lastly, research about interactive videoconferencing with young children builds on a foundation of previous studies about technology usage and determined guidelines and standards. More detailed discussion about these significances continues.

Generation i

While kindergarten age children arguably have limited exposure to technology in their lives due to their youth, they are nonetheless immersed in a digital, electronic world. According to a media report published by the Henry J. Kaiser Family Foundation and the

Children's Digital Media Centers (Rideout, Vandewater, & Wartella, 2003), the average day for children aged 0 to 6 years old includes about 2 hours of watching TV, listening to music, playing video games, using the computer, and interacting with other types of screen media or digital imagery. In addition, time spent under the influence of these electronic media continues to increase both at home and at school before children ever stepping foot in a kindergarten classroom.

More Young Children on the Computer and Internet

Nursery and kindergarten students are using computers and the Internet more than ever before (Figure 1). According to the Current Population Survey (CPS) taken by the U.S. Census Bureau in October 2003, 66% of children in nursery school were identified as computer users with almost one quarter (23%) also identified as using the Internet. In contrast, 80% of children in kindergarten were reported as working with computers and almost a third of these students (32%) were accessing the Internet (DeBell & Chapman, 2006a). Table 4 depicts the percentages of nursery school and kindergarten children using the computer and the Internet.

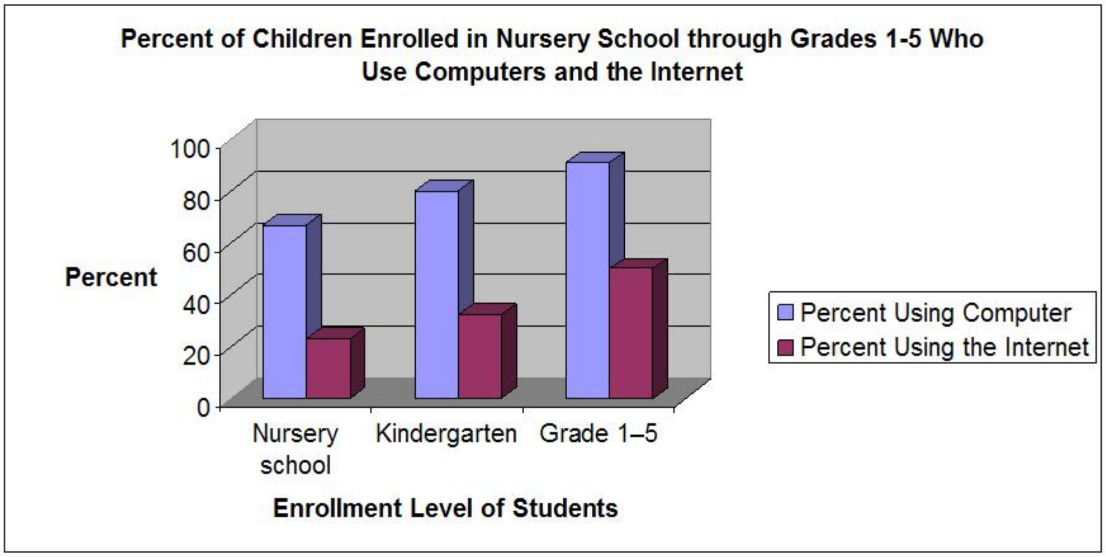


Figure 1. Percent of children enrolled in nursery school through Grades 1-5 who use computers and the Internet.

Note. *Adapted from (DeBell & Chapman, 2005, Table 1, p. 2)*

Table 4

Percentage of Children Enrolled in Grade 12 or Below Who Use Computers and the Internet, by Child and Family/Household Characteristics: 2003

Characteristic	Number of students (in thousands)	Percent using computers		Percent using the Internet	
		Percent	Standard error	Percent	Standard error
Total	58,273	91	0.3	59	0.4
Child characteristics					
Enrollment level					
nursery school	4,928	66	1.5	23	1.3
Kindergarten	3,719	80	1.4	32	1.7

Note. Adapted from (DeBell & Chapman, 2006b, Table 1, p. 6)

In the *Computer and Internet Use by Students in 2003* report, DeBell and Chapman (2006a) broke down these figures from the same CPS data even further to show computer usage at home versus at school. Table 5 displays information for the next set of figures. While nursery school children in this sample showed a higher usage of computers in the home over their time in school, 51% compared to 43%, the reverse was true for kindergarten age children (DeBell & Chapman, 2006a). For kindergarteners, two thirds (67%) were described as using computers at school while only 60% were reported as using computers at home. In another comparison of computer and Internet usage based on the CPS from September 2001 and October 2003 (DeBell & Chapman, 2006b), results showed that children from 5-7 years of age reported an increase in computer usage from 80 to 83% over the 25-month period of the 2001 versus 2003 survey (Table 6). It also indicated a higher Internet usage rate of 34 to 36% for the same monthly span (Table 7). The trend in increased computer and Internet usage by 5-7 year old children (80 to 83% [Table 6] and 30 to 34% [Table 7]) was similar to the trend by the reported number of children in the survey from age 5-17 years old (90 to 91% [Table 6] and 60 to 62% [Table 7]). It is also interesting to note that the CPS from September 2001 did not include usage percentages for nursery school children. The 2003 CPS was the first year to reduce the reporting age to include nursery school students—a significant change. DeBell and Chapman (2006b) offer no explanation for the trend in reporting statistics for younger children. However, the reporting of the age group does signal that younger aged children are using the computer and Internet more often. Another important note regarding the nursery school data is that these values may not include enrollment in all kinds of early childhood programs (DeBell & Chapman, 2006b).

Table 5

Percentage of Children in Nursery School and Students in Grades K-12 Using Computers at Home and at School, by Student and family/Household Characteristics: 2003

Characteristic	Number of students (in thousands)	Percent using computers at home		Percent using computers at school	
		Percent	Standard error	Percent	Standard error
Total All Levels	58,273	68	0.4	83	0.3
Child Characteristics					
Grade level					
Nursery school	4,928	51	1.5	43	1.5
Kindergarten	3,719	60	1.7	67	1.7

Note. Adapted from (DeBell & Chapman, 2006b, Table B-3, p. 15)

Table 6

Percentage of Children and Adolescents Age 5–17 Versus age 5-7 who Use Computers: 2001, 2003

	September 2001			October 2003		
	Number of children (in thousands)	Percent using computers		Number of children (in thousands	Percent using computers	
Characteristic		Percent	Standard error		Percent	Standard error
Total (persons age 5-17)	53,013	90	0.3	53,561	91	0.3
Child Characteristic						
Age 5-7	11,990	80	0.8	11,785	83	0.8

Note. Adapted from (DeBell & Chapman, 2006b, Table B-4, p. 62)

Table 7

Percentage of Children and Adolescents age 5–17 Versus age 5-7 Who Use the Internet: 2001, 2003

	September 2001			October 2003		
		Percent using the Internet			Percent using the Internet	
Characteristic	Number of children (in thousands)	Percent	Standard error	Number of children (in thousands	Percent	Standard error
Total (persons age 5–17)	53,013	60	0.5	53,561	62	0.5
Child Characteristic						
Age 5-7	11,990	34	1.0	11,785	36	1.0

Note. Adapted from (DeBell & Chapman, 2006b, Table B-4, p. 62)

Parent Advocates

Recent magazine, online, and journal articles report heightened parental concern about technological literacy, even in the primary grades. While early childhood educators and researchers focus their attention on observational studies of children using electronic media to determine best procedures, developmentally appropriate practices, and instructional strategies (Clements & Sarama, 2003b; Cole et al., 2004; Elkind, 1998; Wyeth, 2006) parents display viewpoints about these technologies based on a different mindset. In the fall of 2006, the Parent Teacher Organization (PTA) and the Public Broadcasting Service (PBS; 2006) issued a national back-to-school press release about parental pressures and new media technologies. This Roper Public Affairs and Media

Survey (2006) was conducted as a telephone poll to 1,001 parents with children aged 2 to 11 years old. Parents were read statements about the technological media their child uses and were asked to respond with a remark of one of four choices—*agree strongly, agree somewhat, disagree somewhat,* or *disagree strongly*. An overwhelming proportion (92.4%) of parents agreed strongly or somewhat that their child's media use lets them learn about new and fascinating things (Roper Public Affairs and Media Survey). Parents were also asked to respond to the statement, "If your child does not learn how to use new media technologies they will fall behind in school" (Roper Public Affairs and Media Survey, p. 4). Sixty-eight percent of these parents agreed that if their child does not know how to handle media technologies they will fall behind in school, and 57% believed it is the school's responsibility to prepare children to use new technologies. Dr. Michael Bradley, psychologist and child development expert, presented this interpretation about the survey during the press release:

> This research demonstrates that new millennium parents from very diverse backgrounds mostly share one overriding worry: for the success of their children in life. These same parents intuitively know that by increasing unstructured play time where kids develop critical decision-making skills, and by finding more family time where the life-sustaining relationships between parents and children are built, that they are creating a foundation for success not only in school, but in life. It is those relationships which turn out to be the most powerful component of successful kids. (as cited in PBS & PTA, 2006, para. 7)

Dr. Bradley echoed the sentiments of parents polled in the Roper Survey (2006) and Henry J. Kaiser Family Foundation and the Children's Digital Media Centers report (Rideout et al., 2003).

Student Advocates

These statistics point to a learning population characterized by children who are inundated with many types of multimedia and digital technologies. However, this is all that they have ever known. These technologies surround them at home and hopefully in their school environments also. These students are termed *digital natives* (Prensky, 2001) and part of an Internet generation that takes the World Wide Web for granted—they can't recall a time without this technology and are surrounded by Internet forums, e-mail, search engines, MySpace, videos, and Wikipedia. Digital natives represent radically different students compared to the children who the American educational system was designed to teach. The kindergartners of today will not remember the catastrophe of 9/11, but they will be able to navigate to Web sites to research the ordeal. Even at a young age, children are multitaskers and learn how to manipulate data supported by technology. Prior to the publication of the *National Education Technology Plan 2004*, the U.S. Department of Education (2004) sought to include the perspectives of students about the importance of technology in their in schools. The Plan (U.S. Department of Education) featured five student themes that were gathered from an online survey conducted in October and November 2003 by NetDay, a national nonprofit organization. NetDay promotes technology use in schools to enhance student achievement. The themes were

1. Today's students are very technology-savvy, feel strongly about the positive value of technology and rely upon technology as an essential and preferred component of every aspect of their lives.
2. Students are not just using technology differently today but are approaching their lives and their daily activities differently because of the technology.
3. As students get older, their use of technology becomes more sophisticated, but, comparatively, the younger students are on a fast track to becoming greater technology users and advocates.
4. The access point for technology use, particularly for older students, is home-focused, not school-focused.
5. Today's students are ultra-communicators. (U.S. Department of Education, 2004, p. 19).

When given the opportunity such as in this survey, children express strong sentiments about the importance of including technology literacy in their academic experiences.

Multicultural and Diversity Tool

The National Center for Educational Statistics reports estimates that the number of young adults between the ages of 14 to 24 years old will increase between 2000 and 2020, largely representing an increase in minority youth (Fox, Connolly, & Snyder, 2005, p. 11). By the time the kindergarten class of 2007-2008 reaches high school graduation, the number of Hispanic 14- to 17-year-old youth is anticipated to increase 21% while the number of Black youth will rise by only 1%. Meantime, the number of white, non-Hispanic youth aged 14 to 17 years old is expected to decrease. In terms of population, this represents a dynamic shift in the demographic makeup of today's high school graduating class. How will the school systems prepare to educate this diverse citizenry? Schools need to consider instructional strategies to meet and exchange information about the changing demographics. Interactive videoconferencing assists in addressing diversity issues by providing a way for learners in different parts of the nation and world to come together and share thoughts (Anderson & Rourke, 2005; Cifuentes & Murphy, 1999, 2000a, 2000b, 2000c; Cole et al., 2004; Thurston, 2006). Ideas about current events, curriculum content matter, and culture are often depicted as collaboration topics.

Extending Research About Young Children and Technology

This study builds on the existing base of research associated with the use of technologies in early childhood classrooms. This study does not justify whether young primary students should use technology in their classrooms. Foundations for this defense exist in *The Position Statement: Technology and Young Children—Ages 3 Through 8* (NAEYC, 1996) as well as in sources by other leading researchers (Clements & Sarama, 2003a, 2003b; Papert, 1993).

The precedent for research with children and information communication technologies is well established (Clements & Sarama, 2003b; NAEYC, 1996). This is evident in several forms. First, the NAEYC (1996) created a position statement about the developmentally appropriate ways that technology can be utilized in the education of children aged 3 to 8 years old. The position statement addresses seven different issues including (a) the teacher's gatekeeper role over evaluating appropriate technology uses, (b) the potential advantages of technology applications for this age group, (c) technology infusion into the early childhood academic experience, (d) equal opportunities to work with technology, particularly for students considered disadvantaged or in need of learning support, (e) social, ethical, and human issues regarding software (especially concerning violent and stereotypical content), (f) the advocate role of teachers and parents, and (g) professional development considerations (NAEYC). Thus, over a decade ago, this organization of concerned educators proffered their insights about policy issues regarding early learners and the importance of technology in their educational experiences. This position statement serves as an important guideline for teaching strategies and the implementation of technology in the early childhood classroom (Appendix B).

Another indictor that illustrates the prevalence and importance of technology in young students' academic world is the International Society for Technology in Education's National Educational Technology Standards (NETS) for Students (ISTE, 2000c). Originally from 2000, ISTE (2000c) established the following six categories of student technology standards:

1. Basic operations and concepts
2. Social, ethical, and human issues
3. Technology productivity tools
4. Technology communications tools
5. Technology research tools
6. Technology problem-solving and decision-making tools (ISTE, 2000c)

ISTE renamed these student standards the Technology Foundation Standards for All Students (2000c) after NETS revised the standards in 2007 (ISTE, 2007). Appendix C portrays a complete listing of these Foundation Standards. The revised technology standards NETS for Students: The Next Generation Standards (ISTE, 2007) reflect a set of guidelines designed to meet the changing demands of information literacy in the 21st century (Appendix D). The category that appeared first in the 2000 standards, Basic Operations and Concepts (ISTE, 2000c), now appears in a similar form at the bottom of the 2007 list of standards as Technology Operations and Concepts (ISTE, 2007) The new standards embrace the following categories:

1. Creativity and Innovation
2. Communication and Collaboration
3. Research and Information Fluency
4. Critical Thinking, Problem-Solving & Decision-Making
5. Digital Citizenship
6. Technology Operations and Concepts (ISTE, 2007)

The revised categories provide a framework to identify criteria for technology-literate students. Although these standards apply to preK-12 grade levels, NETS performance indicators (ISTE, 2000b) are separated into several developmental divisions. The first category of performance indicators is for prekindergarten through Grade 2. There are 10 different performance indicators for this grade subdivision that relate to the six category areas. Appendix E shows the 2007 performance indicators and Appendix F provides the older 2000 performance indicators. Once again, the 2007 indicators indicate criteria for technology-literate students while the 2000 standards concentrated more on basic operations.

Limitations

This study was bound by the teacher, students, and school districts where it occurred. It represented a single case, although the inception of the study actually involved two instances—the pilot study and the final dissertation research. The context of the results will be distinctive within every classroom due to differences in characteristics of the teacher, professional development, hardware differences, connection speed differences, budgets for videoconferences, and characteristics of the student participants. Another limitation of the study concerns the time of year that the study was conducted. The dissertation research occurred in the autumn through the spring and represented a tremendous period of development. Different time frames might reflect different developmental patterns on the part of a kindergarten classroom.

Entry can be a limitation. Even when communication lines are optimal, there were times when the researcher could not ethically observe and record the goings on in the classroom. Unexpected invitations arose to partake in school plays and other assemblies. In these large gatherings, the researcher was limited by the number of assenting minors who had parental permission to participate in the study. Sometimes classes were combined for efficiency or to provide an opportunity for a teacher to fulfill a certain task; these occurrences were off limits to the researcher for recording purposes. Substitute teachers also imposed certain dilemmas as to whether to observe the classroom or remain absent during these periods. Occasionally, the teacher was ill. These types of situations limit the ability of the researcher to observe the classroom when sometime takes over classroom management.

Site selection could also be a limitation. The location of the school and the diverse community of learners would likely change some of the outcomes of the study. The pilot study and the dissertation study actually comprised two separate samples that permitted observation of two distinct locations.

A final limitation of the study might be consistency. Although a teacher may fulfill all of the requirements necessary in the research study, unless they continue to utilize the technology, some of the advantages or lessons learned may not serve as a catalyst for further exploration and integration. As with the use of computers, modeling and implementation of technology needs to be ongoing, appropriate for the content, based on sound instructional design principles, and pedagogically correct for the age of the learner.

Overview of the Study

The literature review is presented in chapter 2. The chapter commences with a quantitative review about the effectiveness of distance learning. While this study uses a qualitative-research design, the meta-analyses establish the basis for further investigation of distance education in elementary school. After a through review of the tenets of Vygotskian learning theory, the results of videoconferencing case studies are reviewed. Additional sections emphasize research about meaning making, collaborations, interactions, and multicultural characteristics of interactive videoconferencing that are relevant to the study.

Chapter 3 begins with a discussion of the methodological pursuit for the research design the three areas that informed the methods approach. A detailed explanation of the sampling strategies describes site selection along with access and ethical considerations for the study. The chapter then moves into a description of Lovand School, the participant site for the study. After describing data collection in terms of participant observation and videotaping of the videoconferences, the chapter finishes with a description of the

ATLAS.ti software for data analysis as well as a comparative matrix about qualitative quality and rigor issues.

Chapter 4 provides descriptions of the seven interactive videoconferences that are accompanied by a discussion about how the pilot study informed the dissertation's data analysis. The chapter delineates the data reduction rationale for choosing the gingerbread puppetry and astronomy interactive videoconferences for analysis. The analysis proceeds on a chronological basis as determined by the dates of the actual videoconferences. Results portray the kindergartners' meaning making based on the four Vygotskian tenets selected for this study: the social context of learning, sign and tool use during mediated activities, the importance and role of language, and the ZPD.

Chapter 5 summarizes the findings of the study in terms of the research questions.

CHAPTER 2: LITERATURE REVIEW

Introduction

This literature review examines and synthesizes research from multiple fields including distance education, Vygotskian sociocultural theory, collaboration research about young children working on computers, and multicultural videoconferencing research. As described in earlier chapters, the threads of these practice areas weave together to provide the foundation for a qualitative dissertation study about kindergartens and interactive videoconferencing.

The search for articles pertaining to this study commenced with a broad investigation in Google Search as well as the PROQUEST and EBSCO databases. Search terms included “interactive videoconf,” “videoconf,” “teleconferencing,” “videoconf,” or “distance learning” with the addition of application to younger students represented by the words “elementary school” or “primary students” or “kindergarten.” Searches such as these produced a handful of useful resources with additional references found in the bibliographies of these articles. After the completion of a pilot study, additional search strings were added to these parameters that inferred a connection to sociocultural-learning theory. These included “meaning,” “sociocultur,” “Vygotsk,” “meaning making,” and “culture.” As the literature review began to take shape, these terms were augmented to include implications for globalization and included terms such as “global” and “multiculture.” In addition to these searches, participation in communities of learning specific to interactive videoconferencing (e.g., the interactive videoconferencing special interest group of the International Society for Technology in Education (ISTE, 2008b), Center for Interactive Learning and Collaboration listserv (2008b), and AT&T's Knowledge Network listserv (AT&T Knowledge Network Explorer, 2008), early childhood education (e.g., Early Childhood Education Technology List and National Association for the Education of Young Children (NAEYC, 2008)), and instructional technology listservs (e.g., DEOS-L (The Pennsylvania State University, 2008) and ITFORUM (Department of Instructional Technology, 2008) provided electronic notification of applicable information.

Meta-Analyses and Effectiveness of Distance Learning

Research linking the effectiveness of K-12 distance education is growing. As more quantitative research about the effectiveness of online education emerged, the prevalence of meta-analyses developed. These meta-analyses assisted in overcoming limits to the size and scope of individual K-12 studies that examined the effectiveness of using distance education. The meta-analyses collectively sought to determine the overall effectiveness of distance education and the relative impact of independent variables such as distance education technology, frequency of use of distance education, grade level, instructional design, or subject/content area, and the strength of the relationship between variables. Smith, Clark, and Blomeyer (2005) reported that from 2001- 2004, five different meta-analyses about distance learning developed. Only two of these meta-analyses, Cavanaugh (2001) and Cavanaugh et al. (2004), focused exclusively on K-12 learners. The remaining three analyses mentioned by Smith et al. combined distance education studies from a wide variation of populations including K-12, undergraduate,

graduate, and military groups. For the purposes of this literature review, the other three meta-analyses are not reviewed in this literature review due to the inclusion of adult learners. Only the meta-analyses specifically relating to K-12 are reviewed.

The meta-analyses sample selections were based on study designs employing "scientifically based research" (No Child Left Behind, 2001, p. 540). The NCLB Act of 2001 defines this term as meaning research that involves the application of "rigorous, systematic, and objective procedures to obtain reliable and valid knowledge relevant to education activities and programs" (p. 540), usually employing experimental or quasi-experimental design. These meta-analyses warranted particular attention because they established a foundation for the need of continued research about distance education in elementary and secondary environments.

Cavanaugh (2001) provided a meta-analysis about the effectiveness of interactive distance education technologies in K-12 learning. The purpose of the meta-analysis was twofold: (a) to evaluate the achievement of K-12 students who participated in online courses through videoconferencing or online telecommunications, and (b) to identify the characteristics of distance education such as instructional design, frequency, subject area, and grade level that were most effective. The meta-analysis included a sample of 19 studies ranging from 1980 through 1998. Thirteen of these studies used videoconferencing as the distance education system, five employed e-mail, and one used the Web. Six of the studies used an experimental design while the remainder used a quasi-experimental design. The meta-analysis showed a small positive effect size supporting distance education. The overall mean effect size was 0.147. Thus, the meta-analysis determined that student achievement from distance education environments is at least comparable to traditional instruction. No statistical significant differences were determined across the variables of grade level, subject area, ability level, distance education system, frequency, or instructional design as they related to learning as measured by student achievement. Cavanaugh (2001) noted that these results should be applied cautiously as distance education in K-12 education signified a much newer form of instruction than traditional face to face classrooms. Another important matter for consideration pertains to the small number of studies in the meta-analysis. Only 19 studies met the criteria for the meta-analysis.

Cavanaugh et al. (2004) provided an updated meta-analysis of K-12 distance education programs that included 116 effect sizes from 14 Web-delivered distance education programs conducted from 1999 and 2004. The combined sample comprised 7,561 students. The purpose of the analysis was to provide a 5-year quantitative synthesis of online K-12 distance education across subject areas, grade levels, and outcomes. The weighted mean effect size across all outcomes was -0.028 (*SD* =.045) with a 95% confidence level from -.116 to 0.060. The analysis indicated that distance education can be as effective as classroom instruction. "[D]istance learning did not outperform or underperform classroom instruction" (pp. 19-20). Cavanaugh et al. (2004) warned that these results should be reviewed as indictors of tendency rather than steadfast outcomes. The researchers also note that "[p]rior to this point, the field relied on small individual studies, syntheses that included outdated analog technology, and syntheses that included adult learners" (Cavanaugh et al., p. 20). Both of these meta-analyses contend that student achievement for Grade 3-12 learners in distance learning environments is at least as effective as outcomes within a face-to-face classroom.

While these meta-analyses do not include studies of kindergarten age students, they do apply to elementary students. These outcomes are essential because they lay the groundwork for further investigation about the impact of distance learning in young children. The meta-analyses concluded that there was no statistical significant difference when using distance education over face to face instruction. Yet, digital natives (Prensky, 2001) form meanings from a vast array of technologies. Kindergarten children can load a DVD into the player, turn on the television, and sit down to enjoy a movie. They regularly use computers and many also surf the Internet. Therefore, it is important to find new ways to explore the impact of distance learning through alternative methods other than quantitative analysis.

Vygotskian Sociocultural Theory

Social Origins of Cognition

Vygotsky (1978) traced the importance of social interaction and the transformation of practical activity to the moment when a child's "speech and practical activity, two previously completely independent lines of development, converge[d]" (p. 24). Thus, Vygotsky considered the role of language to be of central concern in cognition. Vygotsky summarized the importance of language as a tool for children and all humans to solve difficult tasks, prevail over impulsive acts, problem solve, and take control of their behavior. He proffered that there was an inseparable link between a child's speech and action in terms of their development.

Vygotsky's Use of Tools and Signs

Vygotsky (1978) expressed the logical relationship between tools and signs in Figure 2, which pictures three concepts. The concepts of sign and tool are subsumed under the concept of indirect (mediated) activity. Signs and tools interplay through mediated activity to bring new considerations to the context at hand. The difference between signs and tools is apparent in the ways that they direct human behavior. The tool is "'*externally*' oriented" (Vygotsky, p. 55) and its function is to "serve as the conductor of human influence on the object of activity." Vygotsky recommended thinking of a tool as a means of conquering nature. Contrastingly, the sign is "'*internally*' oriented" (Vygotsky, p. 55) and has no impact on the object of psychological consideration. Instead, a sign is a "means of internal activity aimed at mastering oneself" (p. 55). The relationship between signs and tools results in "'*higher*' psychological function" or "*higher behavior*" (Vygotsky, p. 55). Development may be thought of a process whereby tools, signs, and mediated activity work together to advance to a higher level (Vygotsky).

In addition, language and speech besides being psychological tools are also higher mental functions as they undergo cultural development (Kozulin, 1986). According to Vygotsky (1978), the process of mediated activity occurs when adults teach psychological tools to children during the course of their social, joint interactions, whereby children internalize them, resulting in the psychological tools becoming mediators in the children's higher mental functions.

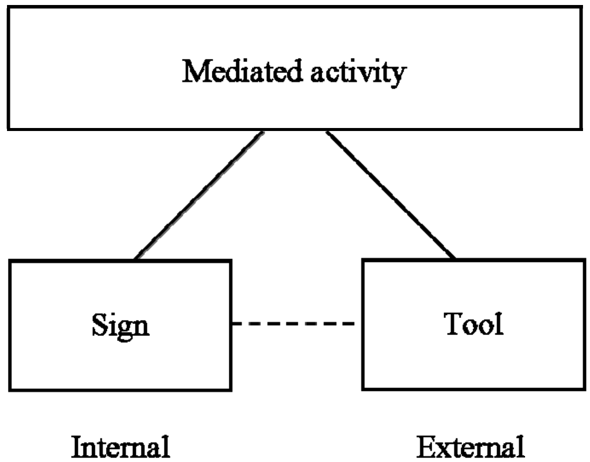


Figure 2. Relationship of the Vygotskian concepts of sign, tool, and mediated activity.

The Role of Language and the Internalization of Speech

Vygotsky (1978, 1986) argued that language mediates higher order thinking. Thus, language represented a psychological tool that caused change in children's cognitive development. Speech not only served as a way for children to communicate about their actions, but it also functioned to direct their dynamic learning. Vygotsky (1978) confirmed the role of speech in relationship to practical activity:

> A child's speech is as important as the role of action in attaining the goal. Children not only speak about what they are doing, their speech and action are part of *one of the same complex psychological function,* directed toward the solution of the problem at hand. (p. 25)

Language serves a dual messaging role in human functioning: "It is a communication tool, and it mediates human mental action (Nasir & Hand, 2006, p. 461).

Vygotsky (1978) referred to the internal reconstruction of an external operation as *internalization* (p. 56). This process is important the learning in a social context as it consists of three different transformations. First, an act that first appears as an external activity is reconstructed to commence occurring internally. Next, the interpersonal process, or the social and cultural process, is converted to an individual one. On this point, Vygotsky emphasized that

> An *internal process is transformed into an interpersonal one.* Every function in the child's cultural development appears twice: first, on the social level, and later on the individual level; first *between* people (*interpsychological),* and then *inside* the child (*intrapsychological*). This applies equally to voluntary action, to logical memory, and the formation of concepts. All the higher functions originate as actual relations between human individuals. (p. 57)

The final characteristic of the transformation process relates to the prolonged nature of the change. The interpersonal to intrapersonal transformation results in a long series of developmental events. The conversion may even stop or stalemate in the stage of external signs. Vygotsky (1978) observed that egocentric speech was the transitional form between external and internal speech and the foundation for inner speech. When expressed externally, he stated that egocentric speech was "embedded in communicative speech" (Vygotsky, p. 27). During internalization, aspects of spoken language (external) in addition to egocentric speech, turn inward to become the basis for individual speech (Vygotsky, p. 57).

Vásquez (2006) augmented Vygotsky's notion of development from the social to individual level as being influenced by the social and cultural processes in which a person is raised. So, a child's culture or their socialization context influences their formation of concepts. She elaborated about the importance of this cultural perspective in an individual’s intermental to intramental transformation in the following passage.

> As learners interact with others in the social environment, they not only acquire new forms of knowledge and skills, but also acquire the ideas, language, values, and dispositions of the social group, making their experience a “culture learning experience.” It is through the process of acquiring these cultural resources that learners achieve membership in the social group. (Vásquez, 2006, p. 36)

From a developmental perspective, Vygotsky envisioned development as the internalization of socially shared activities.

ZPD and Development Theory

Another concept integral to the Vygotskian perspective is the ZPD. Vygotsky (1978) used the ZPD to distinguish and describe the differences between development and learning. Vygotsky defined the ZPD as

> the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers. (p. 86)

Vygotsky proposed that what children can do with the assistance from others (adults, teachers, and other knowledgeable peers) may be more indicative of a child’s mental development than what they can do solely on their own. Figure 3 illustrates the ZPD. The role of teacher held a position of importance in Vygotsky’s theory that supported a learner-centered approach. The teacher maintained the role of a guide or facilitator to scaffold students’ learning to new levels of knowledge and subsequently enhance their learning environment. Complimentary components of Vygotskian theory and the ZPD advanced four additional views about human learning and its relationship to development including (a) learning should be aimed at higher developmental levels, not yesterday's developmental stage (Vygotsky, 1978, p. 89), (b) "good learning is in advance of development" (p. 89), (c) an essential feature of learning is to create the ZPD, and (d) school learning leads development.

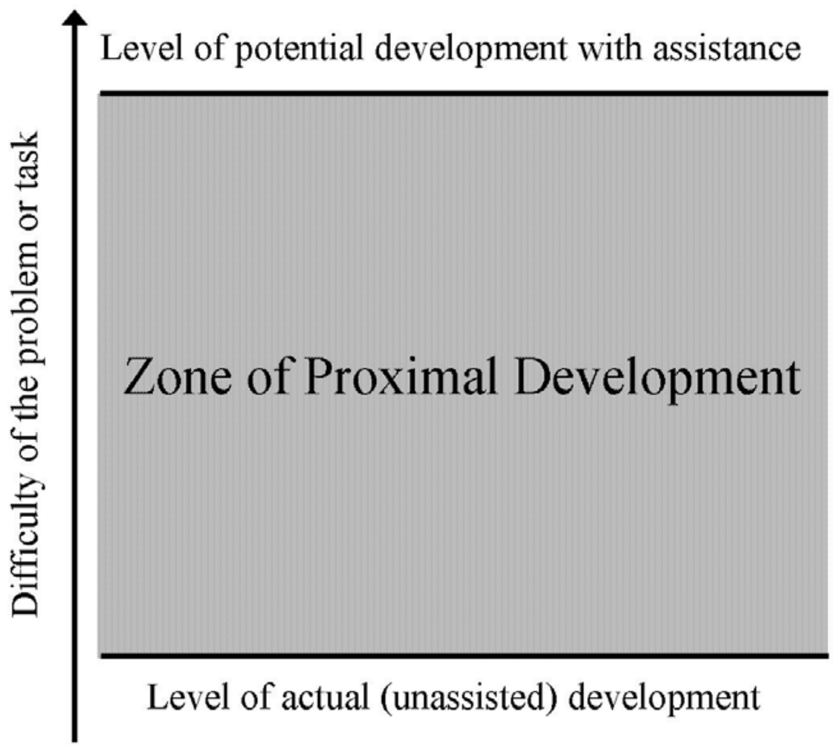


Figure 3. The ZPD.

Methodological Considerations

Vygotsky (1978) diverged from other researchers, psychologists, and educators in his scientific method and approach by characterizing the "uniquely human aspects of behavior, and to offer hypotheses about the way these traits have been formed in the course of human history and the way they develop over an individual's lifetime" (p. 19).

Vygotsky investigated learning from a historical point of view, or "to study it in the process change" (p. 65). This approach is called the dialectical method. His concern for human functions as opposed to natural or biological functions became Vygotsky's signature trademark in addition to his focus on culture and consciousness as the actual topic of inquiry (Kozulin, 1986). Vygotsky argued that the study of cognition in a sociocultural context required special attention to the methodological framework. He challenged the experimental method of examining learning and reiterated that

> The search for method becomes one of the most important problems of the entire enterprise of understanding the unique human forms of psychological activity. In this case, the method is simultaneously prerequisite and product, the tool and the results of the study. (Vygotsky, p. 65)

Application of Vygotskian Sociocultural in the Changing Face of Technology and Globalization

Children bring different cultural identities to their classroom based on the environments, experiences, and dialogues that surround them. Hence, the composure of the American classroom represents a mixture of identities based on different and sometimes contrasting languages and activities of their homes and communities. These children function in multiple worlds that depict the culture of their families and friends as well as the community of their schools and classrooms. In the changing face of the classroom, education supported solely by the transmission of content in a didactic manner is ineffective and needs to emphasize the creation of new knowledge structures. Lim and Renshaw (2001) asserted that

> The key pedagogical shifts in education emphasize learning to build new knowledge and new possibilities, learning to deal with change, and learning with others. These shifts in our conceptualization of pedagogy offer exciting opportunities and challenges to include people of diverse abilities and culturally diverse backgrounds in new forms of participation and new partnerships. (p. 13)

Lim and Renshaw further recommended that through education, learners can link their personal beliefs and identities with social practice to begin a dialogue about the opportunities and potential for change in regards to engaging with others different from themselves. The Vygotskian sociocultural perspective affords the opportunity to examine children's intentional and dynamic action as it relates to their social context, practices, and "intervening mediating agents as they intertwine in an interactional relationship" (Vásquez, 2006, p. 37) whether in their homes, schools, or communities. Additionally, technologies such as interactive videoconferencing, advance the ability of learners to interface with cultures more global than their local contexts, partake in learning activities where learning precedes development with more knowledgeable others, and engage in meaningful dialogue.

Increased attention about the application of Vygotskian theory in the changing face of technology and globalization (Beldarrain, 2006; Borthick & Jones, 2003; Harvey & Charnitski, 2003; Lim & Renshaw, 2001; Nasir & Hand, 2006; Stahl, 2003; Vásquez, 2006) indicates a desire to find new ways of transforming education. These articles identify that

> Because collaborative learning takes place through processes of shared meaning-making, CSCL [comport supported collaborative learning] must be concerned

with the nature of meaning and social meaning-making practices.(Stahl, 2003, p. 523)

Emerging technologies are changing online distance learning because they offer new solutions, add flexibility to integrate student interaction, and evoke real-life collaboration opportunities (Beldarrain, 2006, p. 149).

The increasing interconnectedness between cultures and their concomitant intermixing as a result of globalization requires that pedagogies about cultural diversity also focus on creating new knowledge and meanings about cultures as they change (Lim & Renshaw, 2001, p. 9).

Vygotsky's theories provide a solid foundation on which to base the design of learning activities and entire curricula that help students become "global-ready graduates," that is, students who are more aware of global issues and who have the knowledge and skills to move beyond the walls of their classroom and thrive in the global environment that will be their workplace. (Harvey & Charnitski, 2003, p. 1456)

In the ZPD approach, learners, rather than teachers, motivate the need for concept understanding. That is, when they realize that not understanding a concept impedes their work on a learning objective leading to a performance, learners set about constructing their understanding of it. (Borthick & Jones, 2003, p. 113)

These articles heighten the need for more research about technology-oriented collaborative environments that include learners in both local and global contexts, use the concept of the ZPD to address issues of diversity and culture, feature problem solving that evoke real-life situations, and applauds and appreciates our differences.

The next section of the literature review recounts characteristics of elementary school videoconferences case studies that are predominantly descriptive in nature.

Illustrative Characteristics of Elementary School Videoconferencing in Case Studies

Case study descriptions discuss goals, learning objectives, equipment, communication, training, troubleshooting, outcomes, and other details of videoconferencing sessions. The cases depicted in the dissertation form a representative sample for a narrow range of age levels—preschool through the sixth grade. Cases applicable to more mature students are not included since the many of the issues related to older learners do not necessarily transfer to children in the primary and elementary grades. Examples of these issues include content or subject areas and what is considered developmentally appropriate. Videoconferencing in elementary school requires different instructional strategies and considerations than teaching in the older grades. Assessment and evaluation of these experiences also requires different approaches. Appendix G provides a comparison of ages and grade levels for the research within the literature review for the countries of the U.S., UK, and Australia. This was done to avoid any confusion about the comparative levels described in the literature review as well as in this dissertation.

Nut eCluster Project

The British Educational Communications Technology Agency (BECTA) (2002) documented multiple videoconferencing experiences in the elementary and secondary schools. In *The Nut-e-Cluster Project* (BECTA, 2002), five UK primary schools named

Clatford, Hatherden, Hurstbourne Tarrant, Smannell, and Vernham Dean connected with one another using Windows based computers and Webcams. All students were in the Year 6 level which is approximately fifth grade in the USA. They participated in three videoconferences between the schools that provided instruction, collaboration, and problem-solving opportunities. Throughout all of the videoconferences, the teachers noted that the children were well behaved and exhibited "conferencing etiquette" (BECTA, p. 6). Teachers commented about the looks of wonder on the faces of the students when they saw another. Both children and teachers maintained enthusiasm for the project throughout. Teachers remarked that the students developed their own ideas for the videoconference.

During the first student videoconference in the trio of videoconferences between the five schools, students from two schools built periscopes. Their session involved collaboration followed by off-line time to design and build the periscopes. Later in the day, the students regrouped to collaborate about the designs. The second videoconference featured a partnership between Clatford and Hurstbourne where the students described mathematical properties of shapes. They worked within the NetMeeting environment. Children played noughts and crosses (tic tac toe) on the NetMeeting whiteboard at the beginning of the second and third sessions while getting to know one another and establishing a community of learners. The teachers noted that the students were quite comfortable using the technology after their initial discussions. The final videoconference featured the exchange of student-composed limericks. Students read their limericks aloud and asked for feedback.

BECTA Videoconferencing Across the Curriculum

The *Video Conferencing in the Classroom: Communications Technology Across the Curriculum* (Arnold, Cayley, & Griffith, 2005) guide sponsored by BECTA portrayed examples of videoconferencing sessions in early elementary or primary school (see Appendix H). These are described in further detail. The first videoconference case study in Arnold et al. (2005) guide depicted two primary schools, Tipton St. John and Cockwood Primary, videoconferencing in their reception and Year 1 classes (nursery school and kindergarten). The curriculum area it addresses was titled “Speaking and listening/developing communication skills/using a range of ICT tools to communicate with each other” (Arnold et al., p. 33). The initial videoconference on October 1 introduced both schools to the videoconferencing equipment. For this preliminary session, the agenda was limited to permit the children to explore and to allow observation by their educators. Children exchanged information about their names and reveled in the fact that children in both classes were 5 years old. They also discussed the location of things common to their schools such as the reading area, computers, the playground, and the toilets and they even displayed the contents of their lunch boxes. While the adults observed a time lag in the audio, the children reportedly did not seem to notice. The authors dubbed the theme of this session as exploring.

Two weeks later, the classes reconvened. Because one of the teachers was ill for the first videoconference, the students shared many of the items of the first conferencing session. The teachers tried to learn the names of their “virtual” students and children shared news about the projects that they were working on. Despite technical disconnections, the classroom teachers persevered and reestablished the connections.

After the December holidays, the two classes met for the third time. The schools connected early in the day so that parents could take a peek at the setups prior to the conferences beginning. Other students in the school also peered into the conferencing room. In fact, the Tipton soccer team challenged the Cockwood team to a match. Heather, a Cockwood teacher, led the students in mental math, and Penny, a Tipton instructor, read a big book, *Where's My Teddy Bear?,* while the Cockwood students followed along with a copy of the their own book. Students also sang songs, said prayers, and later said their goodbyes (Arnold et al., 2005).

Subsequent videoconferencing meetings included professional development opportunities for teachers on both ends. Later in the year, students met for their soccer match and in July, they had an actual picnic where all had an opportunity to meet face to face. Students were "inspired to write letters, cards and invitations, and to draw maps, plans and diagrams" (Arnold et al., 2005, p. 66). In addition, students were asked to informally evaluate the session. They responded favorably with remarks of the following: "I enjoyed telling them about me; It was fun when we sang songs together; it was nice seeing all the children; it was a good story; and, I liked their playground things" (Arnold et al., p. 66).

During another BECTA session, two early-years centers (before nursery school level)—Chalvey Early Years Centre and Arbour Vale School for Early Years arranged to hookup for 6 weekly links where they planned storytelling between sites (Arnold et al., 2005). The curriculum context for these events was labeled "Foundation stage—storytelling" (Arnold et al., p. 34). Each session commenced with introductions and then a story was read to a small group of children from each site. The book was held close to the camera so that the children near and far could follow the pictures. After the session ended, the storyteller asked questions, students discussed the book, and then the session usually closed with the students singing a song to one another (Arnold et al.).

Yet another example of a primary-school videoconference occurred between reception, Year 1, and Year 2 students in Branscombe Primary and Farway Primary, two small schools in rural Devon, UK. During the sessions, students were grouped according to two different ages, reception and Year 1 students together and Year 2 students in their own group. In total, eight different videoconferences occurred in small groups of students where the children talked about the toys that they used and as well as those their parents played with. The curriculum context for these stages was "Key Stage 1—Toys we like to play with" and the final session "Key Stage 1—Data handling" (Arnold et al., 2005, p. 35). A final videoconference in this series paired the students at both ends to showcase the items in their lunchboxes as well as to count the number of items in the same.

The guide also provided several examples of Key Stage 2 videoconferences. Since these ages parallel elementary school in the United States, they will be mentioned to provide a thorough picture of videoconferencing curriculum ideas in the elementary schools. However, the children in these grades had more advanced reading and math skills than in the first three examples from Arnold et al. (2005). Branscombe Primary and Farway Primary, the same two schools as in the last example did a collaborative exercise about their respective villages. Children in Key Stage 2 grades researched the histories of their schools and compared the two schools as wells as people's job in the schools and their facilities. Lea Junior School in Slough and Hawkes Farm School in East Sussex shared Key Stage 2 literacy lessons over six, 20-minute videoconferences. This collaboration started with each school researching narrative poems. Next, the students worked to make up ideas for stories including the plot. Videoconferencing sessions permitted the students to collaborate about their poems to recite their stories.

The last example pulled from the BECTA summary occurred with Key Stage 2 students that were studying Hinduism as a religion. This videoconferencing example differed from the previous BECTA (Arnold et al., 2005) examples because the collaborating partners were unfamiliar with the other party. In the previous examples, sessions occurred between parties who already had familiarity with their partners. For the final BECTA example of an elementary school videoconference, Key Stage 2 students at West Down Primary School in Devon, a primarily monocultural community, responded to an online request for a videoconference from Montem Junior School in Slough, a school with more multicultural demographics. Global Leap (2007), a not-for-profit organization aimed to "promote the effective and integrated usage of videoconferencing in the classroom," hosted the collaboration request from Montem Junior School. The videoconference occurred close to Christmas, when there were many questions about the differences between Christianity and Hinduism. Students prepared, exchanged, and e-mailed their questions to one another. Then during a 40-minute session, Devon students asked their questions while Slough students replied through the reading of short stories and the sharing of pictures. The BECTA case studies also appeared on the Global Leap Web site.

While the intention of these case studies was not solely to describe how the videoconferencing experiences addressed development from a Vygotskian perspective, they painted a vivid picture about the importance of interaction and language in the collaborations, emphasize the multidisciplinary of videoconferencing in terms of content areas, describe the social nature of learning with the technology, and hint about ways that teachers and more knowledgeable peers provided opportunities for students to problem solve at higher development levels than would have without the scaffolded or guided assistance. The BECTA examples indicated a wide range of approaches for setting up learning opportunities with interactive videoconferencing and were summarized with the intent of describing a broad range of diverse classroom to classroom virtual meetings.

Preservice-Teacher Observations

Classroom-to-classroom videoconferences characterized only one method of employing videoconferencing in elementary schools to provide meaningful learning opportunities for elementary students. In another model, universities and colleges are implementing interactive videoconferencing to form partnerships with K-12 schools and to allow preservice teachers the chance to interface to interface with diverse student populations they might not otherwise be able to communicate with due to geographical or time differences.

Kinnear, McWilliams, and Caul (2002) investigated whether videoconferencing could be used as a tool for preservice teachers at Stranmills University College in Northern Ireland. Results from the study described benefits for student teachers when using interactive videoconferencing to view activities at remote primary classrooms. However, observations by the primary teacher about her pupils also merited extensive attention. Few journal articles described videoconferencing scenarios involving K-12 students. Most recounts were subjective in nature (Anderson & Rourke, 2005). Therefore, information from this study is included to demonstrate some results that surprised both the researchers and the teachers and to provide additional results about videoconferencing at the elementary-school level.

For this study, a videoconferencing link connected the university and level P6/P7 pupils at Loanends Primary School, located about 15 miles apart. Loanends Primary School's population consisted of nearly 140 pupils and 5 teachers. The project had two major goals: (a) to provide an opportunity for preservice teachers to observe a classroom firsthand in order to develop and test hypotheses about teaching, and (b) to model student supervision in an actual classroom situation (Kinnear et al., 2002). The videoconferencing link enabled student teachers at the university to observe instruction by teachers in the field. It also provided a window for the student teachers to interface with primary pupils at a distance. Results from an online questionnaire administered after the videoconferences measured the subjective benefits of preservice teachers ($N = 509$) when using videoconferencing in terms of six factors: "1) effective content, 2) technical quality, 3) opportunity for interaction, 4) good examples of classroom practice, 5) what students (preservice teachers) hoped to get out the experience, and 6) what students (preservice teachers) liked and disliked about using the technology" (Kinnear et al., p. 21). Sixty-four or 12.8% of the student teachers responded. Results revealed that the preservice teachers identified benefits associated with content, technical quality, interaction, and classroom practice. However, the preservice teachers desired more interaction with the pupils but were unsure what the outcomes of more interaction might entail.

Several noteworthy findings were reported by the cooperating teacher at Loanends Primary School. First, the primary teacher noticed that her pupils were motivated and enthusiastic to participate in the experience (Kinnear et al., 2002). In addition, she related that her P6/P7 pupils exhibited greater concentration spans and more concern about their appearance and oral communication than they usually did in the traditional classroom environment. Pupils quickly adapted to the classroom cameras. Interestingly, the primary teacher found that the use of videoconferencing had an untended outcome—“it was also found to operate as a form of classroom control” (Kinnear et al., p. 25). From a sociocultural viewpoint, the students evidenced self-regulation while engaging with the interactive videoconferencing equipment.

Math and Weather Videoconferences

The Motivate Project (Gage, Nickson, & Beardon, 2002) investigated whether videoconferencing collaborations between mathematicians and students contributed to teaching and learning from both the teacher’s and students’ perspectives. Based in the UK, this program established six learning objectives for their program:

> to enrich the mathematical experience of school students, to broaden their mathematical horizons, to give them an experience of collaborative working on mathematical tasks, to improve mathematical thinking and communication skills, to give them an audience to whom they could present reports of their work, [and] to raise their aspirations. (Gage et al., Theories section, para. 1).

During the videoconferencing activities, students introduced themselves, listened to a speaker, worked off-line, collaborated online, and finally presented their work to one another. The project collected evaluations from teachers and students over a 2-year period, primarily from secondary students. The evaluation forms were not included in the project article, but select findings were recorded. Most teachers responded that their videoconferencing experience with the project was positive; 26% strongly agreed and 43% agreed (Gage et al., Teacher's section, para. 4). Another 25% of the responses were neutral and 5% strongly disagreed with the positive nature of the interaction (Gage et al., Teacher's section, para. 4). Teachers reported valuing the open-ended questions directed towards the students and appreciate for the opportunity for students to problem solve authentic mathematic problems that they might not experience through standard course instruction. They also indicated that sometimes their students were surprised to learn that the focus was really mathematics and not just an algebraic equation or geometry calculation (Gage et al., Teacher’s section, para. 7). The Motivate Project coordinators conveyed that their videoconferencing sessions provided opportunities for learning with ICT, required high levels of communication skills, and allowed students to present their work to a larger audience than did a traditional classroom (Gage et al.).

During the 2000-2001, Yost (2001), a professor of early childhood education, explored ways that videoconferencing could be used with kindergarten students. Her Pennsylvania laboratory school environment afforded Yost the opportunity to design a curricular project about weather using desktop videoconferencing. Working with a colleague’s classroom in Illinois, the two classrooms augmented their traditional practice of observing the weather and graphing the types of weather in the month by sharing weather reports. For 6 weeks, students shared weather reports between their Pennsylvania and Illinois classrooms for 10 to 20 minutes a day.

Before the classes began to videoconference, Yost (2001) developed learning activities to scaffold her young learner’s upcoming virtual exchange. First, she found a Web site with a live Webcam that displayed weather in different states. As part of the kindergarten meteorologist's daily job, they reported the weather for the local area as well as for a different place located on the Web site. Students learned that weather and time are different in other areas through their observance of the weather on the Web site (Yost, 2001). They also had the opportunity to visit the campus television studio to learn more about the responsibilities of a meteorologist as well as to play with the cameras, monitors, and other equipment. Back in the classroom, Yost set up a desktop camera on a tripod that was attached to a computer so that students could play with the setup, become familiar with how to operate technology, and practice being live meteorologists and camera persons.

In April, the classes began sharing weather reports and generally visiting one another. Besides just sharing weather related information, they also posed questions to one another and shared stories. Yost (2001) concluded that these activities allowed her students to construct a better understanding of weather "in ways not available to them with out the technology. What began as a simple exchange of the weather became an exciting interdisciplinary project combining math, science, social studies, literacy, and communication skills into an authentic and meaningful experience" (p. 3175).

Research Supporting Interaction, Community, and Language in Collaborations

Several empirical studies provide information about the roles of interaction and language associated with collaborative learning. This section begins with an overview of two dissertations that investigated constructivist attributes of interactive videoconferencing. While these studies did not apply sociocultural-learning theory specifically, the Vygotskian (1978, 1986) influence in constructivism in relation to the importance of language as well as the social context of learning provided insights applicable to this study.

Hayden's (1999) qualitative, Delphi study investigated the characteristics and critical strategies in videoconferencing sessions that supported constructivist learning experiences. Hayden employed a purposeful sample to draw participants from three different areas: teachers with technology integration experience in K-12, videoconferencing experts, and educational consultants or visionaries. From the responses of thirty two Delphi panelists, Hayden ascertained 20 characteristics of interactive videoconferencing that support constructivist learning. These were narrowed to the top 10 statistically highest ranking characteristics and then categorized into four themes:

> 1. Connections: Synchronous connections between students and primary sources such as experts and remote locations; involving multiple sites in activities.
> 2. Questioning: Students develop and ask questions to investigate topics; they are in charge of their learning.
> 3. Learning: Students present to remote partners using audio and video for communication.
> 4. Interaction: Students work in groups on authentic activities with remote sites. This involves videoconferencing with remote sites and use of an online suite of tools to support videoconferencing activities. (Hayden, 1999, p. 136)

In addition to the four themes of characteristic of interactive videoconferencing that support constructivist learning, Hayden (1999) also developed a six-theme roster of critical support strategies for videoconferencing including people, access, hardware and software, materials, staff development, and cost/budget (p. 138).

Building on Hayden's foundation, Sweeney (2007) investigated whether K-12 teachers use videoconferencing in ways that align with constructivism. Sixty-three educators participated in a survey about the relationship between videoconferencing and educational theory. The 44 question survey was divided into three sections: frequency of videoconferencing techniques, preference for constructivist learning, and demographics. Sweeney's survey of 20 videoconferencing techniques that support constructivism were a compilation of ideas from Hayden (1999), Ravitz, Becker, and Wong (2000) and Taylor and Fraser (1991). Respondents selected items based on a 5-point Likert scale with the following selections: *almost never, seldom, sometimes, often*, and *almost always* (Sweeney, p. 85). Over 80% of the respondents were educators who had been teaching at least 10 years, and over 50% conducted at least 20 videoconferences.

According to Sweeney (2007), the principal finding of the study was that the "use of videoconferencing techniques has a positive relationship to the educator's preference for constructivism. The greater the degree of preference for constructivism in their classroom the more frequent is the use of the particular videoconferencing techniques, which support constructivism" (Sweeney, p. 110). Sweeney separated a constructivist-learning environment (CLE) into four constructs: prior knowledge, mental models, interaction, and active student direct learning experiences. The results of a linear regression indicated a strong positive relationship between constructivism preferences and the use of specific videoconferencing techniques that support CLEs. Also noteworthy was the preparatory work indicated by the teachers.

The four themes identified by Hayden as being constructivist characteristics of interactive videoconferencing—connections, questions, learning, and interaction—likewise stress the importance of the social context for learning found in the sociocultural perspective in addition to the substantial role governed by language. Two of the four constructs Sweeney (2007) recognized in constructivist learning environments are highly applicable to determining the meaning making of kindergartners while learning with interactive videoconferencing—interaction and active student direct learning experiences.

Interaction

As a theme, interaction remained a prominent concern within multiple interactive media studies that supported sociocultural theory. Amirian (2003) noted that "[i]nteraction is the key component of this use of the technology [interactive videoconferencing] to support a more social learning, negotiating meaning through interaction with peers over distance, and forming a sense of community using the technology" (p. 4). Wartella, O'Keefe, and Scantlin (2000) and Wartella, Lee, and Caplovitz (2002) concurred about key frameworks for studying the effects of interactive media on young children's cognitive development and learning. Wartella et al. (2002) described the ensuing learning process as a convergence of three components: the perceived and actual properties of the technology, the student's own preferences and experiences, and the situational use. They reinforced that "[l]earning is thus founded on interaction" (Wartella et al., 2002, p. 13). In their research compendiums about children and interactive media, Wartella et al. (2000) and Wartella et al. (2002) emphasized the importance of the socio-cultural aspect of learning and recognized the key role that socialization played in the cognitive development of children.

Several types of interaction are involved in a distance education setting involving interactive videoconferencing in a kindergarten classroom. In each of these scenarios, the learner refers to a kindergarten student. The types of interaction inherent to this environment are (a) learner-content (topic of the videoconference and focus of the instruction or collaboration), (b) learner-instructor (teachers and facilitators both near and far), (c) learner-learner (remote site; Moore, 1989), and (d) learner-system (the system being the videoconferencing equipment; Bouhnik & Marcus, 2006). Moore recognized the importance of dialogue in distance education communication and made a salient distinction between interaction and dialogue. Moore remarked,

> Dialogue is developed by teachers and learners in the course of the interactions that occur when one gives instruction and the others respond. The concepts of dialogue and interaction are very similar, and indeed are sometimes used synonymously. However, an important distinction can be made. The term 'dialogue' is used to describe an interaction or series of interactions having positive qualities that other interactions might not have. A dialogue is purposeful, constructive and valued by each party. Each party in a dialogue is a respectful and active listener; each is a contributor, and builds on the contributions of the other party or parties. There can be negative or neutral interactions; the term 'dialogue' is reserved for positive interactions, with value placed on the synergistic nature of the relationship of the parties involved. The direction of the dialogue in an educational relationship is towards the improved understanding of the student. (1993, p. 23)

From this discussion of dialogue, several key issues emerge as being relevant to an analysis about young children learning with interactive videoconferencing. First, dialogue has purpose or is related to learning objectives and goals. Second, dialogue reflects collaboration directed toward a common set of goals. Lastly, dialogue is learner-centered and directed towards improving the cognitive knowledge of the student.

Community of Learners

Amirian (2003) revealed another important connection related to interaction in distance education—the formation of a sense of community or a community of learners. While terminologies associated with communities of learners were first applied to more mature students such as adults and students of higher education, the term is also applied to younger students (Harada, Lum, & Souza, 2002; Turvey, 2006; Wartella et al., 2000; Wartella et al., 2002). Harada et al. provided a pertinent definition for a learning community in the lower elementary grades including kindergarten. They affirmed that "in learning communities, shaping the learning experience becomes a shared process as adults and students work together through negotiation" (Harada et al., p. 66). Harada et al. (2002) identified several critical features in building a shared community of adult and student learners in a Hawaiian kindergarten classroom. These included

1. The focus of the learning is on processes where new perspectives are valued.

2. Learning is a social experience that extends curriculum interactions beyond the classroom.

3. Students remain engaged while building knowledge through the investigation of relevant, real-life problems.

4. Learners demonstrate their knowledge through activities such as explaining, creating analogies, and generalizing.

5. Students have an open learning environment with access to diverse resources.

6. Assessment is continuous and in context with ample opportunities for reflection.

7. The role of the teacher is that of a facilitator who guides students' curiosity and inquiry (Harada et al., 2002).

Emphasis on Meaning Making

Murphy, DePasquale, and McNamara (2003) highlighted that "[f]or technology to fulfill its promise as a powerful contributor to learning, it must be used to deepen children's engagement in meaningful and intellectually authentic curriculum" (p. 2). Much disparity exists in regards to what really constitutes meaning making, whether it occurs in a traditional classroom or in a distance educational setting. Jonassen, Howland, Moore, and Marra (2003) purported that if the purpose of the schools (and education as a whole) is to engage students in meaningful learning, then

> their primary obligation should be to help students to learn how to recognize and solve problems, comprehend new phenomena, construct mental models of those phenomena, and given a new situation, set goals and regulate their own learning (learn how to learn). (p. 6)

Furthermore, based on that premise, the use of technology to support meaningful learning and enhance teaching instruction is viewed as a medium to "engage students in active, constructive, intentional, authentic, and cooperative learning" (Jonassen et al., p. 6).

Jonassen et al. (2003) differentiated between learning with technology as a tool compared to technology being the driving force behind the learning. They argued that the traditional thought of technology being a vehicle for instructional lessons does not hold up. Instead, they emphasized that learners must *use* the technology for “knowledge construction, conversation, articulation, collaboration, and reflection” (Jonassen et al., p. 15) in order for it to be meaningful.

Meaning-Making Research Involving Young Children and Computers

Studies about young children and computers shed light on research questions, theories, methodologies, and other considerations for doing research about learning with interactive videoconferencing in a kindergarten classroom. The following studies highlighted children’s interaction patterns while working on computers (Daskagianni, Leontitsis, & Pange, 2004; Hyun & Davis, 2005; Klerfelt, 2007; Lomangino, Nicholson, &, and Sulzby, 1999; Pantaleo, 2007) research emphases on collaboration around computers, discourse analysis (Hyun & Davis), qualitative methods in early childhood classrooms (Hyun & Davis; Klerfelt; Lomangino et al.; Pantaleo; Plowman & Stephen, 2005), ethnographic studies (Lomangino et al.; Wyeth, 2006), and methods for analyzing interaction (Fisher, 1993; Hyun & Davis; Klerfelt; Pantaleo; Wegerif & Mercer, 1996).

Young Children Collaborating with Computers

An ethnographic study by Lomangino et al. (1999) examined the interactive patterns of first graders composing together on computers. This study drew from the theoretical underpinnings of socio-cognitive and sociocultural theories of cognitive development. Three groups of children working on the computer were analyzed. Common interaction patterns amongst the children included using one another as resources, expressing an opposite point of view, guiding or directing instead of instructing, using self-monitoring behavior, and repetition. Lomangino et al. (1999) concluded that “our findings suggest that even with minimal adult involvement, children exhibit many constructive patterns of interaction while composing collaboratively on computers” (p. 223). The researchers recommended two ways to improve the effectiveness of young children’s collaborative composing. First, teachers need to model prosocial ways to partake in collaborative interactions (p. 225). Next, Lomangino et al. recommended that teachers actively assist their students to extend their interactions beyond the local focus of their compositions (p. 226).

In another qualitative study, Wyeth (2006) employed an ethnographic methodology to gain insights about the development of new technology for young learners in an Australian kindergarten class of thirty students. Most human computer interface studies related to work, and did not relate to the playful, social, and explorative nature of kindergarten. Therefore, the project had two research objectives: to explore the effectiveness of ethnographic methods in portraying contextual information about the busy world of kindergarten, and to gain insight about children’s interactions with one another and their environment as well as their styles of interaction (Wyeth). In order to understand how and what new technological products might transform kindergarten education, it is first necessary to understand the general happenings of the environment. Wyeth commented on the ancillary role that computers often had in kindergarten—rather than technology being infused into the curriculum, working with computers was often referred to as playing on the computer (Plowman & Stephen, 2005) or thought of as a preparatory tool for further study and professional work.

The children's favorite places in kindergarten were the block area, the home corner section, the fort (an outdoor play structure), and the sand pit (Wyeth, 2006). The researcher observed that children often moved things from one area of their environment to another when they were playing, yet technology oriented could not be used in the same manner—they usually had a solo purpose. Wyeth focused on the personal connection that children made while they were playing, whether with a toy or another person. The study concluded that ethnographic methods were a valuable tool for gathering data in the classroom and for examination of design developments for new technology devices and their use in the kindergarten classroom (Wyeth).

Studies investigating the interaction of children working on computers did not just extend to textual compositions, Daskagianni et al. (2004) reviewed the ways Greek children drew pictures of televisions and computers. Utilizing observation techniques, they found that students working in collaborative learning situations had better paintings of the televisions and computers in general including more colors and better attention to details. Another important conclusion was that students recognized the differences between televisions and computers noting that the latter was programmable (Daskagianni et al.).

Conversations and Interthinking

Hyun and Davis (2005) examined the emerging inquiries and dialogue of a kindergarten classroom comprised of 5 and 6 year olds as they worked on a mapping project in their classroom. The researchers examined the emerging inquiries and dialogue of nine boys and nine girls around computers as they worked on their project. The students attended kindergarten at the child development center at Kent State, a culturally and linguistically diverse sample.

The premise for examining the emerging inquiries and dialogue of the students was predicated on the Fisher's categorization of three types of talking among children in the classroom. According to Fisher (1993), children represent their thinking in conversations as

1. Disputational talk, which can be characterized as an initiation in various forms (e.g., suggestion, instruction), followed by a challenge (either a direct rejection or a counter suggestion). This results either in a lack of any clear resolution or a resolution that does not build directly on the previous utterances.
2. Cumulative talk, in which initiations are accepted either without discussion or with additions or superficial amendments.
3. Exploratory talk, in which the initiation may be challenged and counterchallenged with suggestions that are developments of that initiation. Progress then rests on the joint acceptance of one of the suggestions or of a modification of what has been put forward (Fisher, 1993, p. 255, as cited in Hyun & Davis, 2005, p. 120)

Fisher promoted the idea that exploratory talk represents a potential for learning. Likewise, exploratory talk also represented evidence of children augmenting their knowledge within Vygotsky's concept of ZPD (Fisher, 1993, as cited in Hyun & Davis, 2005).

The focal research question for Hyun and Davis' study (2005) was "What is the nature of young children's emerging inquiries and dialogue surrounding their use of computers in a technology-rich classroom? In this study, 'emerging inquiries' refers to the questions children ask while using computers" (Hyun & Davis, p. 122). The researchers recorded data in the form of field notes, digital pictures, and videotapes that were later transcribed. For the map making project, the teacher and technology support personnel introduced new software to the students in large groups. Once the students learned how to use the software and had an opportunity to play with the program, they proceeded to work and play with the software in pairs.

Data analysis methods included open, inductive, axial, and selective coding along with data reduction. Transcripts were read multiple times during the initial stage of open coding to break down, examine, compare, and reorganize the children's emerging inquiries, talking, and learner roles. Multiple readings of the transcriptions were completed in the initial stage of open coding, which involved breaking down, examining, comparing, conceptualizing, and categorizing the data to capture any patterns in the children's emerging inquires, their talking, and learner roles (Hyun & Davis, 2005, p. 125).

Hyun and Davis (2005) exposed five key findings related to the emerging inquiries and dialogue of the students surrounding their map making project. These were highlighted in distinct vignettes. First, they found that while initial conversations represented cumulative talk, subsequent dialogue evolved into exploratory talk. The next finding related to the intention of the inquiries and dialogue—"children's thinking, questioning, and talking was purposeful, reflective, and autonomous" (Hyun & Davis, p.

127). The third result indicated that the children's conversations impacted their developing technological literacy skills. Next, the researchers found that peer collaboration and teacher input and modeling scaffolded the student's understanding of the map making project and technology usage. Lastly, students developed personal preferences in working with the map making project and associated technology (Hyun & Davis).

Pantaleo (2007) investigated the nature of children's interthinking while engaged in collective group read-alouds with picture books with Radical Change characteristics (Dresang, E., 1999, as cited in Pantaleo). The participants included 20 inner-city, first-grade students from British Columbia, Canada. Mercer's (1995, as cited in Pantaleo) definition of "interthinking" to mean the ''joint, coordinated intellectual activity which people regularly accomplish using language'' (1995, p. 16, as cited in Pantaleo, p. 439). Simplifying this definition, interthinking can be thought of as using talk to think collectively as a group, or to connect to other's ideas with oral language.

Pantaleo (2007) emphasized that classroom talk is multifaceted and it is shaped by a range of collaborative factors such as the individual, social, and cultural characteristics. Children's oral language depicts their understanding of the world, their representations, and thought patterns. During the read-alouds, Pantaleo encouraged the children to interpret the pictures and extend their comprehension of what the characters were doing in the story through the adoption of an inquiry stance. First the stories were read as a whole class. Then, the students were divided into subgroups where they read the story again. Field notes and recorded audio files served as methods for data collection in this qualitative study. Audio recorded files were later transcribed. Pantaleo used excerpts from these transcribed files to show how children supported one another in their learning. In one excerpt, Pantaleo described the process her and with me, orally, to fill in the gaps and construct meaning" (p. 445). In addition, the author remarked about the guided read-aloud sessions and how the children used their language to think collectively, to scaffold interpretations, to extend understandings, to explore significances, to construct storylines, and develop a community of learners to discuss children's literary works (Pantaleo).

Klerfelt (2007) emphasized the importance of the early childhood teacher in a study that analyzed the significance of gestures and utterances when preschoolers and their teachers created stories using the computer. Seventeen preschool teachers and thirty four children in a Swedish preschool participated in the study. Klerfelt utilized interaction analysis to evaluate the conversational dialogue, gestures, and mesh of these two expressions to determine the sociocultural learning that occurred in the classroom. The goal of this approach was to identify customary patterns of socially constituted understanding when the teachers engaged the students in story building with the help of a computer (Klerfelt). According to the researcher, "In preschool and children's leisure centres, conversations run in both dyadic and polydyadic forms, and analysing these conversations is one way to understand the meaning-making activities which are enacted by people who participate in the activity within these social practices" (Klerfelt, p. 336).

Teachers received directions to sit with two children at a computer, one at a time, in order to create a story. Instructions for the teachers also specified that they interact as they normally do, in their own pedagogical style, to build stories. Klerfelt (2007) selected three different scenarios to describe, each depicting a different interaction type directed towards (a) technological functions, (b) the content and form of the tale, and (c) conversational dialogue. Video and audio recorders captured the dialogue of the participants. The video camera was placed behind the teacher and student so that it could capture the body movements, personal expressions, and computer screen. Although the activity started out as a teacher-centered activity where the children were instructed about what would occur, the activity shifted to a more student-centered activity as it progressed.

In order to analyze the data, the videos were first watched in their entirety. Then the video files were transcribed. The textual transcription files were reviewed for coding followed by a selective review of portions of the videotape to illuminate certain sections. The results of the study showed the importance of the teacher's role in the interplay of children while making and developing stories on the computer (Klerfelt, 2007).

In the Hyun and Davis (2005), Pantaleo (2007), and Klerfelt (2007) studies, methodologies focused on ideas of breaking down interactions and dialogue as measurements of learning with computers. These qualitative studies employed prolonged periods of field work and participant observation, followed by analysis involving discourse and dialogue analysis. They also used audio and videotaping as a way to preserve and record events. Tape recordings were transcribed for further textual analysis. Next, coding of the transcripts ensued as well as constant comparison scrutiny of the data. Videotapes were replayed and observed to ensure that interpretations of the data were accurate. The concepts presented in these three studies are relevant to the use of interactive videoconferencing in a kindergarten classroom.

Exploratory Talk and the Sociocultural Lens

Hyun and Davis (2005), Pantaleo (2007), and Klerfelt (2007) investigated meaning making through a sociocultural lens. Hyun and Davis (2005) broke down dialogue looking for examples of exploratory talk, or a style of talking where students' words may be challenged or counter challenged. After initiating dialogue, progress continued until there was a joint social acceptance or the offering of a modification of the original statement. Pantaleo followed a similar procedure of investigating the collective group talk, or interthinking, of children while they discussed stories. This included children's language to connect with one another's thoughts through oral language. Finally, Klerfelt used interaction analysis to analyze dialogue, gestures, and a combination of the two in order to look for instances of reciprocal understanding between the teacher and the pupil.

Fisher's (1993) categorization of disputational, cumulative, and exploratory talk was created to describe categories of speech surrounding the ways children spoke while working collaboratively on computers. For the purposes of analyzing sociocultural learning, only exploratory talk was analyzed to provide a frame of reference to understand how children constructed meaning around their shared spaces while working on the computers. The significance of exploratory talk, according to Wegerif and Mercer (1996), rests in its "disembedded" or "decontextualized" (p. 53) state of educated discourse—free from context in terms of abstract meanings. Likewise, letting children talk about their experiences in an unhindered fashion allowed them the freedom to describe events, ask questions, account for outcomes, and clarify their thoughts in ways that helps them to understand their own learning and thinking process (Wegerif & Mercer).

Besides the fact that all three studies (Hyun & Davis, 2005; Klerfelt, 2007; Pantaleo, 2007) investigated young children of preschool or kindergarten age, they are also similar in what they examined—the sociocognitive and sociocultural ways that children learn with computers. These recent studies indicated a trend in using sociocultural theory to describe the learning associated with young learners and computers. These same principles may be applied to working with an emerging technology in the classroom—interactive videoconferencing. However, ramifications of the time and space differences afforded by the technology remain untested in the research.

The Hyun and Davis (2005) study made a special contribution to this dissertation—it provided the source of one of the research questions. The wording was adapted changed to reflect the nature of the technology being studied. As a result, the research question became "What is the nature of young children's emerging inquiries and dialogue surrounding their use of interactive videoconferencing?"

As noted earlier, many of the studies investigating the use of technology and associated learning or meaning making by the students in early childhood classrooms represent qualitative studies (Cifuentes & Murphy, 1999, 2000a, 2000b, 2000c; Daskagianni et al., 2004; Hyun & Davis, 2005; Klerfelt, 2007; Lomangino et al., 1999; Pantaleo, 2007; Poveda, 2003; Turvey, 2006; Volk & De Acosta, 2001; Wyeth, 2006). The scope of these studies constituted an area of research that is still emerging in terms of subject matter and or sociocultural-learning application. Thus, many of these researchers followed a qualitative approach to add thick, rich description about the phenomena being investigated. These studies reinforced the decision to use a qualitative method of inquiry for the dissertation that is further described in chapter 3. As these qualitative studies indicated, there is a methodological fit between doing research with young children and their use of technology.

Multicultural Videoconferencing Studies in Elementary School

Research about interactive videoconferencing collaborations among elementary students showed multiple benefits including multicultural awareness, technological literacy, increased self esteem and motivation, and improved presentation and communication skills (Abbott, Austin, Mulkeen, & Metcalfe, 2004; Cifuentes & Murphy, 1999, 2000a, 2000b, 2000c; Thurston, 2006). In fact, studies about multicultural collaborations represent a growing body of research about interactions in younger children. These studies promote a qualitative and mixed methods body of information about changing attitudes and beliefs in elementary schools. The remainder of this section describes four research studies about global connections in the upper elementary grades.

Employing a case-study methodology, Cifuentes and Murphy (1999) expounded upon the benefits of an intercultural exchange between four, fourth-grade classes. Two classes were located in College Station, Texas and the other two were located in Mexico City, Mexico. Through a year long set of videoconferences, the classrooms shared information through presentations, poetry, songs, and historical reenactments. While students in Mexico spoke English fluently and had a working knowledge about American culture, Cifuentes and Murphy noted a “sharp contrast” in the ability of the Texan students to speak Spanish fluently and recount information about Mexican culture. Table 8 shows a roster of the videoconferences during the collaboration.

Table 8

Videoconferencing Activities between Texan and Mexican Sites (Cifuentes & Murphy, 1999)

IVC no.	Description of videoconferencing activity
1	All four classes participated in a poetry writing workshop.
2	Students wrote a story about a day in the life of a fourth grader. Students completed a survey about their values and artistic interests and created a student profile about their personal interests. This included a picture. Materials were delivered by courier between the Mexican and Texan sites.
3	Conducted 90-minute session about the Alamo. Goals were to describe why the battle took place, make a dynamic representation of the battle, and write an essay comparing and contrasting U.S. versus Mexican interpretations of the battle.
4	Students read texts from both the Texan and Mexican points of view. U.S. students read a Mexican text that was translated into English. Students wrote an essay about similarities and differences in the texts they read. Teachers selected best essays and reenactments to share during the videoconference.
5	Students sang folk songs and read folk tales. Students also shared visual representations of the other's culture through the murals and the symbol used in the murals.

Note: IVC is an abbreviation for interactive videoconference.

Initial videoconferencing activities for all students included writing poetry about their culture and creating stories about a day in the life of a fourth grader. Next, students researched the Battle of the Alamo and reenacted the historical scenes. Students shared folktales and sang folk songs during another videoconferencing session. Students even drew murals and shared pictures about their cultural heritages (Cifuentes & Murphy, 1999). Cifuentes and Murphy stressed that the videoconferencing encounters empowered the students as they garnered new multicultural insights and took charge of their own learning.

In another article more specific to the mural art, Cifuentes and Murphy (2000b) concluded that students can learn much about another culture through the exchange of art work. When the researchers applied content analysis to the murals of two Mexican fourth-grade classes and two Texan fourth-grade classes, they found that

> Texan school children chose not to include people in their mural, while Mexican children chose to portray people. Texan children portrayed local themes and included imagery associated with places, and Mexican children chose universal themes and conveyed human events and activities. Texans used many labels but Mexicans used text only if it was integrated into the picture. (Cifuentes & Murphy, p. 318)

The study showed how students can evaluate art in a global connection to better understand one another's culture. In addition, students learned how ICT can be used to share pictures in order to study the similarities and differences in multicultural settings.

In another case study by Cifuentes and Murphy (2000c), two Texas schools shared multicultural activities via videoconferencing. While the schools were both located in Texas, they represented ethnically different student populations. One school was located very near the Texas/Mexico border. Participants from this school included 15 eighth graders made up of 2 Caucasian and 13 Hispanic students. Fourteen of the fifteen students were considered at risk and received Title I funding (Cifuentes & Murphy, p. 75). The other school was located about an hour's drive north of the border school. Participants from this school included 10 gifted and talented fifth graders. Seven were Caucasian, one was Hispanic, and two were African American. 40% of the northern school's population was eligible for Title I funding (Cifuentes & Murphy, p.75). At the beginning of the study, the border school perceived the northern school to be "wealthy and trouble free" (Cifuentes & Murphy, p. 77). Students met nine times over videoconferencing during the 1996-1997 school year and shared individual portfolios created with the HyperStudio software.

Results of the data analysis revealed the emergence of four themes: growth, empowerment, comfort with technology, and mentoring (Cifuentes & Murphy, 2000c, p. 76). The teachers developed a kindred spirit and empowering multicultural relationships. Subsequently, their students developed "multicultural understanding and positive self-concept" evident in heightened student academic aspirations and more poise in communication while engaged in public speaking (Cifuentes & Murphy, p. 76). Cifuentes and Murphy also accentuated the importance of technology in fostering a learning community between the two sites.

Thurston's (2006) study examined the multicultural awareness impact of two types of student interaction. Scottish students gathered data from their local community and subsequently shared this information through videoconferencing presentations with a Missouri, USA classroom that was doing the same. Sixty-six Scottish primary students, ages 11 and 12, collected data through several means: questionnaires, interviews, personal observations, digital images and video. Thurston reported the results of the study based on the activity of the Scottish students. The researcher trained the students how to make digital movies with iMovie. After collecting all of their data, students created a multimedia presentation where they were required to condense 3 hours of video into a 15-minute iMovie to be used in a PowerPoint presentation. In order to measure the effects of the project in terms of the children's environment, the ethnicity of their community, their own ethnicity, and the news images, students took a presurvey and postsurvey. Thurston reported that students were required to express ICT skills in two regards. First, they needed to use ICT skills in the promotion of multicultural awareness. Second, the students exercised ICT skill in the preparation and presentation of their multicultural PowerPoint for the videoconferences.

Sample site selection for the Scottish participants represented a purposeful sample based on the school's ethnically diverse area that was geographically accessible. Although there were 66 potential subjects, only 24 were included in the final sample analysis because seating space in the school's distance learning lab was limited to only 24 seats and included 11 and 12 year olds (Thurston, 2006). After collecting data and before the videoconferencing sessions, students exchanged information by e-mail in order to learn the Missouri students' names, interests and other basic information. Students demonstrated critical thinking skills in the prioritization of topics in their lengthy videos so that they fit into only a 15-minute movie.

Based on results of the preproject and postproject gains, students showed some gains in the way they viewed their environment, their community's ethnicity, their own ethnicity, and images broadcast on the news. During the presurvey, all students reported their ethnicity as Scottish. However, the postsurvey indicated a further breakdown in the reporting of their own ethnicity to include the following categories: Chinese, English, Scottish-Italian, Scottish-Spanish, and Scottish. In the postsurvey, only 58% of the students identified themselves as Scottish (Thurston, 2006).

Similar results were recorded for the postsurvey village environment as completed by the students. In the presurvey, students described their environment in terms of how they felt about it or as a physical description (Thurston, 2006). However, after the videoconference, approximately 40% of the students described their environment in terms of its ethnicity in addition to how they felt about it or as a physical description. Thurston concluded that “the intervention developed the student’s ability to think and reflect on the nature of their environment” (p. 173). Students’ attitudes and beliefs about multicultural issues changed after the videoconference.

Interactive videoconferencing is not just seen as a way to bridge the cultural divide between national and international classrooms. It is also viewed as a method to reach special populations such as students with learning disabilities (Abbott et al., 2004; Johnson, 2004; Thorpe, 1998), hearing impairments (Abbott et al.; Johnson; Mallory, 2001; Thorpe), emotional and behavioral disorders (Thorpe). In a study about cross-national collaboration through ICT within the statutory curricula of 10special schools in Northern Ireland and the Republic of Ireland, Abbott et al. evaluated learning through collaboration technology using asynchronous computer conferencing and videoconferencing. Students were paired in north-south classes for the collaborations. The purpose of the study was fivefold:

1. To learn whether and to what extent cultural awareness cultivated when student used collaborative forms of ICT,

2. To determine how and in what ways computer conferencing encouraged cultural awareness,

3. To identify the ways computer conferencing enhanced students' literacy and technology skills,

4. To determine how and in what ways videoconferencing encouraged cultural awareness, and

5. And to identify the ways videoconferencing enhanced students' oral and communication skills. (Abbott et al., p. 227)

Participants in the study included a special needs teacher from each of the 10 schools in the study along with a total of 120 special needs pupils, 73 in the north and 47 in the south. 69% were male and 31% were female. The range of ages for the pupils was from 10 years to 18 years old (Abbott et al., 2004, p. 230). Pupils exhibited a wide range of learning and behavioral difficulties, sensory impairment and physical disabilities.

Results from the study relating to videoconferencing included several interesting points. First, one school partnership found that using the videoconferencing equipment to practice communication skills before actually conducting an interactive connection helped students to prepare (Abbott et al., 2004, p. 231). Teachers expressed mixed messages about the effectiveness of using the computer conferencing with their students to gain motivation, confidence, and self-esteem. However, 7 of the 10 teachers considered videoconferencing "a *much* more successful medium for special needs pupils" (Abbott et al., p. 234) while "ten teachers spoke in glowing terms of improvements in almost all pupils, regardless of the nature of their special needs" (Abbott et al., p. 234). Seven teachers also identified barriers to using the videoconferencing, mostly in terms of practical and organizational matters such as coordinating videoconferencing sessions, poor audio or picture quality, and timely communications (Abbott et al., p. 235). Nine teachers believed that the addition of a peer audience in a videoconference had a positive effect on "some pupils' written and oral work, encouraging more careful preparation and revision of collaborative work, and fostering a sense of pride" (Abbott et al., p. 236). Most teachers (eight) reported appreciation for the opportunity for their students to be included in the global classroom and the researchers reported reason to celebrate the learning achievements of both students and teachers in the study. They also cautioned that ICT for special needs students must always match the benefit of the technology with the learning requirements of the student (Abbott et al.).

These multicultural videoconferencing studies with elementary age students hold promise for application to younger elementary students. Research about interactive videoconferencing collaborations for upper-elementary aged students indicated benefits associated with ICT and technological literacy and increased communication skills along with more confidence and self esteem. In addition, students began to develop a sense of multicultural awareness.

The next section of the literature considers studies involving computers in early childhood education. Specifically, it addresses curricular integration of computers and their impact on student learning. The remainder of this literature review will focus on articles and documents specific to elementary-school students and where possible to kindergarten or near-kindergarten aged students.

Summary

The review of literature began with a review of meta-analyses pertaining to K-12 distance-learning studies. Over the past 2decades, distance education research has gradually moved from levels of higher education towards secondary and even elementary grades. The meta-analyses evaluated the achievement of K-12 students who participated in online courses offered via videoconferencing or other online telecommunications and found that there was no statistical significant difference when using distance education over face to face instruction. It was important to consider the quantitative results because it laid the foundation for further investigation about the impact of distance education in the early grades.

The next section of the literature review detailed tenets of Vygotskian sociocultural theory. A review of Vygotskian texts (1978, 1986) revealed four tenets applicable to kindergartners' learning with interactive videoconferencing. These included the following principles: the social origins of cognition, sign and tool use through mediated activity, the role and importance of language, and the ZPD. These tenets were considered in relation to the culture of the classroom and the development of the learners. Vygotsky foresaw development as the internalization of collectively experienced shared activities. He also differed from other psychologists in his historical investigation of learning or what is called the dialectical method. A final issue surrounding the Vygotskian perspective is application of the theory in the face of interactive technologies that provided opportunities for students to interface with different cultures, partake in learning activities with students outside of their local context, and form new virtual communities of learners (Harada et al., 2002).

After detailing tenets of Vygotskian theory, the literature shifted to portray existing case studies about learning with interactive videoconferencing in elementary school. These narrative depictions describe different types of learning activities in the sessions as well as the motivation and proper etiquette behavior of the students. They highlight learner-centered activities and shifting roles of educators facilitating the conferences. Many of these case studies originated outside of the United States (Arnold et al., 2005; BECTA, 2002; Gage et al., 2002; Kinnear et al., 2002) and depict classroom-to-classroom interactions that host a multitude of subject areas such as mathematics, science, social studies, reading, language arts, performing arts, communication skill, and preservice teaching. These studies provide a well-rounded explanation of classroom happenings but do not necessarily analyze the learning activities from a theoretical framework and are thus more anecdotal in nature. They do, however, highlight the importance of interaction, the building of a community of learners, and the emphasis on joint meaning making.

The next section reviewed a growing body of research that investigated how young children learned while doing collaborative work on computers. Framed by the sociocultural perspective, these studies analyzed the dialogue, interthinking, and gestures of students to provide evidence of student meaning making. These studies provided support for the social nature and collaboration experience of young children learning through language. In addition, discussions focused on the importance of using exploratory talk to understand new learning concepts as the children became familiar to the technology. These studies created a foundation for further research about the impact of other technologies in the early primary classroom.

The final section of the chapter reviewed studies that focused on the multicultural characteristics and benefits of using interactive videoconferencing to build partnerships between classrooms. Like the other elementary videoconferencing cases studies, qualitative methodologies provided a framework to describe the authentic learning environments and cultural impacts of these collaborations. They established a line of inquiry that extended the social context of Vygotsky's theory to include the virtual cultures established while using interactive videoconferencing.

CHAPTER 3: METHODOLOGY

Methodological Pursuit

Introduction

The methodology chapter incorporates the results of a literature review about qualitative methodologies in general and progresses with the articulation of the design for this study. The conception of the research was a study in itself moving from a prototypical model in the pilot study to a more structured framework in the actual dissertation. Synthesizing a broad selection of chapters and journal articles about qualitative research assisted in fabricating a line of reasoning about the methodological design.

The literature review was part of an independent study course the researcher undertook in the fall of 2006 in order to determine the most appropriate methodology for the dissertation. Questions answered during this pursuit included determinations about when a type of methodology was typically used, who used certain methodologies, what types of data were collected, what was the historical context of the methodology, and was there a potential fit concerning these issues within her dissertation. The selection of the majority of the journal articles and book chapters were recommended by her professor and dissertation committee member during the course of the semester based on the researcher's interest about studying kindergarten learning using interactive videoconferencing. As the semester progressed, the researcher identified and selected supplemental journal articles and books to pursue based on insights gained from the other course readings. At the end of the semester, the researcher completed a literature review about the readings that served as the basis for making informed decisions about the methodology design.

There is a paucity of research relating to young children and their use of technology in school. Formulation of the methodology aimed to empower the voices of children and to create a foundation for further research involving them and interactive videoconferencing. The pursuit and selection of a qualitative methodology for this study began with an appraisal of the characteristics inherent in qualitative research.

Pilot Study

In April 2007, the researcher conducted a pilot study to evaluate the research design for her dissertation methodology. She examined the impact of interactive videoconferencing in a kindergarten classroom from the perspective of classroom experiences and corresponding learning theories. The study examined six research questions including (a) What is going on? (b) What is the setting of the action? (c) When and how does the action take place? (d) What types of meaning are being formed by the kindergarten students during interactive videoconferences? (e) What is the nature of young children's emerging inquiries and dialogue surrounding their use of interactive videoconferencing in their classroom? and (f) Were students actively engaged?

The pilot study followed an ethnographic, case design study design that included 10 days of observation in April 2007 for over 55 hours of observation. The participating school was chosen based on five criteria: (a) access in the spring of 2007, (b) availability of videoconferencing equipment, (c) a full-day kindergarten schedule, (d) proximity to the researcher's locale, and (e) eagerness to participate in the study. Data collection methods included the recording of hand written field notes and videotaping and transcription of two interactive videoconferences with the kindergarten class. Consent forms were obtained for adult participants. Students received permission forms from parents or guardians and also signed minor assent forms. The entire class participated in the study. During the observation period, students participated in two interactive videoconferencing sessions. The first videoconference was an intra-school district session where the participant site presented bird reports to another kindergarten classroom in the same district. During the second videoconference, the kindergarten class took a virtual field trip to a marine laboratory featuring a read aloud of the book *Smiley Shark* (Galloway, 2003), a content presentation about sharks, and a question and answer session with a marine scientist.

Field notes and transcriptions were loaded into the ATLAS.ti (Muhr, 2004) qualitative analysis software for coding. The researcher employed data triangulation through observation of the videotapes and inspection of the field notes. Line-by-line constant comparison of the text produced a refined set of codes and helped to eliminate redundant code names (Charmaz, 2000). Narrative descriptions and a selection of vignettes highlighted answers to the research questions. In addition, ATLAS.ti graphics assisted in visualizing the relationships between the codes and in portraying the meanings being formed by the kindergartners during the shark and bird report videoconferences.

Themes Within Qualitative Research

A review of key qualitative-research chapters, articles, and books revealed common characteristics of these research methods. While qualitative studies provided a wealth of information in the form of description, explanation, and processes, Miles and Huberman (1994a) stressed that the “creation, testing, and revision of simple, practical, and effective analysis methods remain the highest priority for qualitative researchers” (p. 3). Miles and Huberman expanded their description of qualitative methods with a roster of recurring themes found in this methodology as well as its “naturalist” character. These themes included (a) importance of prolonged field experience, (b) the researcher’s quest to gain an interdependent picture of the situation, (c) intent to capture data from an insider’s perspective (seeing the situation from the inside out), (d) integrity in preserving the original form of the data despite the need to isolate or sift some information, (e) explanation of how participants determine meaning in their situations, (f) interpretation of the data based on grounds of internal consistency, (g) the researcher as the focal “measurement device” of the study, and (h) words portray the analysis (1994a). The eight themes guided the methodology framework for the dissertation. Table 9 identifies Miles and Huberman’s recurring themes and how the themes informed the methodology decisions for this dissertation.

Besides Miles and Huberman’s (1994a) characteristics of qualitative research, several other themes appeared prominently within the literature. Erickson (1986) related that qualitative researchers are interested in interpreting the “theoretical suppositions” (p. 125) about the nature of schools as well as those of the instructors, the students, the culture of the classroom, and their general, contextual social life. The process is not always straightforward.

Table 9

Miles and Huberman's (1994a) Recurring Qualitative Themes and Their Influence on the Methodology Decisions.

Theme #	Recurring themes (Miles & Huberman, 1994a)	How the theme informed methodology decisions
1.	Extended field experience.	Duration of data collection for the study: 4 months from October 2007 through February 2008.
2.	The researcher's quest to gain an interdependent picture of the situation.	Teacher and students observed in multiple school locations including their classroom, gym class, computer lab, outdoors, and during celebrations. Primary concern was learning opportunity and access (Stake, 2000).
3.	Intent to capture data from an insider's perspective (seeing the situation from the inside out).	The prolonged field experience provided an opportunity to capture data in terms of the children, teacher, principal, and interactions between all participants.
4.	Integrity in preserving the original form of the data despite the need to isolate or sift some information.	Manual field notes and memo writing recorded the daily happenings of the classroom. In addition, videotaped recordings of the interactive videoconferences and the subsequent text transcriptions further preserved the dialogue, behaviors, and collaborations during the videoconferencing sessions.

Table 9 (*continued)*

Theme #	Recurring themes (Miles & Huberman, 1994a)	How the theme informed methodology decisions
5.	Explanation of how participants determine meaning in their situations (meaning making).	Meaning making was viewed through a Vygotskian sociocultural perspective. This is represents the thrust of the research questions. Examination of the meaning making during the interactive videoconferences was based on Vygotsky's tenets including (a) children build or construct their knowledge, (b) learning often precedes development, (c) learning and development coexist in a social interaction context, (d) language is central in the problem solving and learning of children as is evidenced by their dialogue (Vygotsky, 1978, 1986). Likewise, it was important to investigate Vygotsky's ZPD and the role it played in the interactive videoconferencing environment where knowledgeable peers and teachers located both locally and remotely, scaffolded the students' ability to learn (Vygotsky, 1978, 1986). An advantage of the prolonged field experience was that the researcher developed an understanding of the students' learning in the face to face classroom before entering into the interactive videoconferences. Therefore, in addition to examining the meaning making in the videoconferences, there was the opportunity to understand how these learning situations differed from the standard modus operandi.
6.	Interpretation of the data based on grounds of internal consistency	Data from field notes, memo writing, videotapes, and transcriptions offered multiple perspectives for interpretation of the data for internal consistency.

Table 9 (*continued)*

Theme #	Recurring themes (Miles & Huberman, 1994a)	How the theme informed methodology decisions
7.	The researcher as the focal "measurement device" of the study.	The researcher transformed from being an external observer to an informed insider. Field notes and memo making recorded these changes as well as the researcher's emotions during the process of being let into the classroom experience. Notes also included indications of emotions such as gratefulness and fearfulness.
8.	Words portray the analysis.	Field notes and memo writing focused on words to recreate the classroom happenings. Words continued to play an important role during line by line, comparison and contrast analysis of interactive dialogue using the ATLAS.ti software. According to Vygotskian learning theory, language and words are tools.

Eisenhart (2001b) encountered three confounding "muddles" (p. 16), or confusing situations, in her practice of educational anthropology and ethnography (i.e., social science research). The first muddle dealt with the use of the term "culture" in current educational research. The second muddle related to a researcher's enthusiasm (or not) for ethnography. Finally, she identified the third consideration as a responsibility to help those that she addressed in her writing. Eisenhart also encouraged researchers to address the question, "How should we adjust our conceptual orientations and methodological priorities to take into account apparently changing human experiences and priorities?" (2001b, p. 16). This question is of primary concern when designing a research study about vulnerable participants such as kindergartners and their changing interplay with information and communication technologies.

The methodology literature review highlights qualitative-research findings in order to filter and illuminate poignant considerations for designing a study involving young children and interactive videoconferencing. The next section considers epistemological stances of qualitative researchers. Following this segment, a discussion about qualitative approaches in education occurs. Remaining sections include discussion about participant observations, qualitative data collection and analysis, continuation of qualitative approaches, and the conclusion.

Epistemological Stances

Thinking, perceiving, and knowing represent central concerns for qualitative researchers. How do they know what they know? Schwandt (2000) delineated three epistemological stances—interpretivism , hermeneutics, and social constructionism—as various perspectives for doing qualitative research. He noted that the “distinctive praxis” (Schwandt, p. 190) of social inquiry linked acting, thinking, and practice in a circle of reflection and transformation. In order to begin a discussion about epistemological stances, it is necessary to review the roots of positivism. Defenders of positivism believe that the rationale of science is to add to the causal explanation of social, behavioral, and physical phenomena (Schwandt).

When considering an interpretivist philosophy, the researcher looks for meaning in human or social action as opposed to the progress of physical objects. By human or social action, the researcher must grasp "the meanings that constitute the action" (Schwandt, 2000, p. 191) and "the intent of the actor from the inside" (p. 192). Schwandt classified four ways of making sense of interpretative understanding. Empathetic identification with the actor was the first notion. This interpretivist stance represents historical knowledge and serves as the basis for objectivist or conservative hermeneutics. So, interpretivism and objectivist hermeneutics share the same epistemology. Philosophical hermeneutics rejects this contention and seeks to discover "what the actors think they are up to" (p. 192).

Phenomenological analysis, the second notion, addresses an understanding of the life world, or "*Lebenswelt*" (Schwandt, 2000, p. 192). In terms of an educational setting, Erickson (1986) referred to *Lebenswelt* as the lived experience of teachers and students in a classroom at the present time. Here, the goal is to understand how the researcher interpreted his own and others' action as having meaning and to rebuild (reconstruct) the beginnings of objective meanings between individuals (Schwandt). Erickson remarked that

> The task of interpretive research, then, is to discover the specific ways in which local and nonlocal forms of social organization and culture relate to the activities of specific persons in making choices and conducting social action together. For classroom research this means discovering how the choices and actions of all the members constitute an enacted curriculum—the learning environment (p. 129).

A third notion of interpretivism deals with analysis of language approaches. Language involved a series of games in the testing of hypotheses, order generation, salutations, partings, and more (Winch, 1958, as cited in Schwandt, 2000). Each of these games is said to have its own set of rules where participants found meaning in both human action and speech or communication (Schwandt, 2000).

Social action, understanding the life world, and language games constitute ways to comprehend interpretive understanding (Schwandt, 2000). These methods viewed human activity as meaningful, evoked an ethical promise to respect the life world, and emphasized the importance of intention (human subjectivity) to knowledge without forsaking the objectivity of knowledge (p. 193). Erickson (1986) summarized these same notions in terms of participant observation—by observing the enacted curriculum, researchers aim to construct knowledge about how classroom organizations function in terms of "power, politics, and sorting functions of teaching" (p.134). According to Schwandt (2000), interpretivist epistemologies were hermeneutic because the researcher must understand the entire situation in order to portray a particular action. A final commonality in the ways that these notions interpret understanding is the process by which the knower gains knowledge about an object (the meaning of human action; p. 194). In this situation, the inquirer objectifies the action to be construed and remains external to the process.

Philosophical hermeneutics represents the fourth and "radically different" (Schwandt, 2000, p. 194) way of composing interpretive meaning. In this philosophy, the interpreter plays the various parts of the narrative off the other parts until there was a self-understanding so that all of the parts fit. It does not involve procedure or rule governance. The process of philosophical hermeneutics challenges classic interpretivist epistemologies in three ways. First, philosophical hermeneutics equates understanding to interpretation. Secondly, philosophical hermeneutics challenges the interpretivist epistemological stance about inherent bias on the part of the inquirer. This historical context requires the engagement of the researcher's biases. The third challenge involves testing preconceptions and prejudices. Understanding is not said to be reproduced, but produced. Meaning is negotiated by the researcher, not merely discovered (Schwandt, 2000, p. 195).

Philosophical-hermeneutics and social-constructionist philosophies veered away from a representational account of meaning and knowledge (Schwandt, 2000). While logical positivism and logical empiricism concern themselves with semantic and syntactic analysis of scientific statements, or epistemologies that involved a language or pictorial description of conceptual representation of reality, social constructionist approaches try to overcome representational methods. Schwandt related, "constructivism means that human beings do not find or discover knowledge, so much as we construct or make it" (p. 197).

While these three epistemological stances presented alternative approaches to qualitative research, three salient issues cut across these borders. These philosophies addressed (a) the definition of what understanding really meant as well as how to justify this understanding, (b) how to frame the interpretive project, and (c) ethical considerations in relationships between the researcher and subjects, informants, respondents, participants, and coresearchers (Schwandt, 2000).

The dissertation adopted an interpretivist philosophy epistemology. The researcher examined meaning in human and social action from the vantage point of being a participant observer who was looking for the intent of the actors (kindergarten teacher and students) from the inside (Schwandt, 2000). Likewise, the researcher sought to determine the enacted curriculum (Erickson, 1986) where local and nonlocal classroom cultures learned about the other as well as new concepts to form their own learning environment. The intrepretivist philosophy was also evident in the ways in which the participants found meaning in both human action and speech or communication (Schwandt, 2000).

Further research is needed to explore how technological innovations affect learning in the classroom. Interactive videoconferencing represents a technology tool that has undiscovered potential in the school setting. In addition, Gordon, Holland, & Lahelma (2001) related that ethnographic studies involving young children are sparse. Therefore, the researcher determined that qualitative-research methods would be utilized within this dissertation involving participant observation of a kindergarten classroom using interactive videoconferencing.

Research Design and Methodology

The study's design employed a qualitative methodology in order to describe the interactions, learning processes, and exchanges. The natural classroom environment where the study took place provided a safe and empowering environment for the young learners where they could talk, learn, and play (Brown, 1992; Eisenhart, 2001a, 2001b; Emerson, Fretz, & Shaw, 2001; Erickson, 1986; Miles & Huberman, 1994a; Nespor, 1997). The classroom-based setting also provided an unassuming location for the researcher to examine the students' behavior in their cultural context. The research inquiry followed a case-study approach where the bounded system and functioning specific (Carter, 1993; Coles, 1989, as cited in Stake, 2000) were represented by a single kindergarten classroom filled with students, a lead teacher, and other supporting educators. Specifically, this study represented an intrinsic case study (Stake, 2000) whose purpose was to examine the meaning making of a kindergarten classroom engaged in curriculum-supported activities via interactive videoconferencing.

The research design stemmed from the prototypical framework implemented during a pilot study conducted in April 2007. Following the methodological framework of the pilot study, the dissertation research employed an ethnographic, participant observation methodology that is common within social anthropology for its data collection approach (Miles & Huberman, 1994a). This type of method uses relatively few structured instruments, but is more likely to use tools such as audiotapes and videotapes to aid in data observation and recording (Knupfer, 1996; Miles & Huberman).

Sample Considerations

Sampling issues are often the most overlooked component of a qualitative-research methodology. Yet lack of consideration about site selection may have significant impact on access (Curtis, Gesler, Smith, & Washburn, 2000) and data saturation issues (Onwuegbuzie & Leech, 2007) later in the study. After completing the pilot study, the researcher realized the value of accessibility. She followed the pilot class through multiple areas within the school including the gym, music class, the library, and computer lab. This vantage point permitted her to understand the culture of the pilot class when they were both in and out of their standard kindergarten classroom. The researcher did not observe the pilot class when they were paired with other classroom units—only as a solo entity. The open access experienced in the pilot study classroom reinforced the importance of selecting a sample that would provide an opportunity for prolonged, intensive study of the phenomena (Stake, 2000). Another factor in site selection that Stake (2000) recognized was the importance about intuition in case-study sampling selection:

> The researcher examines various interests in the phenomena, selecting a case of some typicality, but leaning toward those cases that seem to offer *opportunity to learn.* My choice would be to examine that case from which we feel we can learn the most. (p. 446)

As the researcher began the site selection process, she sought to locate a school that offered an open environment with the freedom to explore and delve into the subject with unrestricted access.

As was the case in the pilot study, this research utilized a purposive sampling approach. Purposive sampling strategies assisted the researcher in gaining insight into selected individuals or groups' experiences to extract data to develop meaning in the form of theories and concepts (Devers & Frankel, 2000; MacMillan & Schumacher, 2001; Onwuegbuzie & Leech, 2007). In line with this approach, other critical factors entered the selection process. Originally, she intended to conduct the study in a public school district in the same manner as the pilot study. However, weeks of waiting for responses to the invitation for participation altered this outlook.

Sample Selection and Size and Duration

The primary site selection requirements for consideration in the dissertation study related to geographical location, accessibility, and technology availability. Schools needed to be located in Southwestern Pennsylvania within an hour's drive of the researcher's locale. In addition, access to videoconferencing equipment was required. Potential classrooms needed to be of kindergarten age (4 to 7 years old) made up of both boys and girls and at least one teacher. The researcher recommended a class size of 25 students or less. Some videoconferencing content providers limit the number of participants for a single session; thus, she used class size as a guideline rather than as a limiting factor. The class-size stipulation proved to be an unimportant consideration as all interested classes had less than this number of students. Planned length of participant observation was 4 months or approximately half of the school year to provide and in-depth view of the classroom culture.

Invitation for Participation

The region targeted for the study was located in Southwestern Pennsylvania. Within this geographical area, few school districts were using interactive videoconferencing regularly as an instructional strategy. However, several indicators showed that school districts in the targeted area were beginning to embrace interactive videoconferencing as a teaching tool including (a) regional institutions registered as members in the Mid-Atlantic Gigapop in Philadelphia for Internet2[1] (MAGPI[2]; MAGPI, 2008; Appendix I); (b) participation in videoconferencing school directories such as the Center for Interactive Learning and Collaboration (CILC, 2008c) and AT&T Knowledge Network Explorer: Videoconferencing for Learning Directory (AT&T Knowledge Ventures, 2007); (c) informal inquiries made from local schools about interactive videoconferencing to Duquesne University's School of Education Instructional Technology program; and (d) regional information through the Intermediate Units[3] and

---

[1] Internet2 is both a high-speed network and a collaborative project of over 200 U.S. universities dedicated to meeting the application requirements in research, teaching, and learning. In Pennsylvania, 600 K-12 schools out of a possible 3,253 schools, or 18%, are connected to Internet2 (Internet2, 2006).

[2] MAGPI offers The Internet2 Commons videoconferencing training program to members. Once certified, subscribing members may participate in H.323 videoconferencing services for multisite connections that provide standards-based, vendor-neutral videoconferencing for distributed working groups, courses, and meetings that support research and education (Internet2, 2008).

[3] Pennsylvania is divided into 29 Intermediate Units that provide regional educational services to 501 public school districts and over 2,000 private schools. These Intermediate Units also act as liaison agencies between the schools and the Pennsylvania Department of Education.

educational technology conferences. Most school districts in this area were not yet part of Internet2 and interactive videoconferencing was just emerging as a technology tool within the regional K-12 institutions. It was important to identify school districts in the region that were using interactive videoconferencing in order to prepare a roster of potential participation sites for the dissertation study. This selection represented a purposeful, site specific participant sampling method.

Notification about participation in the dissertation study included multiple methods of distribution. Figure 4 displays a timeline from the invitation for participation of the study until the researcher's actual site entry.

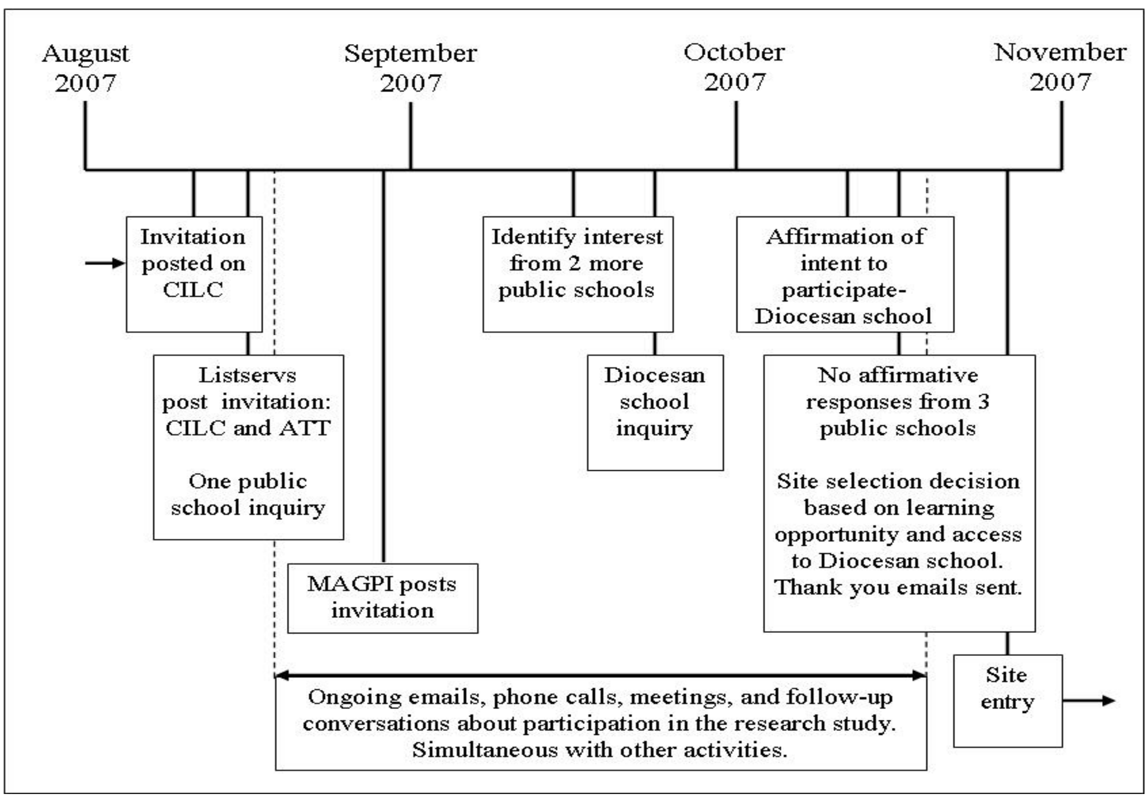


Figure 4. *Participant site selection timeline.*

The invitation for participation in the dissertation study followed the same procedure as that of a pilot study organized in April 2007. First, an electronic invitation was posted to the CILC Collaboration Center (CILC, 2008a) Web site in mid-August 2007. Subsequently, two videoconferencing listservs announced the research study invitation (CILC's "Weekly Collaboration Request E-Mail Update" and AT&T's Knowledge Network Explorer "Collaboration Collage" (known as ED1VIDCONF)). These same two listservs also broadcast the pilot study invitation to participate. At the end of August 2007, MAGPI's Grades K-6 Mailing List (listserv) also publicized the request for a kindergarten research participation site.

Sampling Issues Involving Site Selection

The first and only inquiry resulting from the videoconferencing listserv posting came on August 15, 2007. The inquiry came from a technology staff member of a public elementary school in response to the CILC posting. At the recommendation of the same staff member, the researcher agreed to commence a discussion about participating in the study once school started, only a few weeks later in September 2007. Other potential leads resulted from conversations with Intermediate Units in the locale. Interestingly, two of the Intermediate Units offered to assist with equipment placement and technology support services as a way to progress implementation of videoconferencing in their regions. While school districts lacked videoconferencing systems and technology expertise with the equipment, most regional Intermediate Units were familiar with the technology. Thus, two additional school districts were identified as potential sites for the study based on the conversations with the Intermediate Units. Successive meetings were scheduled with the two respective school district elementary principals and other designated staff.

Although these school districts conveyed an interest in participation, they needed time to disseminate the information to their teaching staff in order to learn whether a teacher would be willing to serve as a host site for the study. Each school received a follow-up e-mail that included an IRB approval letter for the study (Appendix J) and copies of the parental/guardian permission for child to participate in a research study, minor assent form, and adult consent to participate in a research study (Appendix K). The e-mail requested confirmation of interest in approximately a 2-week period. The researcher followed up with telephone calls and e-mails during this 2-week period, but the status of interest in being part of the study remained elusive. To entice feedback, she even sent an e-mail listing potential kindergarten content provider programs.

While the researcher waited for the schools that expressed interest in participation to affirm their intended willingness to be involved in the study, she took advantage of the time to make another round of inquiry phone calls and e-mails to additional schools. The majority of the telephone calls and electronic messages remained unanswered, while other school districts replied that they either lacked videoconference capabilities on the district level or at just the elementary level. At this point, about 6-weeks had transpired since the original inquiry. Vague responses to the participation invitation made the researcher reconsider potential site prospects in addition to the methods used to attract or advise them about the opportunity.

Access consideration in terms of a research site. The researcher's intuition (Stake, 2000) guided ensuing contacts. While public schools seemed to represent the best choice for participation at the study's outset, access was obviously limited. Part of the inaccessibility may be accounted for in terms of the low number of districts that have videoconferencing capabilities in Southwestern Pennsylvania. This issue was realized during the pilot study. However, the month-long lag in confirmation or rejection of interest to participate in the study after positive attitudes expressed in initial meetings with the schools was troublesome. While specific reasons for this lag in information were not given, the researcher surmised that the length of the study and approval procedures within the districts limited their willingness to participate in the study, despite the promised benefits of coordination of classroom to classroom interactive videoconferencing sessions and procurement of content provider programs.

During the researcher's course of study at the university, she provided technology professional-development seminars for several schools. Several of them also had videoconferencing equipment installed. In fact, she even assisted in the implementation of some of the videoconferencing systems. After assessing the likelihood that one of the previously identified schools would respond in a timely manner, she made a phone call to a diocesan school known for its technology integration. The researcher explained the need for a school site for the dissertation and asked whether they might be interested in joining the study. The school's principal eagerly agreed to discuss the matter with the kindergarten teaching staff and requested a few additional days to review the matter.

While the diocesan school considered whether they would participate in the study, the researcher learned about additional procedural requirements at one of the interested schools. Based on their internal approval process, the estimated time to approve a study was up to 6 weeks. In her experience, school district approval methods varied greatly. Authorization in the pilot study school district was not cumbersome. In fact, the elementary school librarian spearheaded the entire process. The same could not be said of the school districts considering involvement in the dissertation study. While the researcher had some leeway as to when the study would start, the prolonged 4 month duration of the dissertation research required commitment by the end of October. Negotiating access takes several weeks depending on the district's plans. In the pilot study, it took a month from the time the superintendant signed off on the study until the first day of observation. The same was anticipated for the dissertation. The researcher wanted to begin the study well before late November due to the number of days that school is closed between Thanksgiving and New Year's Day.

By the second week in October, none of the three original school districts that expressed an interest in the study (one from the videoconferencing listserv and two through the Intermediate Units) responded positively or negatively. No response was received. Shortly after talking with the diocesan school for the first time, they indicated that they were amenable to taking part in the study. The researcher determined that working with a diocesan school with wide open access was preferable to waiting for the nonaffirming schools. Indeed, putting closure to this matter rejuvenated her enthusiasm. Letters to the interested schools informing them about the selection of a site brought quick replies of "all the best" (personal communication, interested school, October 10, 2007) and "good luck" (personal communication, another interested school, October 12, 2007). The researcher perceived that the schools that expressed an interest in the study but had not responded were genuinely supportive of the research effort.

The researcher was surprised that more school districts did not want to take advantage of the benefits of the study—coordination of classroom to classroom videoconferences and procurement of videoconferencing content programs. These incentives did not seem to persuade the teachers. The lack of communication was also puzzling. It was not as if participation in the study was completely out of the question; instead it seemed as though decision making was very slow. Could the timing of the invitation been handled differently? The request was sent in August, shortly before teachers and staff started back to work for mandatory in-service days (late August through early September). Coordinating the invitation to coincide with the start of school was not considered since the first few weeks of school are hectic for teachers, students, families, and administrators. Thus, while the researcher tried to reevaluate whether another participation announcement strategy might have worked more favorably, no definitive answers surfaced.

Six sampling strategies. Curtis et al. (2000) inferred six characteristics of sampling strategies for qualitative research based on the work of Miles and Huberman (1994b, p. 34 as cited in Curtis et al.). Table 10 lists Curtis et al.'s roster of sampling strategies and describes how the researcher met these sampling issues in the dissertation study.

The purposeful sampling strategy narrowed the choices for participant sites to a small group of schools that used interactive videoconferencing in their elementary schools. Final determination of a participant site considered characteristics associated with wide access to learning, a willingness to experiment with the technology, an appreciation for videoconferencing coordination and procurement benefits, and an opportunity to generate plentiful data about the happenings and emerging inquiries of kindergartners involved in interactive videoconferencing learning activities.

Table 10

Curtis, Gesler, Smith, and Washburn's (2000) Sampling Strategy Issues and Their Influence on the Sampling Decisions.

Attribute #	Sampling strategy (Curtis et al., 2000)	How Curtis, Gesler, Smith, and Washburn's (2000) sampling strategies issues informed the decisions of this study
1.	The sampling strategy should be relevant to the conceptual framework and the research questions addressed by the research. (p. 1003)	Results of the pilot study met the criteria about whether the sampling strategy was relevant to the conceptual framework and research questions.
2.	The sample should be likely to generate rich information on the type of phenomena which need to be studied. (p. 1003)	Results of the pilot study met the criteria about whether the sampling strategy would generate rich data about the phenomena.

Table 10 (*continued*)

Attribute #	Sampling strategy (Curtis et al., 2000)	How Curtis, Gesler, Smith, and Washburn's (2000) sampling strategies issues informed the decisions of this study
3.	The sample should enhance the 'generalizability' of the findings. (p. 1003)	The fundamental answer of whether the sample enhanced the generalizability of the findings was met by the results of the pilot study. In the earlier trial, the choice of a single, public kindergarten classroom provided plentiful data in the forms of rich, thick, and detailed field notes as well as videotapes and transcripts from two interactive videoconferencing sessions. Founded in context of their naturalistic surroundings, dialogue from students, teachers, and distance participants was analyzed to investigate the nature of their emerging inquiries in the form of meaning making. Thus, while the pilot study represented a specific case study, the natural settings and student and teacher interactions depicted information typical of the happenings in a Pennsylvania kindergarten classroom including emphasis on the arts and humanities, mathematics, physical education, social development, reading, writing, speaking and listening, science and technology, environmental ecology, and social studies (PDE & PDPW, 2006). The internal validity of the study was taken into account through the planned, extended duration of the dissertation study. In addition, the lengthy sampling strategy aided in generalizability of findings considerations.
4.	The sample should produce believable descriptions/explanations (in the sense of being true to real life). (p. 1003)	Results of the pilot study met the criteria about whether the sampling strategy would produce believable results.

Table 10 (*continued*)

Attribute #	Sampling strategy (Curtis et al., 2000)	How Curtis, Gesler, Smith, and Washburn's (2000) sampling strategies issues informed the decisions of this study
5.	Is the sample strategy ethical? (p. 1003)	This question represented an extremely important aspect of doing research with young children. This point was underscored by multiple researchers (Eisenhart, 2001a, 2001b; Glaser, 2002; Goldstein, 2007; Gordon et al., 2001; Holt, 2004; Matthews et al., 1998). The Institutional Review Board (IRB) approval letter and approved consent forms, permission forms, and assent forms demonstrated that from the conception of the study, considerations about the ethical issues involving children and adults were at the forefront of the study's design.
6.	Is the sampling plan feasible? (p. 1003)	The slim number of responses to the participation invitation in the dissertation study required the researcher to augment the criteria for selection within the study. This included consideration of schools willing to receive videoconferencing and technology support from their Intermediate Units as well as some nonpublic schools that demonstrated interactive videoconferencing capabilities. In its original form, the plan was not feasible. Hence, the researcher amended the sampling plan to make it realistic given the constraints.

Ethical Considerations

The research posed no greater than minimal risk to human subjects. Multiple levels of consent and assent forms provided information to participants about the purpose, risks, and benefits of the study. Adults in the study completed consent forms while the kindergarten students signed a minor assent form that described the purpose of the research from a child's point of view. In order to participate in the study, parent/guardian permission forms were required for all children. Parents and guardians received a packet of forms that explained the purpose of the research study; provided copies of permission and minor assent forms; described the benefits of the study; and lastly and importantly advised the parents about confidentiality and the use of pseudonyms for all participants. In addition, the research design focused on ethical issues surrounding entrance and exit from the study, data collection, content programming, and developmentally appropriate uses of technology.

During the last three decades, children's depictions in qualitative research changed (Christensen & James, 2000; Holt, 2004; Matthews et al., 1998). The passé view examined children as incomplete adults that emphasized what they lacked before maturing into grown-ups (Hendrick, 2000; Matthews et al.). Matthews et al. referred to this research representation as a shift from working on or for children to working *with* children (p. 311). This outlook raised questions pertaining to ethical issues including informed consent and assent. Holt remarked, "Particular ethical issues arise when researching with children, which are underpinned by children's relative powerlessness in society" (p. 13). Children's depictions were not the only aspect of qualitative research to change in the latter part of the 20th century. Views about culture within educational research also transformed. Society was no longer recognized as a coherent unit linked by a common vision; "Instead society is seen as multicultural, comprising a complex myriad of different socially defined (constructed) groups each with their own `ways of seeing'" (Matthews et al., p. 311). These alterations in the portrayal of children and culture in educational research necessitated revised outlooks about empowering the words of students.

In both the pilot study and the dissertation, illustrating the voice of the children represented a major issue. When adopting this mindset, children are portrayed as competent social actors in their own right (Hendrick, 2000; Holt, 2004; Knupfer, 1996; Matthews et al., 1998). Holt (2004) emphasized the need to “promote empowering research relations through learning the lives of children” (p. 14). Within this study, dialogue illustrated the thoughts, understandings, and interpretations that students constructed during the interactive videoconferencing sessions. According to Knupfer (1996), an important way to showcase the children’s world is “[b]y incorporating lengthy samples of the children’s narratives into the ethnography” thereby presenting “…a sense of time and interrelationships alongside my interpretation” (p.144). Likewise, the results section of this dissertation included lengthy passages of dialogue in addition to the researcher’s interpretation of the goings on.

Participant Site Description

Lovand Catholic School

The kindergarten classroom selected for the study resided in Lovand Catholic School, a three-story, urban school located in Southwestern Pennsylvania. The top two floors of the building were dedicated to academic classrooms and administrative rooms along with the school’s library. An integral gymnasium connected to one side of the school while their local parish’s church connected to the opposite side of the building. The band room and the nutrition center were located on the basement level. Lovand had 10 grade levels from prekindergarten to the eighth grade and their total enrollment was approximately 160 students. The school employed 12 full-time teachers, a principal, four support personnel from the local Intermediate Unit, and two part-time aides in both prekindergarten and kindergarten. Besides academic content areas, students also studied art, music, band, Spanish, physical education, religion, and technology/computer education. The school supported several afterschool organizations and activities including athletics, forensics, yearbook, and science clubs. Optional after school care was provided for students until 6:00 p.m.

Students at Lovand Catholic School scored above average on Terra Nova standardized exams for reading, mathematics, social studies, and science (SOURCE and details after next visit) in Grades 3-8. The school contained many types of technology tools for the students including a 25 PC based computer lab, wireless networking, three interactive white boards, a mobile, wireless cart of 20 Dana keyboards, several projectors, and a Sony PCS1 interactive videoconferencing system with NEC flat panel display monitor. Students resided in several nearby jurisdictions. Some students took public school busses to school, while others walked or were transported by parents or guardians. The school year started in the last week of August 2007 and ended in late May 2008. The school calendar was 180 days long. The school day commenced at 8:00 a.m. and dismissed at 2:30 p.m.

Mrs. Hartman's Class

Mrs. Hartman was a confident, energetic kindergarten teacher. This was her fourth year of teaching kindergarten full-time at Lovand Catholic School. Previously, she taught fourth and fifth grades at Lovand for 4 years. She started her teaching career at the school as a substitute teacher. As school needs changed, Mrs. Hartman moved from teaching fourth and fifth grade science to instructing the kindergarten classroom.

The classroom was located on the first floor, diagonally across from the main entrance of the school and opposite the main office. Figure 5 exhibits the layout of Mrs. Hartman's classroom. The classroom population consisted of 25 students—12 girls and 13 boys. The average age of the students at the beginning of the study (October 2007) was 69 months old, or 5 years and 9 months old. The range of ages was from 57 months to 82 months old. Two students in the class, one boy and one girl, repeated kindergarten. Nineteen of the students remained for full-day kindergarten while six students stayed for morning or half-day kindergarten that ended at 11:00 a.m. (lunch time). Morning students sometimes remained at school for afternoon activities such as celebrations on holidays (Halloween, Thanksgiving, Christmas, and Valentine's Day) as well as for other specially planned events. When the school day required a delayed start to due weather problems, morning students started at 10:00 a.m. and remained until the close of school at 2:30 p.m. Thus, it was always important for the researcher to check the calendar.

Figure 5. Mrs. Hartman's classroom pictures.

Academic content transpired in the mornings between 8:00 a.m. and 11:00 a.m. while the afternoons included lunch, recess, rest time, learning centers, story time, and dismissal. Appendix L shows the full weekly schedule for kindergarten. Subject areas included language arts, small group reading, math, science, Spanish, religion, computer, and gym. Art and music were incorporated into other subjects. During the 2007-2008, Mr. Hartman used the Harcourt Trophies Reading Kindergarten Curriculum, the DASH science program, and the Harcourt Kindergarten Mathematics Series. This was the first year of the school using the mathematics curriculum and Mrs. Hartman used the series in conjunction with calendar time as indicated on the daily schedule.

The Learning Center activities engaged the students in playful forms of learning, group activities. Each day, students place a name card with their name on the front and Velcro on the back beside a learning center name where they wanted to play. The learning center names were displayed on an easel. These included seven areas (Figure 6): blocks, painting, shelf games, play-doh place, inventor's corner, creation station, and discovery space. The blocks area (Figure 7) remained a favorite pastime for the children as they built towers, roads, cities, and other structures with their friends. Students enjoyed using different kinds of paints on different kinds of paper at the painting station (Figure 8). Sometimes they opted for watercolors, but most of the time they wanted to use tempera paints. They wore large T-shirts to protect their clothing from the paint and covered the desks first with old newspaper. Shelf games (Figure 9) featured a wide variety of board games such as Don't Break the Ice™, checkers, Ker Plunk™, bingo cards, Memory™, construction sets, and more. Play-doh place (Figure 10) permitted the students to make creations out of the clay like substance with kitchen utensils and other fun apparatus for molding the dough.

The inventor's table (Figure 11) was the most popular learning center that included lots of recycled, clean trash to be taped, glued, colored, and decorated into new inventions and creations. Families routinely sent their paper towel paper rolls, pie tins, and many other discarded household items into the kindergarten classroom. These items were transformed into masterpieces in the eyes of the kindergarten students. They also used massive amounts of masking tape to hold their concoctions together. Creation station (Figure 12) was an all purpose arts and crafts area where children colored pictures, made greeting cards, assembled collages from construction paper, strung necklaces and bracelets, and had the opportunity to cut, glue, staple, punch holes, and fold in order to make paper-based art. The discovery table (Figure 13) showcased current curriculum themes through the display of books, puzzles, and other artifacts relevant to the learning units. Its goal was to provide additional information about specialized unit. For instance, at the end of February, the entire table was filled with dinosaur artifacts, characters, and books. Children could also assemble puzzles (Figure 14) at the discovery table area.

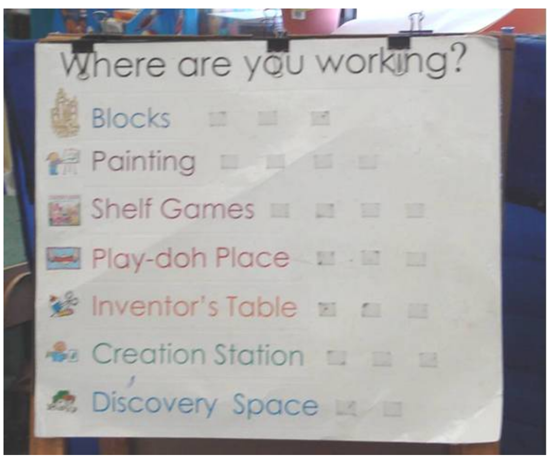


Figure 6. Learning center easel indicating seven areas of activity.

Figure 7. Blocks.

Figure 8. Painting supplies on rolling cart.

Figure 9. Shelf games with play-doh on the top.

Figure 10. Play-doh tools.

Figure 11. Inventor's table.

Figure 12. Creation station.

Figure 13. Discovery table.

Figure 14. Puzzles at the discovery table.

Teacher Promotion of the Research

It was important to recognize the role of the teacher as a research advocate. Although parents and guardians received permission forms about the research study, they were slow to return them. One parent originally returned a form indicating that they did not want their child to participate. In both the pilot study and the dissertation study, the teacher received affirming permission forms for all of the children in the class. The researcher had little influence in this context except to persuade the teacher to talk with the parents and guardians. The teacher’s motivation to attain full participation for the study overwhelmed the researcher with gratitude. During the IRB phase, contingency plans were considered in the event that some students were not permitted to participate. However, no alternate arrangements needed to be made. Mrs. Hartman approached the parents and guardians individually during end of the quarter parent/guardian conferences. This one on one opportunity provided the teacher the perfect opportunity to share a wealth of knowledge with the adults while casually requesting their endorsement on the permission forms.

Negotiation of Entry and Identity into the Classroom

Negotiation of entry, the researcher's role, and access to the classroom overlapped one another in terms of timing, consideration, and interrelatedness. Access was an important topic for the qualitative researcher. Without access, the researcher may not have been privy to scenes that explained behavior and dialogue. Despite naïve thoughts of finding a research site, efficiently accumulating all consents and assents, and just entering a classroom, these ideas fall quickly by the way side after reading the thoughts of more experienced field researchers such as Holt (2004) and Delamont (2002). Delamont (2002) discussed the importance of first impressions. The researcher's previous experience as a professional development trainer for K-12 teachers placed her inside many schools. Thus, she had some familiarity with the kind of attire necessary for spending mornings and afternoons in kindergarten. Kindergarten is a messy place. Wearing business attire and dry cleanable clothes can make a big difference in the way a researcher interfaced with students. Fortunately, from the researcher's experience, kindergarten teachers take classroom participants (whether students, parents, researchers, or other visitors) under their wing and advise them about best approaches to take in the form of attire and position. Thus, considerations about negotiation and entry were also prefaced from the point of view of the kindergarten teacher's expertise in nurturing the classroom adults into position.

After receiving permission forms from the parents and guardians as well as the consent forms from the teachers, the next step involved the creation of an entry strategy. Erickson (1986) recommended careful negotiation of entry to enhance mutual trust between the research and participants, thereby permitting broad situational availability. Part of this plan involved the cooperation of the kindergarten teacher. No matter what the strategy devised by the researcher, execution of the strategy depended on the authority of kindergarten teacher.

Consideration about the researcher's role needed to be contemplated before gaining access to the classroom. As Goldstein (2007) remarked, "As a qualitative researcher, my intent was to observe my participants' typical daily practices in a naturalistic manner and to remain unobtrusive to the degree possible for a strange adult in a kindergarten classroom" (p. 43). Holt (2004) referred to her negotiation of position in the classroom as that of the "least-adult role" (p. 19). In this position, she attempted to create a persona void of disciplinary responsibility and authority and made a "conscious effort to perform [her] identity in nondominant ways, in order to deconstruct hierarchical adult/child relations" (Holt, 2004, p. 19). Within this study, the researcher adopted a least-adult role whenever possible in order to provide distance between the role of the authoritative adult (teacher) and that of the researcher. This approach provided a more opportune position to witness events from a child's point of view. Likewise, this attitude assisted her in empowering the voice of the children by becoming familiar with their language, culture, and meanings. The researcher avoided disciplinary authority, except in cases of physical harm.

Thus, the researcher planned to assume a least-adult role (Holt, 2004; Lappalainen, 2002) and it was necessary to describe to the teacher that while in this position, she would move about the room taking field notes and observing the activities of the children. The researcher that she did not want to be known as a teacher (although at times she was introduced this way) and did not seek to assume a position of disciplinary authority unless a student was in a dangerous situation (Lappalainen). In the beginning, the researcher decided to take the lead from the teacher concerning when she would be introduced, where to sit, and when to interface with the students directly.

Matthews et al. (1998) reduced best practices when working with children in a research study to a short and easy to follow list. These considerations included

1. Getting the balance right
2. Establish ground rules [in terms of student participation in the study]
3. Provide a comfortable setting
4. Communicate clearly [in terms of thinking about how the researcher will interact with the students (e.g. gazing directly into the face of the child and talking about the researcher's purpose in terms that a child can understand)]
5. Listen and respond
6. Encourage openness [in terms of answering questions directly and respecting a child's question]
7. Be flexible
8. Anticipate some lack of interest

9. Dealing with distress [in terms of following the model of the teacher and making sure no harm comes to a child]

10. End positively (pp. 317-318)

While these issues may appear simple at first, Matthews et al. (1998) urged graduate students to consider these matters prior to entry in the classroom. The researcher contemplated these issues to ensure the best response possible in the event these situations arose. During the duration of the study, all of these best practices came into play.

The researcher anticipated answering questions such as, "Who are you? What is your name? Why are you here? What are you doing? and What are you writing about?" As in the pilot study, the researcher ascertained that she would wait for the teacher to introduce her to the class, but that she would answer these questions directly if situated in an appropriate setting. For instance, she planned to talk openly with children during snack and learning centers time while leaning away from talking during instructional instances. While these matters may seem to be just a matter of common sense or good judgment, they assisted her in preparing for her shifting roles as a participant observer, doctoral student, kindergarten aide, playmate, ethnographer, and writer. Some of the considerations contemplated before entering the classroom included

1. In order to let the students know that she would not be a disciplinarian, the researcher anticipated being tight lipped except in the case of physical danger to the teacher or students;

2. She aimed to be a good listener, particularly in terms of the students. A teacher's time is very limited in terms of time to hear stories from all students.

Conversely, she needed to make time to hear these stories, to become an accepted member of the classroom, and to fit into the children's world (Lappalainen, 2002);

3. The researcher also needed to learn and follow the same rules as the children, trying not to step into the adult world. For example, she planned to avoid coffee as this is often associated with an adult role. However, when children sat or stood for a specific purpose (e.g. singing, reciting, or courtesy), she planned to follow the same rules; and,

4. The researcher intended to answer questions honestly and at the right level. For instance, during the pilot study students often asked questions, especially about what she was scribbling. In these instances, she reiterated that she was writing a story about the class' videoconferencing experiences. During the pilot study, students also asked the researcher if she was writing about them specifically. The intended response was that she was writing a story about the whole class.

The final action in negotiating initial access coincided with the completion of the minor assent forms. The researcher formally told the students why she was there while pointing to the picture of the videoconferencing equipment. This let the children know her purpose. It also started a dialogue about interactive videoconferencing in the classroom. Students were also told about some of the upcoming videoconferencing programs. To complete the minor assent forms, the children were instructed to write their names on the top line of the page. She then read the form to the students indicating the purpose of the story and asked them to listen to the rules. She informed them that if at anytime they felt uncomfortable, they should find a teacher or another adult. Students indicated that they understood the rules by once again printing their names at the bottom of the page. While the researcher imagined this process would take several minutes, the actual execution was very swift with few questions. The students followed the lead of the teacher and expeditiously completed the forms that were collected by the researcher.

The Role of the Classroom Researcher

The researcher sought to understand how the students and teachers determined meaning, made choices, and related to activities within the sociocultural context of the kindergarten setting (Erickson, 1986). This included influences from local and nonlocal members. In the case of interactive videoconferencing, the interpretation of the local and nonlocal impact was literal. Local influences included the teachers within the building, the principal, parents, federal and state regulations such as resource allocation, and the students. When utilizing videoconferencing, nonlocal influences included students, parents, teachers, principals, experts, and students at the remote site. Additionally, culture—"learned and shared standards of perceiving, believing, acting, and evaluating the actions of others" (Erickson, p. 129)—was a nonlocal influence. For the researcher, these learned and shared standards alternated between being outside of her consciousness as well as within their awareness. As the study proceeded, she became more attuned to the culture of the classroom.

The ethnographer's role represented a balancing act. On one hand, ethnographic methods tend to be very expressive and feature thick, rich description, dialogue, and twists of plot that carry the reader through a story involving the researcher and the culture or subculture. On the other hand, the research needed to draw the reader into a believable tale. Input considerations were heeded to validate both the description of the situation, the interpretation of the data, and the understanding by the researcher. Ethnographers are risk-takers. They must be vulnerable and willing to divulge emotions, description, and personal information to participants and their readers. All the while, they must balance rigor and imagination opposite one another (Ellis & Bochner, 2000).

Data Collection

In the Field

Field Notes and Journal Entries

Data collection included the recording of handwritten field notes during daily classroom activities from October 2007 through February 2008. General hours of observation occurred from 8:30 a.m. to 2:30 p.m. However, some days the researcher staggered her hours to observe children at the beginning of the day or stayed after the children were dismissed. The first month in the field produced volumes of handwritten notes detailing the children’s personalities, daily patterns, and information about the interactions between the teacher and her aide, Mrs. Hartman Mrs. Sullivan respectively, and the students. They also emphasized how the children reacted to the researcher and her thoughts and responses to this busy environment.

The researcher reviewed the content and ideas of the field notes daily after the students left for the day. Once field notes were reviewed, journal entries were recorded that expounded upon the happenings of the classroom. Classroom activities changed quickly and sometimes field notes represented a quick scrawl. Journal entries were made to elaborate on the daily recordings and also served as a repository for reflections, questions, and answers to other ruminations. Handwritten notes were used for recording field notes.

An example of the content from a field note follows. Each month, the kindergartners made quilt squares out of construction paper shapes (e.g., triangles, squares, and rectangles), glue, and stickers. In January, the students were assembling their fifth quilt square of the school year that featured a snowman theme. It was difficult for the kindergartners to turn their paper shapes in just the right way to make the quilt square patterns. Mrs. Hartman clipped a sample quilt square to her easel so that the students could glance up and look at the final design. Making quilt squares was a messy, gluey process. The sample field note occurred on a wintery day when the kindergartners were making their snowmen quilt squares.

> Ten students are missing. At first I thought I got my days mixed up and that they [the students] went to be computer. The students are still being tested. Because we are making quilt sq. [squares], we kept the group [of students] that had more students. The kids are getting really good with the quilt sq. Ben and Deon squeezed me after I got glue all over me.
>
> Deon asked me if we were going to do a videoconference about dinosaurs.
>
> (January 17, 2008)

Sometimes, the researcher used a personal laptop computer in the classroom to take care of videoconferencing issues surrounding the coordination of the sessions. Details concerning times, dates, addresses, and content of the interactive videoconferencing events were often answered with a short e-mail. The benefit of this approach was that it permitted the researcher to ask questions to Mrs. Hartman during the afternoon when the children were engaged in their learning center activities. This was a lively period of the day when the researcher and Mrs. Hartman often exchanged plans for upcoming events. It was easy and efficient to send e-mails to distance participants while both were thinking of the matter; it was more difficult to coordinate these activities after the school day ended. Special care was taken to always store the laptop along the side of the room in a brief case so that the children would not be harmed. Likewise, the laptop was not damaged due to these precautionary measures.

Memos

Evenings and weekends were a time of reflection, augmentation, and clarification. After a fast-paced and tiring school day, the researcher expounded on the field notes and journal entries of the day through memo writing. This writing incorporated scribbles from the field notes and ideas from previous memos. Memo writing enabled her to discover answers to questions that she didn’t have time during the day to contemplate. Likewise, it produced new inquiries based on these interpretations. Memo writing helped to prepare the researcher for the next day of participant observation. Sometimes, she wrote notes to herself indicating areas where she wanted to focus during the next day’s activities. As she became more of an insider in the classroom, the memos revealed more personal encounters with the students and teachers and an increased sense of belonging on the part of the researcher.

Classroom Artifacts

Children’s and classroom projects also served as artifacts. The researcher took photographs of individual student and group projects as evidence of work and to portray the children’s ambitious efforts. During the pilot study, many drawings were included in the data collection process. In the dissertation study, most of the artifacts collected related to lesson plans in preparation of the interactive. For instance, students made worksheets about the phases of the moon for their science binders. They also completed coloring books for two of the units—backyard birds and planets.

Videotaped Interactive Videoconferencing Sessions

One of the primary benefits of the pilot study was to develop a set of procedures for capturing data both in terms of manual field notes and especially in the taping of interactive videoconferencing sessions. Appendix M describes audio and videotaping considerations addressed in the pilot study. The following process does not describe best practices in terms of how to teach with interactive videoconferencing. Instead, the next section describes the procedures to precisely video record the interactive sessions inside Lovand School beginning with setup on the day before the videoconference and ending with receipt of the transcribed text document. The equipment list is located in Appendix N and outlines all of the equipment used and its purpose. Test calls for all videoconferencing sessions were placed days or weeks before the event to ensure optimal connections. Seven interactive videoconferencing sessions were planned over the course of the 4-month period.

Procedures

Prior to participating in the interactive videoconferencing sessions, the researcher prepared to capture the events using two video cameras as tested in the pilot study. The use of two cameras featured two advantages. First, each video camera netted a different view of the same event. Second, in the event of a camera recording malfunction, whether human or mechanical, there was always a backup recording of the dialogue and occurrences.

The interactive videoconferences took place in Lovand Catholic School's library on the second floor of the school—one floor above the kindergarten classroom. The cable Internet connection for the videoconferencing equipment was located in the library. The videoconferencing equipment was not mobile, so all of the sessions occurred in the library. Figure 15 depicts the two layouts of the room during videoconferences. Sometimes the children sat at tables so that they could work on a surface during the videoconference. Most of the times, they sat together with their legs crossed, just like they did in their classroom reading areas.

Figure 15. Library setup showing tables and videoconferencing equipment.

The Procedure Checklist for Taping Videoconferencing Sessions (Table 11) indicates the sequential procedures the researcher followed starting the day before the videoconference. Rather than describe each line item, only a few key items are highlighted. The checklist is broken into three sections: day before the videoconferencing event, day of the videoconferencing event, and finishing procedures for the movie files to be used for data analysis. Once the students arrived in the room, there was little time to make adjustments or plan. Typically, the children walked into the room and the videoconference commenced momentarily. Therefore, it was very important to set up the room in an orderly fashion so that the process flowed from connection with the distance site and right through until the end of the videoconference. The day before the videoconference, the most important detail was to make sure that the confirming details of the videoconference (contact name and organization, telephone number, time of the session, and IP address) resided on the videoconferencing cart. The confirming e-mail information was always in a set place.

On the day of the videoconferences, the researcher spent about an hour before the videoconference making sure that items 6-17 in Table 11 were done and ready by the time the students entered the classroom. Sometimes, the videoconference call did not go immediately through or was lacking—either in audio or sound. In these cases, having a cell phone readily available was a blessing in order to report problems to the remote site (e.g., a content provider or remote classroom). Within a matter of just minutes, trouble shooting calls resolved the problems before or as the students entered the library. Items 18-28 related to procedures during the videoconference.

The last five items, 29-33, occurred after the videoconference was over, sometimes even a few days after the event. These five procedures were important for creating digital formats of the movie files. DVDs enabled the researcher to review the videos multiple times. MP3 or audio files were made for transcription purposes.

Table 11

Procedure Checklist for Taping Videoconferencing Sessions

Item	Check √	Description
Day before the videoconferencing event		
1.	□	Charge video camera batteries.
2.	□	Print confirming videoconference e-mail including time, telephone number, and Internet address beside the Sony videoconference unit.
3.	□	Discuss arrangement of furniture in room with Mrs. Hartman.
4.	□	Arrange furniture in room.
5.	□	Position audio visual aids (atlas, book, poster, or artifact/project) in the room, if possible.
Day of the videoconferencing event		
6.	□	Move audio visual aids that could not be moved the day before into the library.
7.	□	Set up two video cameras on tripods in the library.
8.	□	Locate additional mini-DVDs by the Sony camcorder—to be swapped when the 30-minutes length expired.
9.	□	Attach the microphone to the Sony videoconferencing unit and turn it on.
10.	□	Position the speakers of the Sony videoconferencing system.
11.	□	Turn on the Sony videoconferencing system.
12.	□	Turn on the monitor.
13.	□	Remove the monitor and videoconferencing system remote controls from the cart and position and place them on the researcher's notebook.
14.	□	Put cell phone on researcher's notebook.
15.	□	Place the videoconferencing IP phone call to connect with the distant site.
16.	□	Mute the microphone so that as the children file into the room, there is no sound disturbance.
17.	□	Turn on the video cameras.
18.	□	Children enter the room with Mrs. Hartman. The teacher announces final instructions to the students. Last minute adjustments.
19.	□	Unmute the microphone.
20.	□	Start the videoconference. Keep eye contact with the teacher, students, monitor. Zoom and pan camera to meet demands of the session.
21.	□	Take notes and record follow up questions.
22.	□	After 30 minutes, swap the Sony mini-DVD.

Table 11 (*continued*)

Item	Check √	Description
23.	□	Conclude the videoconference by saying goodbyes and muting the microphone. Hang up the videoconference.
24.	□	Teacher leads summary of the event with the class and others participating in the library.
25.	□	Children line up at the door and return to their classroom downstairs.
26.	□	Turn off monitor and videoconferencing unit.
27.	□	Turn off microphone and put in cart along with the speakers and remote controls.
28.	□	Put away video cameras and tripods. Store media in DVD cases.
Finishing procedures for the movie files to be used for data analysis		
29.	□	Finish the Sony mini-DVDs inside the camcorder so that they may be played as DVDs in other devices such as computers and DVD players.
30.	□	Convert the JVC video files on the camcorder's hard drive into DVDs for playback in computers or DVD players.
31.	□	Convert the Sony and JVC DVD movie files into audio MP3 files.
32.	□	Upload the MP3 files to the transcription provider so that the audio files may transcribed into text files.
33.	□	Download the text files when notified that they are transcribed by the transcription service.

Transcriptions from Tape

Transcription represented an arduous task for the researcher. Transcribing an hour of audio files into text files takes many more hours than the actual length of the tape. The researcher was unskilled at transcribing audio files into text and she was also in the classroom as a participant observer for 30 or more hours per week. Therefore, a decision was made to pursue using a professional transcription service. Similar decisions were evident in other qualitative-research studies, especially in health related research (Howard, Kaljee, Rachuba, & Cross, 2003; Watkins, Green, Goodson, Guidry, & Stanley, 2007; Yoo, Johnson, Rice, & Manuel, 2004). Advantages of using a transcription service included significant time savings for the transcription (Labaree, 2006), freeing time for data analysis and interpretation (Labaree), and receipt of a word processing file. The researcher located a transcription service organization that specialized in doing transcription for educational research. In addition, the service did not shy away from the challenge of transcribing young students' voices, offered secure, encrypted Internet upload and download features, and signed a confidentiality statement. MP3 files were uploaded using secure file transfer protocol software to the service's web server. Special instructions included attention to transcribe the files verbatim with words such as "oh or umm." In addition, the researcher requested that noises such as laughter or clapping also be notated. In less than 2 weeks, the transcribed files were sent to her e-mail address in the form of word processing documents.

Before each videoconference, the researcher reviewed the library's physical setup needs with Mrs. Hartman and planned what furniture needed to be moved. Other considerations included the necessity of including props or other audio visual aids such as an atlas, book, poster, or other artifact. The afternoon before the videoconference, or sometimes very early in the morning, tables and chairs were arranged for the session. The researcher often requested the assistance of the janitor or upper level students to move tables. Smaller pieces of furniture were moved into place by the researcher and sometimes by the teacher.

Qualitative, Textual Analysis

Data collected from field notes, journal entries, and transcriptions from videotaped recordings of interactive videoconferences was analyzed using open coding techniques with the support of the ATLAS.ti (Muhr, 2004) software. The overall goal of the analysis was to uncover the happenings and settings and find emerging patterns of meaning making in the dialogue transcriptions from the interactive videoconferencing sessions. Strauss and Corbin (1998) defined coding as the "analytic process through which the data are fractured, conceptualized, and integrated to form theory" (p. 3) where the aim of open coding was "to discover, name, and categorize phenomena according to their properties and dimensions" (p. 206). Open coding efforts considered the knowledge gleaned from several days of participant observation in the classroom. The implications for this coding therefore brought in previous experiences with the teacher and students outside of just the interactive videoconferencing sessions. The researcher considered this background contextual effort while determining the codes.

ATLAS.ti Software as a Tool

The ATLAS.ti software provided a powerful computer assisted qualitative data analysis tool to portray the analysis process through coding, organize the plentiful data, "publicly disclos[e] the methodological rigor and analytical defensibility of qualitative research" (Anfara, Brown, & Mangione, 2002, p. 28), and to create concept maps to visualize the meaning making of the kindergarten students. A student license of the software was purchased for the study. Details about decision making didn't remain hidden; instead they were put on the stage for all to see (Anfara et al.). The ATLAS.ti software provided windows for the researcher to follow the analytic process. The software is based on a grounded theory approach and assisted in substantiating the rigor and quality of the study.

The use of the ATLAS.ti data analysis software allowed the researcher to stay close to the data by linking transcription files, audio files, memos, and videos to a central source of information. Likewise, the software permitted her to associate data from multiple sources with similar themes. This represented a creative process of traditional and technological methods using textual documents, audio MP3 files, videos, axial and selective coding, diagrams, memos, and photographs into a rich amalgamation of data funds. Data analysis employed tabular strategies as recommended by Anfara et al. (2002) to examine the relationship between data sources and the dissertation research questions, the development of themes and categories, and the triangulation of findings. The ATLAS.ti software did not supplant the researcher’s skills. Rather, the computer assisted software supplemented the coding, category, and theme analysis.

Coding With ATLAS.ti

Textual records from videoconferencing transcripts were uploaded into the ATLAS.ti (Muhr, 2004) qualitative software for coding analysis. The transcript records were saved as Microsoft Word documents and assigned as primary documents (sources of data) within the qualitative data analysis software. This process associated the correct source (Word) file with the correct process (interactive videoconferencing session). Once loaded, open coding of the transcriptions began. During open coding, the transcripts were read multiple times to break down, examine, compare, and conceptualize the data. A line by line analysis of the dialogue in the transcription files identified instances where the students and teacher were establishing meaning from reception of content information, discussion of the material, answering questions, making utterances or declarations, or collaborating with those present to come to some conclusions.

The ATLAS.ti software provided easy and efficient ways to name the codes. Figure 16 shows a screenshot of the three coding options in ATLAS.ti: open coding, code in vivo, and code by list. While some code names captured the idea of the dialogue (put in an example after data analysis), sometimes the in vivo code naming method was used. This feature allowed the researcher to highlight some dialogue and use these same words as the actual code name. Examples of in vivo codes from the pilot study were two of the teacher's phrases, "listening ears" and "you become a mother here." The researcher named some of the codes after daily themes that emerged during the participant observation such as "questioning," "directions," and "problem solving." These themes represented commonalities in both the traditional classroom as well as the videoconferencing sessions.

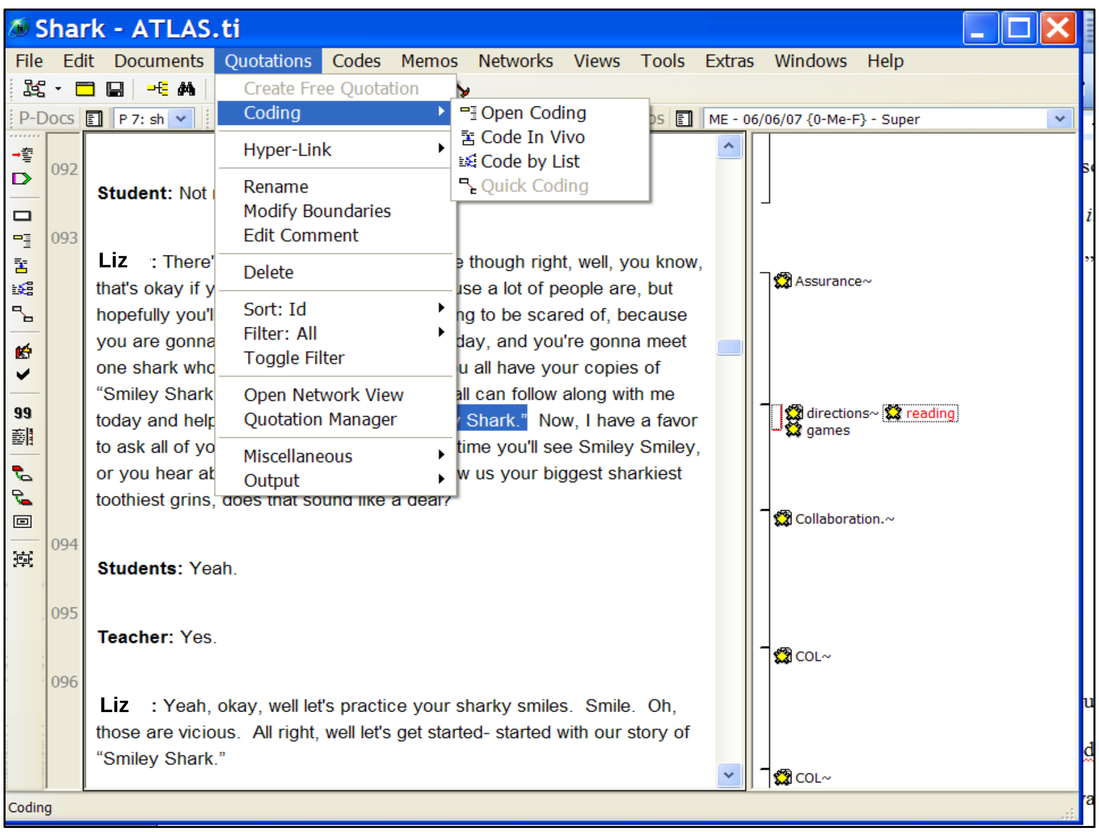


Figure 16. Screen shot of coding procedures in ATLAS.ti.

The process of naming codes was iterative. After reviewing the transcripts multiple times, some of the code names were renamed to represent a more general or contextual name. For instance, during the pilot study initial readings of the shark transcript produced codes of “certainty” and “assurance.” Later, these two codes were reduced to the single code of “assurance.” This method allowed the researcher to constantly compare data from journal entries and videoconferencing transcripts. The software also provided a memo making function in the software. This function supplemented previous memos written exclusively from field notes. Once the data was exposed in the ATLAS.ti software, the researcher used the computer assisted memo making capability to keep data analysis notes organized in the central software database. The process was dynamic in the flexibility of coding and in the capability to create and reconfigure concept maps.

Concept Maps

ATLAS.ti provides a powerful tool for analyzing qualitative data from both a textual perspective as well as a knowledge management tool. “It [ATLAS.ti] offers tools to manage, extract, compare, explore, and reassemble meaningful pieces from large amounts of data in creative, flexible, yet systematic ways” (Muhr, 2004, p. 2). While many researchers employ the software to code and categorize their textual sources of data, few explore the visualization capabilities inherent in the network view features of the software.

ATLAS.ti may be termed a cognitive tool or a technology “that engage[s] and facilitate[s] specific cognitive activities” (Jonassen, 2003, p. 372). Specifically, the ATLAS.ti software has the capability of creating a semantic network consisting of nodes representing codes and labeled links representing relationships between the codes (nodes) that provide an "intuitive graphical presentation" (Muhr, 2004, p. 217). The "networks add a heuristic 'right brain' approach to qualitative analysis" (Muhr, p. 217). Another term for a semantic network is a concept map (Jonassen, 2001). Jonassen (2003) noted that concept maps assist to depict the knowledge structures stored in the human mind (p. 372).

After coding the dialogue from interactive videoconferencing sessions, the network view feature aided the researcher in displaying the overall interactive process as well as portraying the sociocultural meaning making that occurred during the sessions. As a nouveau study about interactive videoconferencing, she sought methods to graphically represent the happenings of the interactive sessions. Jonassen (2003) asserted that "the more ways that learners are able to represent problems and domain knowledge, the better able they will be to transfer their skills" (p. 364). Therefore, the ATLAS.ti software provided a multipurpose tool to both code the conversations and envision the phenomena being studied.

The kindergarten classroom participated in six interactive videoconferences during the participant observation period and one later in May 2008. The topics covered during the collaboration sessions included (a) backyard birds, (b) the folktale *The Gingerbread Man* and related puppets, (c) birdfeeders and happy holidays, (d) Astronomy I, (e) polar world discussions about penguins and polar bears, (f) Astronomy II, and (g) a shark-content program featuring the book *Smiley Shark* (Galloway, 2003). The next section describes the interactive videoconferences in more detail. A calendar showing the dates and times of the interactive videoconferencing events appears in Appendix O. Pseudonyms were used for all participants and their institutions.

Description of Interactive Videoconference Sessions

At the beginning of the participant observation, the researcher discussed possible topics for the interactive videoconferencing sessions with Mrs. Hartman. The teacher had never conducted an interactive videoconference and wanted to know about recommended partnerships for her class. She was aware of the types of videoconferencing sessions intended for the study—content provider programs (a virtual field trip with an expert) and kindergarten to kindergarten classroom learning activities. Likewise, Mrs. Hartman previously received professional development training along with her school's faculty about planning and teaching with the videoconferencing equipment.

Backyard birds. Mrs. Hartman's first decision about videoconferencing topics was to transform a familiar science unit about backyard birds into a collaborative session. She partnered with a kindergarten classroom at St. Rose Catholic School that had a similar number of students as well as videoconferencing equipment. St. Rose is located less than 10 miles away from Lovand School. The backyard birds topic was a regular component of Mrs. Hartman's teaching schedule, but represented a new one for the kindergarten teacher at St. Rose, Mrs. Walsh. Therefore, Mrs. Hartman shared her curriculum materials with Mrs. Walsh in the form of (a) 10 backyard-bird coloring pages that could be photocopied for completion by the students along with a master coloring page that showed how Mrs. Hartman colored the birds (Figure 17), (b) a photograph of each of the 10 backyard birds that had facts about the bird on the back of the photograph (Figure 18), and (c) a back yard bird book. St. Rose's adult and student participants signed the appropriate consent, permission, and assent forms for the study prior to joining with Mrs. Hartman's class.

Figure 17. Backyard-bird coloring pages.

Figure 18. Bird photographs used for the backyard-bird videoconference.

On November 15, Mrs. Hartman's class presented pictures and facts about backyard birds to the students at St. Rose Catholic School. Lovand students sat on the floor on their "Xs." Mrs. Hartman held up pictures of 10 different backyard birds, one at a time. The birds included the (a) Northern cardinal, (b) black-capped chickadee, (c) pigeon, (d) blue jay, (e) house sparrow, (f) American robin, (g) house finch, (h) goldfinch, (i) downy woodpecker, and (j) Eastern bluebird. Her students then helped to discuss the names of the birds and facts about their colors, migration, and food preferences. After this portion of the videoconference, the children at St. Rose recited a poem/song about five kinds of birds and reviewed some bird sounds. Mrs. Hartman's class responded by saying a hand rhyme called *Two Little Chickadees Sitting on a Hill.* Then, the St. Rose students also joined in to saying the rhyme. The videoconference ended with the exuberant singing and dancing of the song *The Chicken Dance* and also known as *The Bird Dance.* At the end of the videoconference, Mrs. Hartman and Mrs. Walsh informed the students that they would be reuniting for another conference to talk about their bird-related projects that were completed after their first videoconference. Twenty minutes lapsed from the beginning to the end of the conference.

Gingerbread boy and puppetry. The backyard-bird videoconference was an example of a collaboration that did not include a content facilitator. The next interactive meeting scheduled for the study was a content provider program about The Gingerbread Boy folktale and puppets. Mrs. Hartman selected this program based on its emphasis on childhood literacy and folktales, the problem-solving exercises for comparing and contrasting folktales, the opportunity to create puppets, and the holiday oriented theme of gingerbread that is associated with Christmas. Content provider programs frequently adhere to local and national education standards so that when teachers or administrators select the programs, they provide a curricular rationale for how the distance education instruction meets their individual school's curriculum. The gingerbread and puppet videoconference followed this practice and listed the national curriculum standards met by the course. This program's standards included a focus on the interdisciplinary nature of reading, mathematics, cultural differences, visual arts, fine arts, technology, theater, visual and fine arts processes, technology as a tool for learning, and the importance of theater and its application to daily life. During the videoconferencing program, a puppetry center narrated and performed The Gingerbread Boy with shadow puppets. Students also learned about shadow puppets and the history of gingerbread and its ingredients. Lastly, students made their own gingerbread shadow puppets. For this interactive lesson, students sat at tables so that they had a level surface to work on when constructing their puppets. The duration of this session was 57 minutes.

E-mails between the content provider, Mrs. Hartman, and the researcher confirmed the date and time of the videoconference during the last week in October 2007. The content provider immediately e-mailed a lesson preparation document to Mrs. Hartman that included two learning activities. The objective of the first activity was to read four folktales and create a bar graph depicting the class' favorite story. The class read *The Gingerbread Boy, The Little Red Hen, The Tortoise and the Hare, and How the Camel Got His Hump.* After reading the stories, the kindergartners received a piece of paper that featured a character from each of the four folktales: a gingerbread boy, a hen, a tortoise, and a camel. Mrs. Hartman instructed them to color a picture from the story they liked the most. Later, she assembled the pictures into a bar graph and the students counted their favorite literature images on the graph. For the second learning activity, students compared and contrasted the sequences of gingerbread person stories, their characters, the story characters' statements, and the outcomes of the stories. The class compared and contrasted *The Gingerbread Boy, The Gingerbread Man,* and *The Gingerbread Baby.*

Birdfeeders and happy holidays. The third videoconference occurred exactly 1 week after the gingerbread and puppet videoconference. Once again, Mrs. Hartman's class connected with the kindergartners at St. Rose. Lovand students sat on their "Xs" on the floor. For this videoconference, students shared bird projects that they completed after their backyard-bird session. Lovand and St. Rose students completed bird coloring books and showed their colored images to one another. Mrs. Hartman reviewed the bird names with her students as well as the remote students and they discussed the students' favorite birds. They joked about the American goldfinch and how it could also be called the "Steeler" bird because the Pittsburgh football team, named the Steelers, sported black and gold uniforms—the same colors adorning the American goldfinch. Students at both schools showcased their birdfeeders. St. Rose students made birdfeeders out of peanut butter and birdseed. Lovand students made birdfeeders out of clear 2-liter bottles adorned with an adhesive, colored imaged of birds and filled with birdseed (Figure 19). Students presented their birdfeeders to the videoconferencing cameras while describing how they made them to the other kindergartners. Students also shared in singing holiday songs to one another.

Figure 19. Birdfeeders made by Lovand kindergartners.

It was interesting to note that during this videoconference, both Mrs. Hartman and Mrs. Walsh were already thinking about how they could collaborate again. At the close of the birdfeeder videoconference, Mrs. Hartman asked Mrs. Walsh, “What will you be studying next in science?”

Mrs. Walsh replied, “Well in January, we are doing polar world.”

Mrs. Hartman responded, “Oh, you're going to do polar worlds in January, okay. In the spring, we will be hatching chicks and maybe in the spring, we can share our chicks with you.” Mrs. Walsh thought that it would be a great idea to meet again in the spring. This videoconference lasted 20 minutes.

Astronomy I. A leading British university organized the interactive videoconferences that focused on astronomy. As part of the university’s mathematical outreach and videoconferencing series, the astronomy program was targeted for students from ages 5 through 7 years old and was offered once or twice per year. The astronomy program actually consisted of two different, 1-hour videoconferences occurring in back-to-back months. Although signups for the astronomy program were available on the university’s Web site, the available slots for the 2007-2008 school year were filled by the start of the researcher’s participant observation period in October 2007. Therefore, the researcher contacted Laura, the university's videoconferencing organizer and a mathematics instructor, directly about the potential for including the astronomy program in her research. Laura graciously expressed interest in both offering the astronomy videoconferences for the research and even recommended a potential partner school for the program. Based on this special arrangement, the researcher and Mrs. Hartman included the astronomy program in the roster of videoconferences for Lovand Catholic School.

Two university professors played integral roles in the astronomy program. Laura facilitated and organized the conferences while Elizabeth, the astronomer, instructed the children about the science concepts. The videoconferencing arrangement called for a series of two videoconferences to occur in simultaneous winter months. Preparation for the pair of collaborations coincided with the researcher's entry into the classroom in October 2007. Laura arranged for Smith Church of England School to partner with Lovand Catholic School for the astronomy collaborations. Laura introduced Mrs. Hartman to Mr. Thomas, the headmaster and first level teacher at Lovand School, via e-mail. Laura's e-mails also described the purpose of sessions, pointed the teachers to resources materials, and conveyed event information and procedures.

Table 12 shows the planning details for the astronomy videoconferences that included backup dates for the conferences in the event that inclement weather postponed or closed school in Woodview, Pennsylvania and thus prevented completion of the videoconference sessions. In fact, the second videoconference occurred on the backup date of February 14, 2008 due to a school snow cancellation on February 12, 2008, at Lovand Catholic School.

Table 12

Interactive Videoconferencing Plans with British University

Conference no.	Topic	Date	Backup date	Actual date and VC length	USA time	UK time
1	Meet one another. British university to provide the content and activities for the first VC. Astronomy content: sun, earth, moon, stars, planet solar systems, and galaxies.	Jan. 15, 2008	Jan. 22, 2008	Jan. 15, 2008 for 1 hour.	9:00 AM	2:00 PM
2	"The children showing each other what they have done on the follow-up project work at the second [VC], and talking to each other about it, as well as talking to Elizabeth about it" (Laura, personal communication, Nov. 17, 2007).	Feb. 12, 2008	Feb. 14, 2008	Feb. 14, 2008 for 1 hour. Lovand Catholic School was closed 2/12/08 due to snowy weather. Therefore, the second VC took place on 2/14/08.	9:00 AM	2:00 PM

The first videoconference occurred on January 21, 2008. During this initial hour-long meeting, students had the opportunity to (a) meet and greet one another while exchanging information about their schools; (b) learn about the orbit patterns of the sun, earth, and moon; (c) physically demonstrate the rotation of the sun, earth, and moon when three of their classmates pretended to be one of these objects; (d) observe the remote students' physical demonstration of the orbit pattern; (e) talk about what they observed in the sky on a clear night; (f) name the eight planets in the earth's solar system, (g) discuss the composition of the planets, (h) play a game where they had to name the object as a star, planet, or galaxy, and (i) listen to the follow-up astronomy project assignments for the second videoconference. This program lasted 1 hour and students sat on the floor on their "Xs."

Polar world—penguins and polar bears. The fifth videoconference was actually the third collaboration between the Lovand students and the St. Rose kindergartners. Mrs. Hartman's science lesson units guided the first two collaborations, but Mrs. Walsh directed the polar world session. St. Rose students learned about polar bears while Mrs. Hartman's class concentrated on understanding penguins. Mrs. Walsh provided several different materials for the Penguin lessons including facts about macaroni and emperor penguins, paper patterns to make construction paper penguins, and a poem called Peter, Peter Penguin. The researcher drove to St. Rose School to collect these materials because it gave her an opportunity to talk with Mrs. Walsh about videoconferencing in addition to providing a timely method of picking up the lesson plans. Although Mrs. Hartman did not need to prepare the lesson materials, she had to make time to integrate them into her teaching plans. This was noteworthy during a year where Mrs. Hartman was implementing a new math curriculum. Time was precious and Mrs. Hartman made decisions about how to prioritize her lessons as well as when to combine constructs. For instance, in preparation for the polar world videoconference, she read books about penguins to give her class the opportunity to review penguin facts and vocabulary such as rookery and colony.

During the polar world videoconference, children sat on the floor on their “Xs.” They waited for their friends at St. Rose School to begin the videoconference. The students were very comfortable with the technology at this point. They also expressed comments about how to operate the equipment noting when the picture in picture feature was disabled and when it was turned back on. They sometimes stated directions to Mrs. Hartman or the researcher to turn the volume up or down or when to zoom in on a picture.

Mrs. Walsh began by reviewing the polar geographical regions of the world—the Arctic Circle and Antarctica. The St. Rose kindergartners presented facts about the exceptional smelling skills of the polar bear along with facts about their feet being in water and their ears being at the back of their heads. Mrs. Walsh normally prompted her students for these answers, while they spoke into the microphone. They also recited the country names that comprised the Arctic Circle—Russia, Canada, Sweden, and Iceland. Next, Mrs. Walsh and her class talked about the transportation demands of these cold climates. Her students recounted that dogsleds, kayaks, and snow mobiles were integral to moving around in these frigid places.

Next, Mrs. Hartman’s students introduced facts about penguins. They identified the emperor and macaroni penguins and talked about the larger size of the emperor penguin. The kindergartners reviewed the nesting differences between these birds, explained that they lived in rookeries or colonies, and described the blubber and feathers that keep the penguins protected against the harsh, cold weather. They also relayed facts about how the penguins move on land versus how they move in the water. After discussing the penguins, both schools had the chance to recite poems about their respective animals. St. Rose performed a rhyme about polar bears while Mrs. Hartman's class delivered *Peter, Peter Penguin.* The final time of sharing involved both classrooms showing pictures of their polar animals. Mrs. Walsh's class showed their polar bears while Mrs. Hartman's class held up a dark blue mural with penguins organized into a colony. Figure 20 shows the colony. In order to share the artwork, both sides slowly zoomed the cameras to show larger images of the pictures. During the backyard-bird videoconference, the kindergartners were impatient when the camera needed to be adjusted in order to pan or zoom to show the intended picture. Their behavior was more patient and less restless during these same camera adjustment times during the polar world collaboration. They realized that it took a minute for the lens to readjust to the close-up image, and they oohed and ahhed when they had an opportunity to see the remote side's artwork. St. Rose and Lovand students showed further appreciation by applauding one another at the end of the videoconference that lasted 20 minutes.

Figure 20. Penguin colony mural.

Astronomy II. The sixth videoconference was a follow-up session to the astronomy I meeting. Recall that Laura and Elizabeth challenged the students and teachers to create astronomy-related projects to be displayed and presented during their second astronomy gathering. After greeting one another quickly, Lovand School started the presentation of their astronomy project. First, Mrs. Hartman reviewed the planet names using coloring book pages her class finished. Individual students answered questions about the planets and when they were done with the facts, they shouted the pneumonic, “My Very Excellent Mother Just Served Us Noodles!” that helped them to recall the order of the planets from the sun. Next, they held up a scaled drawing of the planets in relation to the sun. The mural was too large to assemble in the classroom, so they glued the components together on the floor of the gymnasium. In the process of assembling the mural, Mrs. Hartman reviewed facts about the planet with her students. After presenting their facts, the British students asked multiple questions to the Lovand kindergartners. The latter responded to several questions about their favorite planets and how they made the coloring books and mural, as well as to inquiries from Laura and Elizabeth.

Next, the Smith School students presented their projects. Mrs. Jones, a teacher who worked along side Mr. Thomas, introduced their projects by saying that the students pretended that they were on the moon and were sending home postcards. Unlike the Lovand kindergartners, the Smith students presented individual and small group works rather than a unified one. The first project was a postcard reading from a young girl followed by a foursome singing *Five Little Men in a Flying Saucer Flew Round the World One Day.* These renderings were followed by a series of posters about the Sun, galaxies, specific stars, the Earth’s moon, other planets’ moons, and the space shuttle. Most of the posters were drawn by hand, but one was even done on the computer. Lovand School’s presentations culminated in several boys’ descriptions of rocket ships. They built rocket ship models and explained the various components and their purpose to

Lovand School. Laura and Elizabeth commended the Smith students before Lovand students had the opportunity to ask questions to them about their projects. This was followed by a round of questions by Laura and Elizabeth.

The second astronomy videoconference then moved into the final learning activity—an interactive game directed by Elizabeth. The astronomer asked each school a question about an astronomy object whose content was covered either during their videoconferences. If the school answered the question correctly, they drew a *forfeit*, or a task, that was directed to the other school to complete. The forfeits were cut up into individual strips and placed in a basket in preparation for the session. Table 13 shows the list of forfeits prepared by Mrs. Hartman and the researcher. They listed 20 forfeits, not knowing how many rounds of questions to anticipate. During the videoconference, each school received four forfeits. Mrs. Hartman and the researcher marveled at the similarity of the two schools' forfeit rosters. Ironically, three of the four forfeits that Smith School told Lovand students to execute were on Lovand's forfeit roster to give to Smith School. These are marked by an asterisk (*) in Table 13. Forfeits read to Smith School have two asterisks (**) beside them. The videoconference ended when the Lovand students met their forfeit challenge by counting down from 100 by tens and shouting "Blast off!" The second astronomy collaboration lasted 60 minutes.

Table 13

Astronomy Forfeits

Roster of Forfeits Prepared by Lovand School	
1. Sing a song. *	2. Pretend to be an elephant. **
3. Name one bird you find in your backyard.	4. Stand up, turn around three times, and touch your toes.
5. Name two things that are red.	6. Do five jumping jacks.
7. Name three things smaller than piece of bread.	8. Name three things bigger than a piece of bread.
9. Recite Mary Had a Little Lamb. **	10. Count to 100 by 10s. *
11. Touch your toes five times. **	12. Hop on one foot.
13. Count backwards from ten to one.	14. Name the four seasons.
15. Say the 7 days of the week.	16. Sing the alphabet song.
17. Name two animals you find in a zoo. **	18. Rub your stomach and pat your head at the same time. *
19. Sing Twinkle, Twinkle, Little Star.	20. Name two board games.

Legend: * Forfeits drawn and read to the Smith students.

** Forfeits that Lovand and Smith had in common on their lists.

Shark videoconference. The final videoconference actually occurred outside of the standard 4-month data collection period from October 2007 through February 2008. While originally scheduled for late January, the event was canceled due to a snow schedule delay. (Refer to Appendix O, the videoconferencing calendar). It was rescheduled for May 2, 2008. The researcher returned to Lovand School to participate and record this event. However, results were not considered for this study because the researcher had been out of the classroom for several months.

For the shark videoconference, Mrs. Hartman's class connected with a marine laboratory in the southern USA. As the session began, tropical strands of music greeted the students while facts and information about sharks were displayed on the screen. The kindergartners sat on their "Xs" for this videoconference. While Mrs. Hartman read the caption of the pictures on the videoconferencing monitor, the students excitedly watched the images of the sharks and uttered short exclamations such as "wow!" and "oh!" The beginning of the videoconference resembled the previews played before the main attraction at the movie theater. A male announcer told the class that the program would start shortly. New music played as the marine biologist and master of ceremonies introduced herself. She spoke about the agenda for the event, asked the students questions about where they were located, and proceeded to read *Smiley Shark* (Galloway, 2003), a story about a shark named Smiley who scared the other fish. The fish befriended the shark after he saved them from the fisherman. After reading the book aloud, the students played a game where they answered questions about the story's content, plot, and character questions as they were accompanied by gurgling sounds and upbeat music. The videoconference moved to a presentation about shark habitats, diet, teeth, and size. The session ended with an open-ended round of questions where individual students asked questions about sharks and other marine animals while receiving answers from the marine biologist. The researcher purchased a copy of the book *Smiley Shark* for Mrs.

Hartman so that she could include it in the kindergartners' classroom library. This videoconference lasted 22 minutes.

Analysis and Coding

The vulnerability of the young participants in this study necessitated a theoretical approach that balanced the social context, developmental appropriateness, and the interactive nature of their learning environment. A Vygotskian perspective was selected as the theoretical framework for the research and analysis. Rooted in the sociocultural writings of Lev Vygotsky (1978, 1986), this framework supported several tenets including (a) individual development is rooted within a social context (Vygotsky, 1978, 1986), (b) development represents a process whereby tools, signs, and mediated activity work together to advance psychological functioning to a "higher" (Vygotsky, 1978, p. 55) level of behavior, (c) language plays an important role in cognitive development (1978) and contrary to Piagetian theory, precedes development for children (Vygotsky, 1978), and (d) the ZPD (Vygotsky, 1978, 1986) distinguishes and describes the differences between development and learning. Vygotsky (1978, 1986) described learning as being embedded in social contexts where a child interacts with other people, objects, and the events in social surroundings.

How the Pilot Study Informed This Study's Data Analysis

Data examination procedures employed in the pilot study informed the analysis process for this study. In the pilot study, general research questions aimed to investigate the setting of the action, what was taking place, the types of meaning being formed by the kindergartners, their emerging inquiries, their engagement level, the playful attributes of interactive videoconferencing, and the developmental appropriateness of the technology.

Through her data analysis in the pilot study, the ATLAS.ti qualitative software enabled the researcher to analyze the events, create summaries of the results, and generate a clear picture of the actual nature of the experience through the creation of concept maps. Constant comparative analysis allowed for the refinement of the codes. A roster of the codes (Appendix P) and their definitions helped the researcher to interpret or reconsider dialogue as well as modify previously coded text. The process of synthesizing the text into codes then served as the premise for developing new theory about how young children learn with interactive videoconferencing. The meanings of the codes were grounded in the participants' words and these meanings came alive through the semantic network capability, or concept maps, created with the network diagram capabilities of ATLAS.ti.

During the pilot study, data analysis using the ATLAS.ti software exposed the dialogue of the students visually so that the researcher could create a snapshot of the learning of the students to answer the research question, "What is the nature of young children's emerging inquiries and dialogue surrounding their use of interactive videoconferencing in their classroom?" The concept maps prepared a visual picture of the student's many reflections, inquiries, and remarks to show that they were not only engaged in their learning activities with interactive videoconferencing but also were critically thinking about the content material. Thus, the pilot study's data examination employing the ATLAS.ti software informed the data analysis for this study by narrowing the research questions for this study, restricting the focus of investigation to only include meaning making through a Vygotskian lens, providing an opportunity to learn how to organize, code, and manipulate data in the software program, generating data displays in the form of concept maps, and developing a process of synthesizing text and graphics into codes that served as the premise for developing new theory about how young children learn with interactive videoconferencing.

Flow Model of Data Analysis

Data analysis in this study follows the recommendations of Miles and Huberman's (1984) flow model of data analysis (Figure 21) that consists of three interrelated components post data collection: data reduction, data display, and drawing and verifying conclusions.. Data reduction refers to the process of "selecting, focusing, simplifying, abstracting, and transforming the raw data" (p. 23) ranging from sampling decisions, coding, and summaries. Miles and Huberman further clarified that "Data reduction is not something separate from analysis. It is a part of analysis that sharpens, sorts, focuses, discards, and organizes data in such a way that final conclusions can be drawn and verified" (pp. 23-24).

The next portion of the flow model related to data display or the "organized assembly of information that permits conclusion-drawing and action-taking" (Miles & Huberman, 1984, p. 24). Data display includes a wide range of tools including matrices, graphs, networks, and charts whose role is to help the researcher better understand "what is happening, and to conduct further analysis or take action based on that under-standing" (p, 24). Further, displays offer alternatives to working with cumbersome wording (p. 14). Once again, this portion of the flow model does not stand in isolation. Instead, the arrows between data reduction, data display, and drawing and verifying conclusion are bidirectional and present the process orientation to data analysis.

The final part of Miles and Huberman's (1984) flow model is drawing and verifying conclusions. As the name implies, this section draws meaning from the displayed, reduced data while noting "regularities, patterns, explanations, possible configurations, causal flows, propositions" (p. 24). Likewise, these conclusions are verified, tested for their plausibility and validity. The next section describes data reduction decisions involving sample and scenario selection as well as coding.

Data Reduction

Four months of field work yielded plentiful data. This included over 500 hours of participant observation, 2 spiral bound notebooks filled with manual field notes, over 5 hours of videoconferencing movies that were simultaneously captured on 2 different digital cameras, over 300 pages of dialogue transcription from the movies, pictures of student- and teacher-created artifacts, and normal materials associated with classroom learning activities such as books, worksheets, and other instructional papers. Considering the massive quantity of data sources, it was imperative to whittle the data to be analyzed. Much contemplation surrounded how to best select the portions of data to analyze.

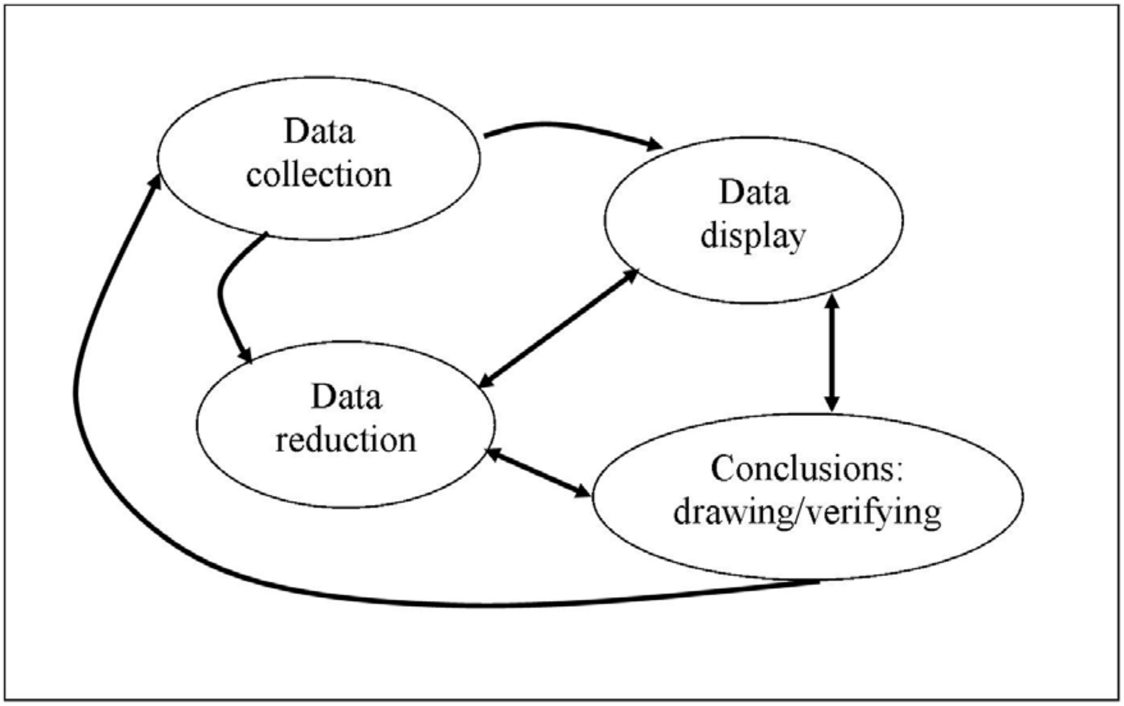


Figure 21. Miles and Huberman's data analysis flow model. *Note.* (Miles & Huberman, 1984, p. 23)

The researcher wrestled with these data reduction decisions through contemplation and reflection in her journal entries. Appendix Q provides an example of these musings. In the journal entry, the researcher used color to organize facts, her questions, and reflections. The color emphasis was part of the researcher's organizational method of answering her own questions about data analysis. These musings lasted for months as she tried to get a handle on the best way to make sense of so much information. Slowly, the researcher started to work out the dilemma about what portions of the interactive videoconferencing sessions best displayed evidence of learning from a Vygotskian perspective. The researcher deliberated about how to expose Vygotsky's emphasis on culture when dealing with local and remote participants. Through her journal entries, she began to answer her own ruminations about what portions of data to expose. In an April 18, 2008 journal entry, the researcher asked herself the following questions.

> Look for sections of the dialogue that show evidence of Vygotskian theory.
>
> Where is their evidence of children asking questions to obtain answers and build their knowledge?
> Where is their evidence of children starting to internalize the answers? How is this apparent? In their dialogue, possibly their facial expressions, nodding or leaning over and explaining things to one another?
> Where can we see that learning precedes development? - Children talking about migrating birds, children talking about gaseous vs. nongaseous planets, moon phases, penguins, polar bears, …
>
> So maybe I just look for those components of the dialogue that show evidence of Vygotskian theory based on the simplified premise/background above. Right? (April 18, 2008)

Several months later, the researcher devised a plan to focus on identifying scenarios in the interactive videoconferences that poignantly showed examples of learning from a Vygotskian perspective. The researcher started a master list of scenarios where the kindergartners were learning in terms of Vygotskian theory. She broke down these examples in a July 2008 journal entry found in Appendix R.

Scenario-based videoconferencing selection decisions. Based on the data reduction examples that the researcher identified, she decided to analyse two different interactive videoconferences for the dissertation. She chose the pair of astronomy videoconferences based on (a) the global context of the culture—one classroom in western Pennsylvania and the other in England, (b) young children's fascination with the topic of space and keen desire to learn more about it (Jones, Yeoman, & Cockell, 2007), (c) the longevity of the collaboration, and (d) the focus on presenting the students' artifacts during the second videoconference. The researcher also chose the gingerbread and puppet videoconference because its learning objectives focused on children's literature and the performing arts, differentiating this session from the others that focused on science-related topics. The shark videoconference also had a literature focus, but the timing of the videoconference did not occur during the participant observation period.

Within these scenarios, the researcher sought to analyze the data according to the four Vygotskian tenets delineated in chapter 2. These included the social origin and context of the dialogue, the use of signs and tools in mediated activity, the role of language and its importance, and the ZPD. The order of the data analysis follows the chronological order of the videoconferences as they occurred. Therefore, the gingerbread and puppetry videoconference is reviewed first, followed by an examination of the astronomy videoconferences.

Coding as part of Data Reduction in ATLAS.ti

Textual records from videoconferencing transcripts along with photographs were uploaded into the ATLAS.ti (Muhr, 2004) qualitative software for coding analysis. The transcript records were saved as Microsoft Word documents and assigned as primary documents (sources of data) within the qualitative data analysis software. The photograph artifacts were saved as JPEG graphic files and also assigned as primary documents. Once loaded, open coding of the transcriptions began. During open coding, the transcripts were read multiple times to breakdown, examine, compare, and conceptualize the data. A line by line analysis of the dialogue in the transcription files identified instances where the students and teacher established meaning from reception of content information, discussion of the material, answering questions, making utterances or declarations, presenting their artifacts, drawing on cultural knowledge, or collaborating with those present to come to some conclusions.

The Miles and Huberman (1984) emphasized the repetitive nature of this process in their flow model. The researcher reviewed the videos several times in order to gain contextual understanding about a passage. This might include observation of intent, sound levels, behavior of the children, or general observation to understand the most important parts of the dialogue. She then coded a passage and began to build concept maps within the network view of the ATLAS.ti software. Sometimes, she coded too many items with the same code or coded very broadly. When first going through the open coding process for the astronomy videoconferences, the researcher coded every sign as implied by the Vygotskian usage, with the same code. This led to a very broad representation of signs and tools. Later, the researcher revised this code to include different types of sign and tool use from the use of mnemonics to coloring pages.

The ATLAS.ti software provided easy and efficient ways to name the codes by one of three coding options: open coding, code in vivo, and code by list. During the first coding attempt, the open coding feature was the most common way the researcher entered codes. This let her assign names to her data. Sometimes, the participants' words just spoke to her and she coded using their exact words or what ATLAS.ti calls in vivo coding. Examples of in vivo coding included the mnemonic, MY VERY EXCELLENT MOTHER JUST SERVED US NOODLES, as well as the way that Miss Peterson, the gingerbread puppetry instructor, referred to gingerbread boys as characters that "come to life and run away." When using in vivo codes, the researcher deduced that there just was no better way to say the meaning of the code.

Coding by activity or portion of the videoconference let the researcher organize the various chronological parts of the videoconference. Examples of this kind of a coding choice included the planet “coloring book” pages and “shadow puppets.” The “coloring book” code included dialogue surrounding the presentation of Lovand students’ artifact to Smith School. In this case, the researcher wanted to make the point that the children were openly talking about planets—an area where they had little understanding prior to the videoconferences. The “comes to life and runs away” code referred to examples of folktales that had gingerbread boy-like characters. The researcher decided to code each of the five stories in this part of the videoconference as a separate code so that each could be portrayed as an example of sharing different cultures about the folktales.

The researcher did not reuse the codes from the pilot study. While there certainly instances where the videoconferences resembled one another, the primary focus of the researcher’s coding efforts was to answer the research questions. Therefore, she investigated the data looking for one of the primary ways described in the literature review for determining Vygotskian meaning making—through social contexts, sign and tool use, language use, or as depicted by the ZPD. Since the research questions of this study were narrowed to only include Vygotskian learning theory, the codes were quite different. The content of the videoconferences was also quite different, so the names of the codes commonly reflected this difference also.

Coding procedures considered the contextual knowledge gleaned from over 500 hours of participant observation in the classroom and their resulting field notes. The overall goal of the analysis was to uncover the happenings and settings and find emerging patterns of meaning-making in the dialogue transcriptions from the interactive videoconferencing sessions. This is in accordance with the primary tenets of ethnographic research which aims to provide in-depth reporting and interpretation of personal experiences as they actually occur (Eisenhart, 2001b).

Another useful function of the ATLAS.ti software was the ability to create memos throughout the data analysis process. This function provided an interface to jot down ideas for follow-up or to create an audit trail about decisions. Memos were also used to highlight code name differences and to point to segments in the movies for clarification. Whether coding a sequence of text or watching the videotaped movies, the software afforded the opportunity to note items requiring further refinement or review. In fact, the capability of the ATLAS.ti software to act as an electronic file cabinet where all of the various file types, whether movies, audio files, text files, memos, or networks were gathered in a single, searchable location was a tremendous benefit.

Data Display - Concept Maps in ATLAS.ti

ATLAS.ti is a powerful software program that facilitates qualitative data analysis from a textual perspective while simultaneously acting as a knowledge management tool. The software "offers tools to manage, extract, compare, explore, and reassemble meaningful pieces from large amounts of data in creative, flexible, yet systematic ways" (Muhr, 2004, p. 2). While many researchers use the software to code and categorize their textual sources of data, few explore the visualization capabilities inherent in the network view features of the software. In Miles and Huberman's (1984) terminology, visualization is referred to as data display (p. 24). Data presented in visual displays helps researchers to understand what is happening in the data and provides clues about what areas should be looked at in a different way or perhaps in conjunction with other important information.

From the researcher's experience, ATLAS.ti is a technology tool "that engage[s] and facilitate[s] specific cognitive activities" (Jonassen, 2003, p. 372). Expressly, the ATLAS.ti software has the capability of creating a semantic network, also known as a type of concept map (Jonassen, 2001), consisting of nodes representing codes and labeled links representing relationships between the nodes that provide an "intuitive graphical presentation" (Muhr, 2004, p. 217). Muhr noted that "networks add a heuristic 'right brain' approach to qualitative analysis" (p. 217). For the researcher, this approach had powerful benefits for learning and disseminating the research results of her pilot study. Jonassen (2003) remarked that "the more ways that learners are able to represent problems and domain knowledge, the better able they will be to transfer their skills" (p. 364). Using ATLAS.ti concepts maps in her pilot study, the researcher exposed the dialogue of the students visually so that the she could create a snapshot of the learning of the students to answer the research question, "What is the nature of young children's emerging inquiries and dialogue surrounding their use of interactive videoconferencing in their classroom?" The concept maps prepared a visual picture of the student's many reflections, inquiries, and remarks to show that they were not only engaged in their learning activities with interactive videoconferencing but also were critically thinking about the content material.

During the coding process, the researcher intertwined the generation of ATLAS.ti graphics to create a better picture of what the data portrayed. The ATLAS.ti User's Guide (Muhr, 2004) refers to this capability as "conceptual level work" (p. 26) that "virtually transforms your text-based workspace into a graphical 'playground' where you can construct concepts and theories based on relationships between codes, text passages, or memos" (p. 26). To create a new concept map, the *new network view* in ATLAS.ti was selected. After entering a name for the network view, code names were imported to represent nodes in the concept maps. Otherwise, the network view is blank. Different network views were created for many different portions of the videoconference—anywhere that the researcher wanted to contemplate the relationships between the codes or just or organize the codes and their relationships into a diagram that complimented or supplemented the narrative description. The researcher was able to drop and drag the nodes to form a diagram that depicted multiple processes including examples of characters who came alive and ran away to the 10 different pages of the coloring book created by the Lovand kindergartners. The dropping and dragging of the nodes was similar to moving picture or graphic files on a personal computer. Patterns that represented the actual interactions and learning events of the videoconferences started to emerge.

The ATLAS.ti software uses the term "network properties" to describe the relationship between the nodes in the network view. Properties have predefined choices including "is associated with, is part of, is cause of, contradicts, is a, no name, and is property of" (Muhr, 2004). Although the ATLAS.ti software has the capability to define and right complex relationship rules, the researcher only used the predefined link properties. The software also permitted the addition of new nodes (codes) to the diagrams. These were called "free" codes. The researcher utilized this feature when organizing examples. For instance, "meeting and greeting" was used to represent the introduction portion of the first astronomy videoconference.

The researcher integrated many concept maps into the analysis of the videoconferences. Some include robust amounts of dialogue. The intent was not to show everything that happened in the videoconference. Instead, concepts filled with dialogue emphasize the importance of language in a passage and sometimes just the volume of dialogue that occurred during a particular event. While the researcher had the opportunity to collapse the quotations surrounding a code, detailed amounts of dialogue are intentionally used to convey the meaning making of the students through one of the Vygotskian tenets.

The analysis section breaks down the videoconference events by demonstrating the meaning making of the students through a Vygotskian lens. For example, constructing knowledge in a social context is commonplace in the kindergartner's videoconferencing activities as they receive inquiries, ask questions of their peers and teachers, work with their local classmates to understand a new concept, or present their ideas. The use of tools and symbols in mediated activity is very common in young children's classrooms to assist them in recalling concepts. The role of language is extremely important in interactive videoconferencing because it is one of the primary ways participants can convey ideas to one another. And in all of these situations, the ZPD may be said to have increased the development of the learners when their meaning making is beyond where it would have been if they were learning in an unassisted manner.

Qualitative Criteria for Assessing Research Quality and Rigor

Dissertations characterize initial research endeavors for many doctoral students. Therefore, Anfara et al. (2002) observed that dissertations also represented an opportunity to emphasize qualitative-research quality and rigor. The study employed various measures to ensure qualitative quality and rigor. Various criteria have been suggested during the past two decades. Lincoln and Guba (1985) recommended a matrix of trustworthiness criteria (Table 14). The matrix creates parallel columns linking the quantitative research term with the qualitative term. For instance, internal validity issues in quantitative studies became credibility issues in qualitative studies. The third column of the matrix lists strategies to employ in order to prevail over these concerns. Within Lincoln and Guba's trustworthiness criteria, this dissertation employed multiple strategies to attend to issues surrounding qualitative-research quality and rigor. The fourth column of Table 14 shows the specific strategies utilized in this dissertation to attend to issues of quality and rigor.

Creswell and Miller (2000, as cited in Anfara et al., 2002, p. 30) recommended eight other forms of verification techniques for qualitative research including (a) prolonged engagement and persistent observation, (b) triangulation, (c) peer review or debriefing, (d) negative case analysis, (e) clarifying researcher bias, (f) member checks, (g) thick description, and (h) external audits. Creswell (1998, as cited in Anfara et al., p. 30) further recommended that at least two of the eight verification techniques be used. According to this roster, the dissertation provided for three of the techniques: (a) prolonged engagement and persistent observation, (b) triangulation, and (c) thick description.

Table 14

Quantitative and Qualitative Criteria for Assessing Research Quality and Rigor

Quantitative term	Qualitative term	Strategy employed according to Lincoln & Guba (1985)	Strategy employed in this dissertation to address quality and rigor
Internal validity	Credibility	• Prolonged engagement in field • Use of peer debriefing • Triangulation • Member checks • Time sampling	• Prolonged engagement in field • Triangulation—(field notes, journal entries, videoconferencing transcripts, classroom artifacts)
External validity	Transferability	• Provide thick description • Purposive sampling	• Provide thick description • Purposive sampling
Reliability	Dependability	• Create an audit trail • Code/recode strategy • Triangulation • Peer examination	• Code/recode strategy • Triangulation
Objectivity	Confirmability	• Triangulation • Practice reflexivity	• Triangulation • Practice reflexivity

Note. Adapted from (Lincoln & Guba, 1985, as cited in Anfara et al., 2002, p. 30).

Summary

This study employed an ethnographic, case-study methodology to examine the meanings being formed by kindergarten students while learning with interactive videoconferencing. The chapter commenced with a review about three criteria that informed the methodological framework for this dissertation including (a) the pilot study, (b) Miles and Huberman's (1994a) recurring themes in qualitative data analysis, and (c) emphasis on addressing the nuances of contemporary culture, especially in terms of selecting a methodological approach for both collecting data and its analysis, while considering technological concerns about working with interactive videoconferencing. Subsequent sections detailed the research design, participant sites, data collection, and qualitative criteria for assessing research quality and rigor.

The detailed sampling section described issues surrounding the sampling strategies of the study, an often overlooked consideration. The determining criteria for participation in the study relied on proximity, accessibility, and technology availability. Although invitations for participation were distributed widely via electronic means, few schools responded to the invitation and the researcher devised a more feasible sampling plan. The researcher's intuition (Stake, 2000) guided her search for a participant site while endeavored to find a case that "seem[ed] to offer *opportunity to learn*" (Stake, 2000, p. 446). Based on these conditions, Lovand Catholic School was selected as the site of the study.

Once the site was selected, emphasis shifted to negotiation of entry and the role the researcher would play in the classroom. The researcher desired to understand the sociocultural context of the classroom—how the students and teacher made meaning, the nature of their classroom dialogue, and their general context for learning. The researcher assumed a least adult role, aiming to distance herself from all authoritative responsibilities in the classroom.

The researcher spent 4 months in the classroom, recording the everyday happenings, learning about the personalities and interaction between the teacher Mrs. Hartman and her students, building rapport, and taking copious field notes. The researcher transformed from being an outsider to just another member of the kindergarten class—learning about the class' emerging literacy, tying shoes, and following the students throughout their normal activities. While in school, the researcher took manual field notes about her observations, later adding journal entries and memos to elaborate about the events. During the course of the 4 months, Mrs. Hartman's class participated in seven different interactive videoconferences. Mrs. Hartman selected the topics for these sessions based on her existing curriculum plans. The interactive videoconferencing sessions were videotaped and subsequently transcribed into textual files for further analysis in the ATLAS.ti qualitative software.

Data from field notes, journal entries, memos, videotapes, and transcriptions were analyzed using open-coding techniques within the ATLAS.ti software. The qualitative, textual analysis focused on finding emerging patterns of meaning making within the dialogue from the interactive videoconferencing sessions and provided a way to make the data analysis phase more public (Anfara et al., 2002). Videotapes and field notes provided a source for data triangulation against the transcriptions. ATLAS.ti concept maps representing the nodes (codes) and their relationships enabled the researcher to represent graphically the meaning making of the collaborative sessions. Thus, ATLAS.ti proved to be a multipurpose tool for coding and illustrating the phenomena of the kindergartners' meaning making.

The kindergartens participated in six interactive videoconferences considered for analysis during the observation period including: 1) backyard birds, 2) the folktale *The Gingerbread Man* and related puppets, 3) birdfeeders and happy holidays, 4) astronomy I, 5) polar world, and 6) astronomy II. Appendix O shows the videoconferencing calendar of dates and times for these events. Pseudonyms were used for all participants and their institutions.

Data examination procedures employed in the pilot study informed the analysis process for this study. The investigation process of coding the dialogue of the students to develop new theory about how young children learn with interactive videoconferencing served as the premise for the data analysis in this study. During the pilot study, data analysis utilizing the ATLAS.ti software exposed the meaning making of the students visually in the form of the concept maps to answer research questions about the nature of the emerging inquiries. Thus, this process was adopted for the dissertation.

Data analysis in this study followed the recommendations of Miles and Huberman's (1984) flow model of data analysis consisting of three foci post data collection: data reduction, data display, and drawing and verifying conclusions. The researcher worked through decisions about data reduction in her journal entries. Data reduction procedures included a scenario-based approach for analyzing the data from a Vygotskian perspective. The researcher selected the gingerbread boy and puppet videoconferences in addition to the pair of astronomy collaborations for her analysis based on the potential to expose the children's meaning making from the Vygotskian tenets of (a) the social origin and context of development, (b) the use of signs and tools in mediated activities, (c) the important role of language, and (d) the zone of proximal development (Vygotsky, 1978, 1986).

CHAPTER 4: RESULTS OF THE STUDY

Introduction

The purpose of this study was to understand how children make meaning using interactive videoconferencing technology in a kindergarten classroom. Meaning making is defined as students learning how “to recognize and solve problems, comprehend new phenomena, construct mental models of those phenomena, and given a new situation, set goals and regulate their own learning (learn how to learn)” (Jonassen, Howland, Moore, & Marra, 2003, p. 6). Furthermore, based on that premise, the use of technology to support meaningful learning and enhance teaching instruction is viewed as a medium to “engage students in active, constructive, intentional, authentic, and cooperative learning” (p. 6).

The study explored two research questions. The first was What types of meanings are being formed by the kindergartners during the interactive videoconferences? The second question related to how the kindergartners formed meaning, What is the nature of young children’s emerging inquiries and dialogue surrounding their use of interactive videoconferencing? Emerging inquiries referred to the questions children ask while participating in the two-way sessions. In addition, this study sought to augment early childhood education research about using interactive and collaborative technologies in the classroom. Data collection procedures included classroom observation and the recording of manual field notes, journal entries, movies from interactive videoconferences, transcriptions from the videotapes, memos, and student- and teacher-created artifacts such as pictures, posters, and photographs. Transcription files were imported into the ALTAS.ti software for coding and data analysis.

The results section breaks down the videoconference events by demonstrating the meaning making of the students through a Vygotskian lens using the scenarios of the gingerbread and puppetry videoconference and the pair of astronomy collaborations. For example, constructing knowledge in a social context is commonplace in the kindergartner's videoconferencing activities as they receive inquiries, ask questions of their peers and teachers, work with their local classmates to understand a new concept, or present their ideas. The use of tools and symbols in mediated activity is very common in young children's classrooms to assist them in recalling concepts. The role of language is extremely important in interactive videoconferencing because it is one of the primary ways participants can convey ideas to one another. And in all of these situations, the ZPD may be said to have increased the development of the learners when their meaning making is beyond where it would have been if they were learning in an unassisted manner.

Analysis of the Gingerbread and Puppetry Videoconference

Five Stories about Characters Who Came to Life and Ran Away

The Gingerbread Boy interactive videoconference provided a rich opportunity for the kindergartners to experience the role of drama through puppetry and its application to their personal lives. From a Vygotskian learning perspective, the renderings of these tales provided the children with language intensive periods to review and analyze the stories. Miss Peterson, the instructor, referred to the folktales from different cultures as centering on a character who “came to life and ran away.” She emphasized that although the gingerbread boy was a story that was told around the world, that

> guess what, people all over the world don’t eat gingerbread, yeah there are few places where they don’t bake gingerbread. They bake other foods, or they make other foods to eat and gingerbread is really strange to them and they don’t eat it. So there are stories in other countries that are the same story but it’s not about the gingerbread boy running away, they are about something else that comes to life and runs away. (Peterson, December 6, 2007)

Miss Peterson provided the children with five different versions of stories that carried this same theme including *The Gingerbread Baby* (Brett, 2003), *The Runaway Ricecake* (Compestine, 2001), *The Musubi Man: Hawaii’s Gingerbread Man* (Takayama, 2007), *The Gingerbread Boy* (Egielski, 1997) set in New York City, and the Puppetry Institute’s shadow puppet rendition of *The Gingerbread Boy.* The first example mentioned by Miss Peterson was *The Gingerbread Baby* (Brett, 2003), a tale the students also read aloud in their classroom. They noted the difference between the boy gingerbread character and the baby gingerbread character.

The Runaway Ricecake

Discussions about the similarities and differences of gingerbread boy folktales from around the world allowed the children to apply the context of the story to new settings. During an information exchange about *The Runaway Ricecake* (Compestine, 2001), students identified the country of the book’s background when Miss Peterson showed the kindergartners a picture of an Asian mother and father from the book. The children immediately shouted “China! China!” in response to “What’s your best guess, where do you think this story is from?” Unbeknownst to Miss Peterson, Sophie was born in China and she had shared this information with her classmates. Sophie quickly announced, “That’s where I am from.” This example indicates that even at a young age, the kindergartners had internalized the information that their classmate was born outside the USA and were working at a higher psychological function (Vygotsky, 1978). Figure 22 depicts the dialogue associated with learning about *The Runaway Ricecake.* The kindergartners recognized Sophie’s heritage just several months into the school year. The impact of the social context of their learning was very apparent. While Mrs. Hartman’s class had already internalized the cultural characteristics unique to Sophie, emerging inquiries about another part of the USA in Hawaii were just were just beginning.

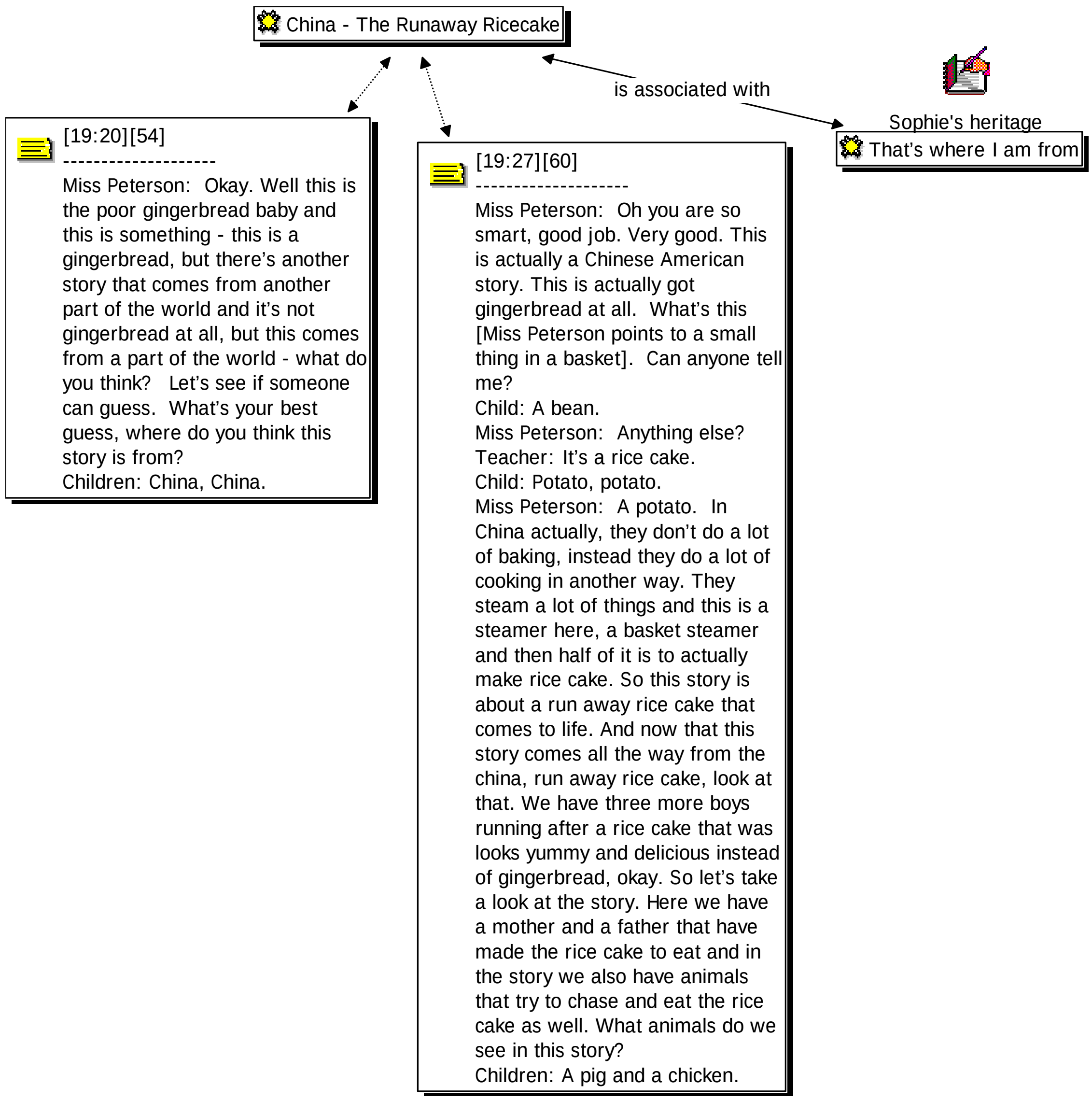


Figure 22. Reflections from learning about *The Runaway Ricecake.*

The Musubi Man

Throughout the gingerbread videoconference, evidence of development preceding learning abounded (Vygotsky 1978, 1986). The kindergartners learned about diet and natural surroundings when they talked about *The Musubi Man: Hawaii's Gingerbread Man* (Takayama, 2007). With Miss Peterson's scaffolding and support, they compared the rice diet common in China to the Hawaiian diet. They investigated the physical appearance of *The Musubi Man* who was adorned with seaweed and even had a shrimp for his nose. Students used their arms to make believe they were like islands, to resemble the state of Hawaii. They deduced that if their environment included much water and plant life that thrived in water, then it would be natural to adorn *The Musubi Man* with a marine plant such as seaweed. Figure 23 indicates the dialogue surrounding the description of *The Musubi Man.* When the children discussed environments that were foreign to them, such as in the case of Hawaii, the role of language proved to be very important in coming to terms with why a runaway rice man would have vegetation and crustaceans to round out his appearance. From a Vygotskian learning perspective, the renderings of these tales provided the children with language intensive periods to review and analyze the stories. Miss Peterson also combined her instruction with use of tools and signs to help facilitate the children's learning as in the case of pretending their arms were the island of Hawaii, floating in the ocean. This outward gesture provided a symbol for the children to grasp the concept of an island.

The New York City Setting

The fourth example used by Miss Peterson in her descriptions of stories that featured a character that came to life and ran away placed *The Gingerbread Boy* in a New York City setting. During this part of videoconference, the children were slow to respond to Miss Peterson's inquiry, "Who can tell me what you see in this picture that reminds you of the city?" When shown a picture of a city street scene from the book, only one student remarked that a bus reminded him of the city. Perhaps the context of a busy city street was foreign to the kindergarten class. Miss Peterson waited for a few seconds for more responses, but quickly moved on to the puppetry rendering of *The Gingerbread Boy*.

The Gingerbread Boy Shadow Puppet Performance

Before the Puppetry Institute organization performed the gingerbread boy shadow puppet play (the fifth example of a gingerbread boy-like story), Miss Peterson showed the students examples of shadow puppets, explained their history, and discussed how they moved and functioned in the light. These examples were external symbols that helped the children to understand the basis of the puppet performance. Miss Peterson first used language to cue the children about the definition and movement of a shadow puppet through explanations such as "our puppet is a going to move and work in a special way" and "now when I shine a light behind my hands, I will cast a shadow on the wall. So your hands can actually be puppets and you can actually shine light on them to make shadow puppets on the wall." Figure 24 illustrates this dialogue in the context of learning about shadow puppets.

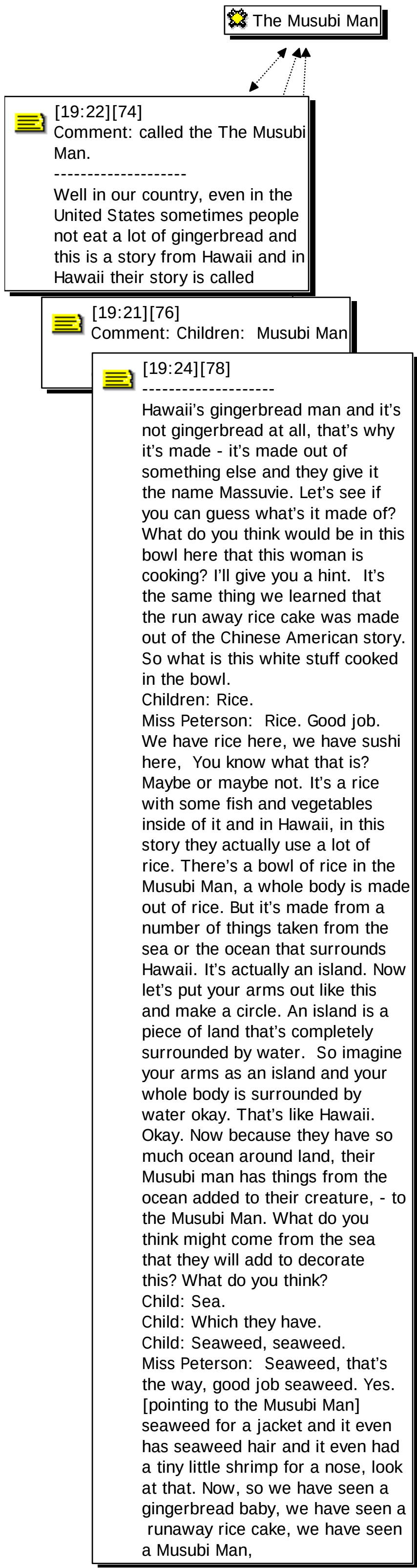


Figure 23. Dialogue surrounding *The Musubi Man.*

Student development preceded learning as the kindergartners learned all about shadow puppets. They formed flying images with their hands to represent the shapes of shadow puppets cast onto walls when hit by light. They saw an example of an ornately colored Chinese woman puppet adorned with a pheasant atop her head. Miss Peterson discussed the history of shadow puppets in China and stressed their cultural importance. The culminating shadow puppet experience involved the retelling of the traditional gingerbread experience. Students remained completely silent as they watched the shadow puppet images on the videoconferencing monitor. If they looked carefully, they could even see the gingerbread boy dancing in the oven before bursting out to run away. (see Figure 24) Throughout the performance, the gingerbread boy sang “Na, na, na, I won’t come back. I’d rather run than be your snack.”

At the end of the performance, Miss Peterson asked the students to recount their knowledge of the characters in *The Gingerbread Boy* as well as to recall other animal characters from the examples of stories where the character came alive and ran away. Figure 25 shows the dialogue of the question and answer session. Haley remembered that a cow wanted to eat the gingerbread boy while Jade recalled that the boy ran across a cow in *The Runaway Ricecake.* Lastly, Jasmine recollected that a dog tried to eat the gingerbread boy in the performance. As part of her question and answer session, Miss Peterson had the children voice animal sounds of the characters. She entertained the children with long spurts of mooing, grunting, and barking that were met with giggles from the children. To reinforce the song and the actions of the gingerbread boy, Miss Peterson even had the children sing the song while they where making their cardboard puppets. Thus, audio renditions of animal sounds and the gingerbread boy’s song gave the kindergartners another psychological tool to help them remember the story. The song and animal noises performed a strong role in the students' mediation of thinking.

The Recipe

The next portion of the videoconference encouraged the children to think about the ingredients that go into baking gingerbread. Miss Peterson crafted a pretend kitchen with the kindergartners as she directed them about the ingredients and method of mixing and baking the cookies. The full discussion surrounding the ingredient list, the mixing of the dough, the rolling out and cutting of the cookies, and the baking of gingerbread appears in Figure 26. In order to read the sequence of the dialogue, locate the Ingredients code in the middle of the diagram. The discussion starts at 12:00, directly above the Ingredients code, and progresses to the right, moving in a clockwise direction. The dialogue ends with the children's answer of ginger.

Miss Peterson started the children's thinking process about gingerbread ingredients by telling them that they needed to put a scoop of flour in their mixing bowls. So she pretended to pour a cup of flour into her imaginary bowl. Then she asked them what else might be part of the recipe. Haley replied, "Eggs." So Miss Peterson cracked her make believe egg and placed that into the bowl. Next, she asked what ingredients would make the cookies sweet.

Chloe responded, "Sugar."

Miss Peterson encouraged all of the children to stir in their pretend sugar. At this point in the videoconference, Miss Peterson provided some background information to the students about where sugar came from, what sugar cane looked like, what the appearance of the red and orange sweet parts of the sugar cane meant, and how the sugar cane was harvested. Then, she returned to the mixing of the gingerbread by informing the students that the addition of ginger would make the cookies taste spicy. She used her document camera to show a close-up picture of a ginger root. She also joked with them about the origins of ginger—the small tins of ginger don't grow on trees. Instead, she enlightened the students about the fact that ginger was actually a root. Meantime, Miss Peterson mimicked the sprinkling of ginger into her bowl and told the children that gingerbread gets its name from the spice ginger.

The instructor continued the pretend mixing of the recipe as she added cinnamon and more flour. As she had for ginger, Miss Peterson conveyed the origin of cinnamon as tree bark and of flour as wheat. She asked the children what else was made of wheat flour, and they replied in unison, "Bread." As in previous portions of the videoconference, the questioning, prompting, and gesturing motions during the Ingredients-coded parts of the session imparted various psychological tools to the kindergartners to help them reflect about the various ingredients in gingerbread, where they came from, and what their purpose was in the making of the cookies. These exercises assisted in the student's mediation of thinking about gingerbread cookies.

Individual Puppets

The videoconference closed with an art puppet project where students assembled individual puppets using a template made of a gingerbread head, torso, and legs, two brads, two twisty straws, and cellophane tape. Figure 27 shows pictures of students' puppets and also portrays their dialogue while making them. Students listened to directions from Miss Peterson in order to align the template parts and join them with a brad. She also directed them about how to adhere the twisty straws to the back of the gingerbread puppets and seized the opportunity to reinforce what the twisty straw should look like before attaching it. She said, “I want for you guys to bend your straws…I have made my straw and what number is this?” She also remarked, “I would like you to take your straws and bend them into a seven, but look at this. If I turn it the other way what letter does it make? As she said these comments, she molded the twisty straw to first look like a “7” and then like an “L”.

The students replied, “seven” to Miss Peterson’s first twisty straw comment and “L” to her second one.

After folding the twisty straws, students taped them to the back of the gingerbread puppets. Miss Peterson proceeded to give directions about how to move and decorate their puppets. She told them to hold the straws and move the puppets, “Back and forth, back and forth. I’m just moving my hands back and forth.” Meantime, Miss Peterson demonstrated the motions.

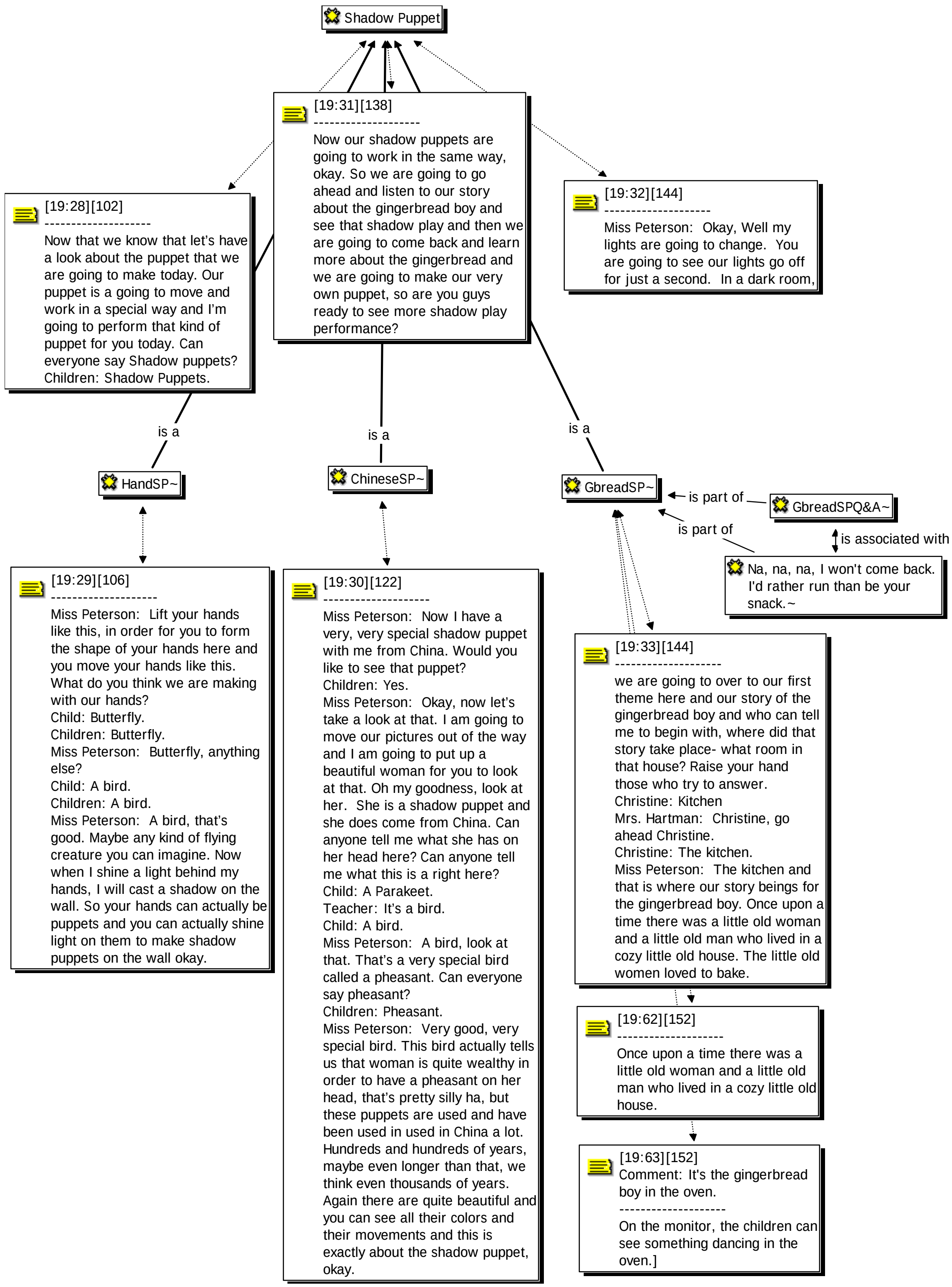


Figure 24. Dialogue surrounding learning about shadow puppets.

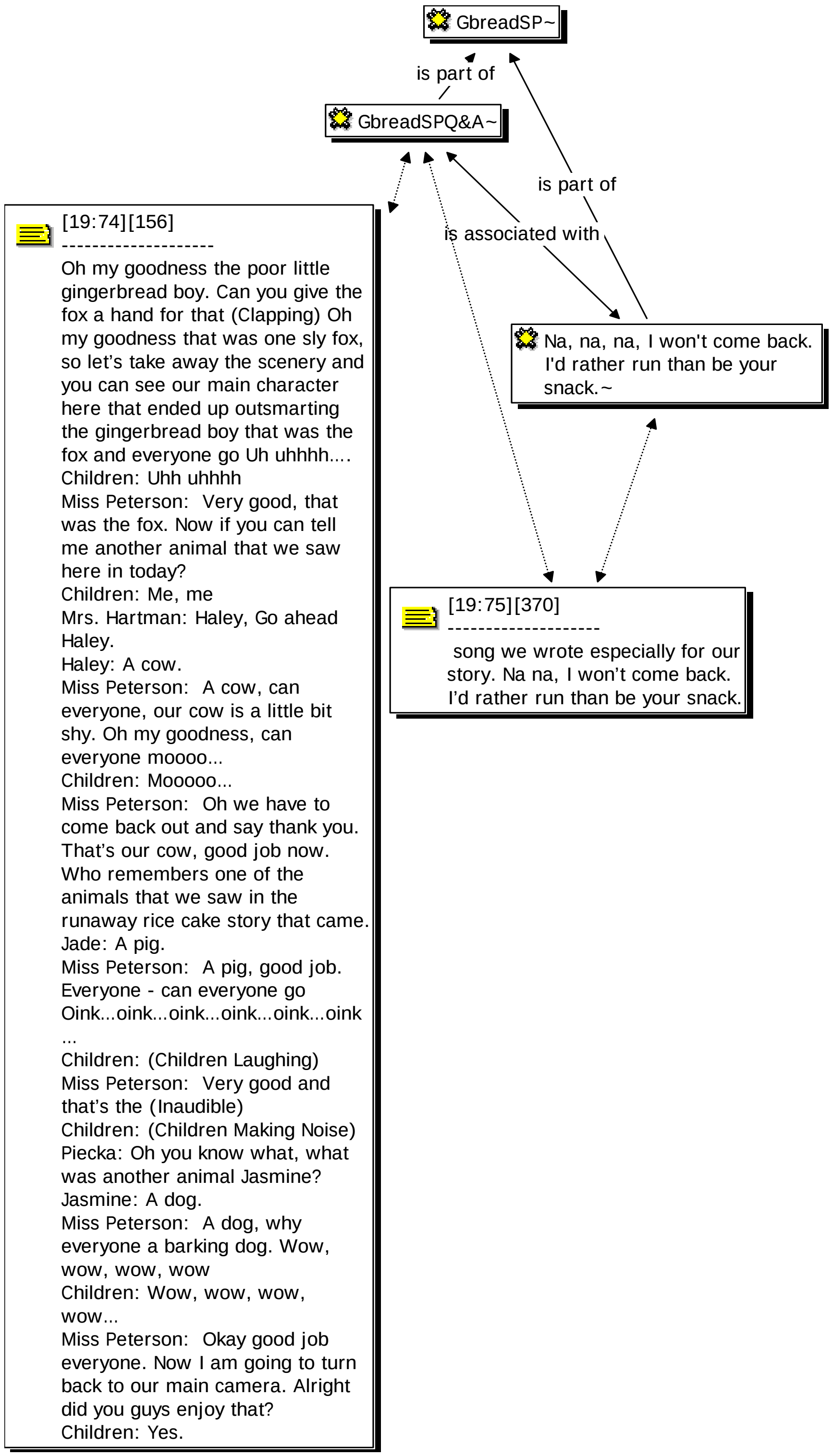


Figure 25. Question and answer session after the shadow puppet performance.

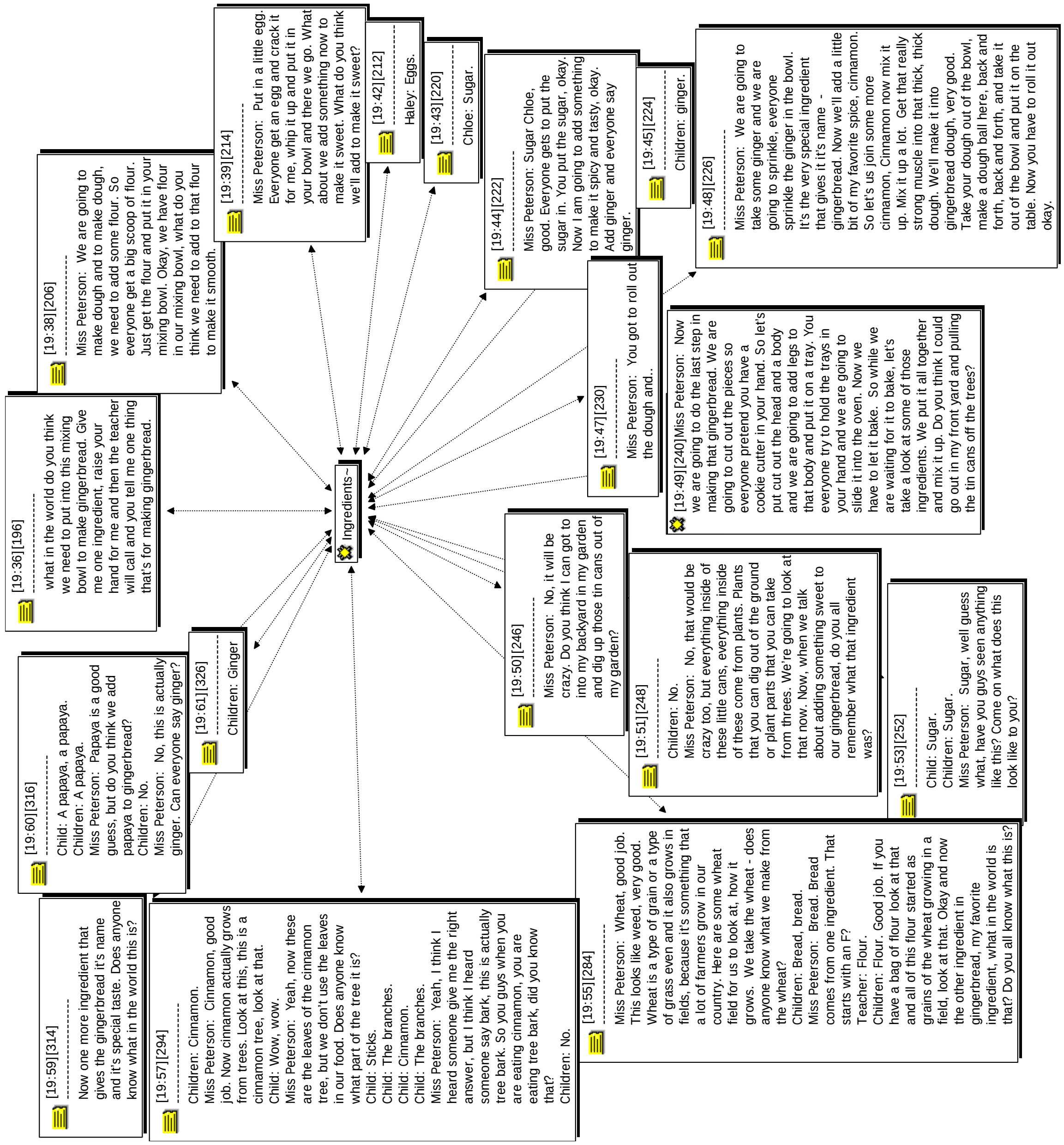


Figure 26. Discussion about mixing and baking gingerbread.

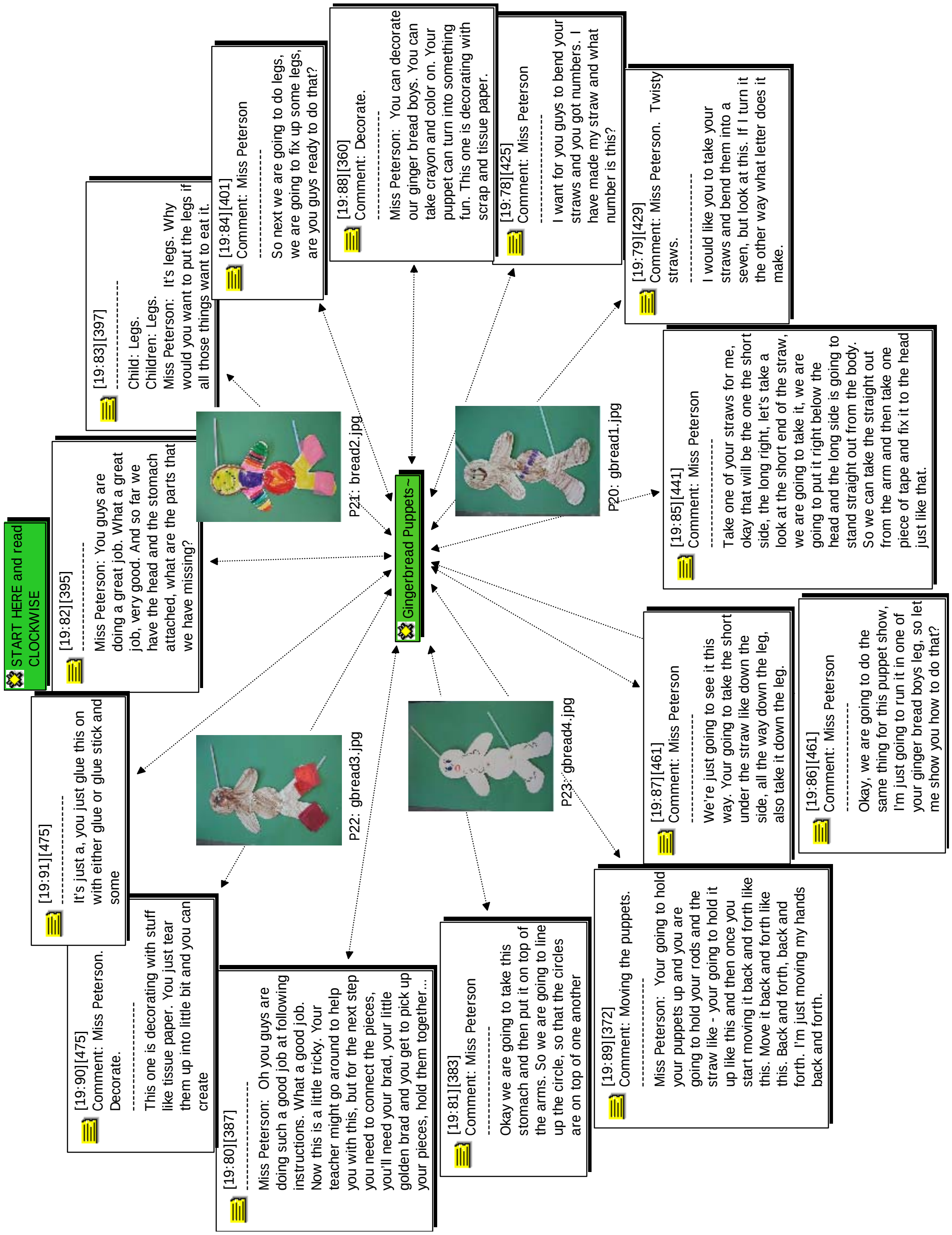


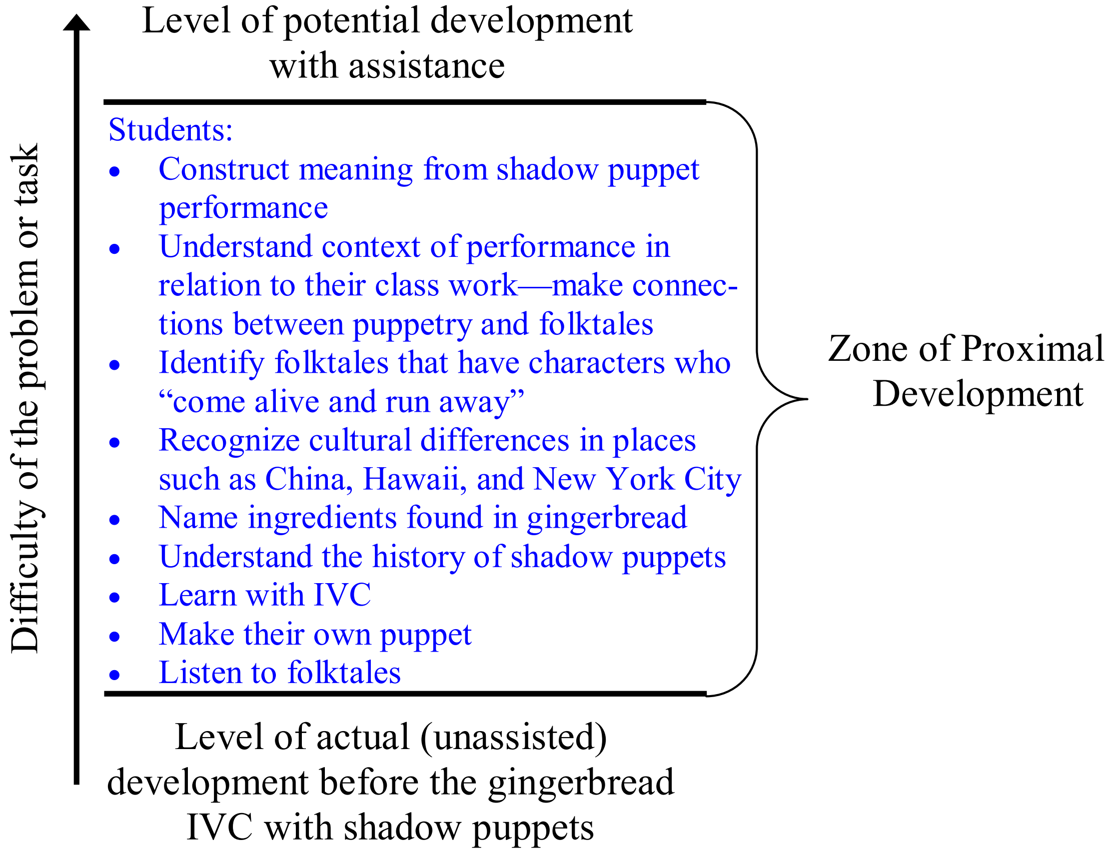
Figure 27. Gingerbread puppet examples and dialogue about making them.

The Gingerbread Boy and the ZPD

For the analysis of whether The Gingerbread Boy and Puppet videoconference increased the students' potential development with assistance, refer to Figure 28. The level of actual (unassisted) development before the gingerbread and puppet videoconference was portrayed through the questions that Miss Peterson asked of her students during the opening of the session. She asked them to tell her what they knew about the story of the gingerbread boy. From these conversations, it is ascertained that the kindergartners had a working knowledge of the story in terms of what the gingerbread boy did during most of the story (he ran away), why he ran away (characters wanted to eat him), why he ran away (at least the old woman wanted to eat him), and where he was created (in the kitchen). Figure 28 summarizes the many methods and manners through which Mrs. Hartman's class was able to make meaning during the interactive videoconference.

Students constructed meaning while reviewing five examples of stories that featured characters that came alive and ran. They formed these meanings through the instruction of Miss Peterson and through the social collaboration experienced during the interactive videoconference. Next, they had the opportunity to review the story of *The Gingerbread Boy* during a shadow puppet performance. They made connections between puppetry and the folktales they read in class while learning about the history, operation, and mechanics of shadow puppets. Mrs. Hartman's class also recognized cultural differences in the example stories provided by Miss Peterson for places such as China, Hawaii, and New York City. They compared and contrasted the characters in the stories, as well as the characters' environments and diets.

Using the psychological tools of primarily language but also gestures and songs, the children demonstrated higher psychological functioning. They were able to discuss cultural differences such as why the composition of the runaway characters in China and Hawaii were made of rice rather than gingerbread. They learned about the ingredients in gingerbread as well as the sources of these elements. While the class had participated in several videoconferences by the time this one took place on December 6, 2007, the theatrical and literature focus of the gingerbread and puppet videoconference was a new content area for a videoconferencing session. Although the topic area was new, the class participated in the same manner experienced in other videoconferences. They followed directions well, showed interest in the instruction, gestured and pretended to bake gingerbread, responded to questions about the folktales, compared and contrasted the similarities and differences in the characters, plot, and outcomes of the stories, created puppets, and enjoyed one another's camaraderie.



Miss Peterson: Tell me one thing you know about the gingerbread boy story

- George: He ran away.
- Chloe: So, everybody wanted to eat him.
- Steve: The old woman [tried to eat him]
- Christine: The kitchen [took place]

Figure 28. Gingerbread and puppet ZPD.

Results of the Astronomy I and II Interactive Videoconferences

Meeting and Greeting One Another

During the Astronomy I session, a large portion of time was devoted to letting the students get to know one another. This was intentional and part of Laura's recommendations. She related, "…I will invite both sets of children in turn to introduce their school and themselves. As it's just the two of you [Lovand Catholic School and Smith Church of England School], it would be good to make this a significant part of the VC [videoconference]" (Laura, personal communication, January 7, 2008). From a Vygotskian perspective, this time enabled the children to learn more about one another's cultures in terms of what they wore to school, their school subjects, where the schools were located, ages of the students, the classroom layouts, and the weather. In Vygotskian terms, the individual developmental environment was rooted within a social context that was both local and remote or global (Vygotsky, 1978, 1986). The local was represented by the immediate classroom at Lovand Catholic School and the remote classroom by Smith Church of England School. Thus, the students on the west of the Atlantic Ocean as well as those to the east of it first learned about one another on a social level, or between people (*interpsychological*) (Vygotsky, 1978). The parties involved in the videoconferences as well as Laura's introductory remarks are pictured in the Appendix S concept map.

Smith School's Social Introduction

The meet and greet portion of the Astronomy I interactive videoconference lasted for 10 minutes during the 60-minute session and as Laura intended, occupied a significant portion of the first videoconference. Microphones remained muted while other parties talked. Thus, conversations at Lovand School could not be heard by Laura, Elizabeth, or Lovand School while Lovand School presented. When Laura and Elizabeth introduced themselves, the Lovand teachers immediately commented on the British accents of the presenters. The Lovand teachers pointed out these language differences to their students and advised them to remain quiet so that they could listen and hear the British words that sounded different to them (Figure 29). The Lovand students smiled and nodded their heads. Laura asked Lovand School to begin the school introductions. The picture on the monitor changed from showing Laura and Elizabeth to that of the first level classroom at Lovand School. The Lovand children observed a class of students about their age sitting at low tables and chairs.

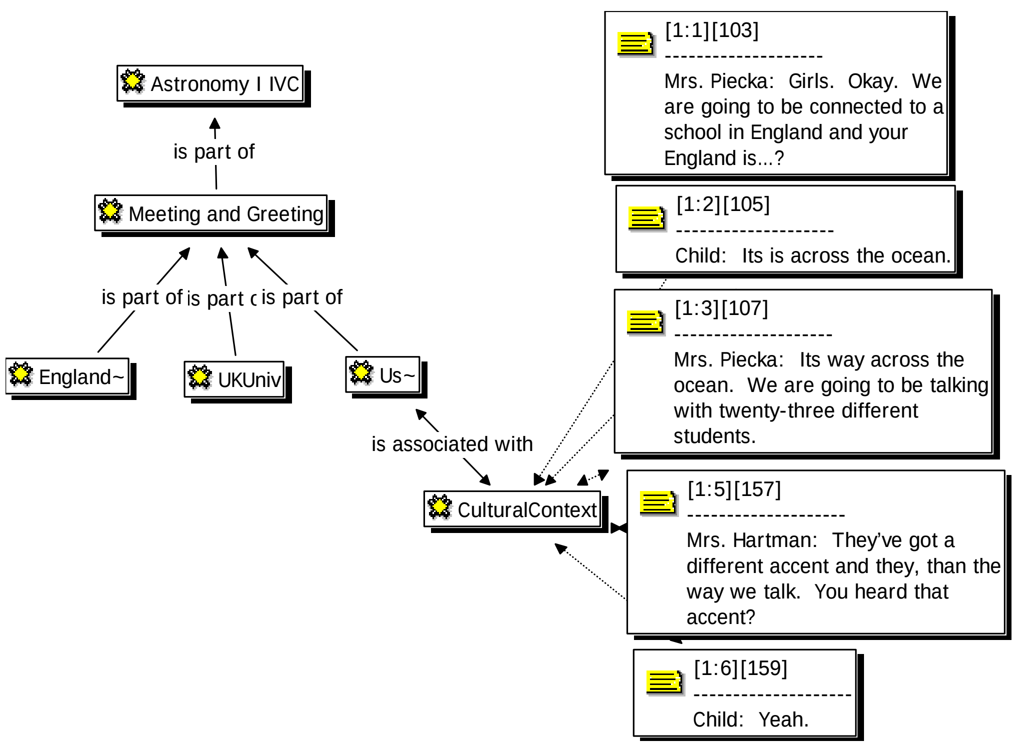


Figure 29. Talking about cultural differences in the Lovand classroom.

Alexa, a young student, commenced Smith School's introductions. She slowly announced their location, "We are in an area of outstanding natural beauty on the edge of

Silk Bay." Mr. Thomas helped Alexa to read and pronounce the "big" word outstanding. The Appendix T concept map portrays Smith School's dialogue during the meet and greet session.

Tori continued, "We have a school uniform, do you? We wear our blue jumper or blue cardigan and a badge that is white." Pointing to her cardigan badge Tori stated, "Our badge says Smith Church of England School."

Next, Jake stood up to read his prepared sentence. His teacher reminded him to walk over to the yellow box where a microphone sat on top. Jake travelled around the table to the box and projected, "Our school is a small village primary school with a 100 children aged between 5 and 11."

Spencer was the next speaker. He took the script from Jake and whispered, "We do three sheets of work a day." Mr. Thomas then asked him to repeat his words in a loud voice. Spencer repeated, "We do three sheets of work a day."

The final student speaker from Smith School approached the microphone. With eyes staring straight ahead, Kendra pronounced her words slowly and flawlessly, "There are 23 people in our class aged between 5 and 7. Twelve in Year 1 and 11 in Year 2. We all bring a packed lunch to school and eat together in school."

After the Smith students finished their descriptions, Mr. Thomas pulled an easel into view and showed the Lovand students where his class was located on a map of England. While pointing at the map, he proclaimed,

> So, the children know where we are. We are on the West Coast of Great Britain on the edge of a place called Silk Bay. So, our children live at seaside. In fact, it will be high tide in 2 hours time. In 2 hours time, it will be 4:00 in the afternoon

> here. Yet in America, you've just come to school. Very shortly, our children will be going home. So that's us at Smith.

Laura prompted Lovand School to begin their introduction, "Okay, let's go to America and tell us about you."

Lovand School's Social Introductions

Mrs. Hartman began her introduction with affirming utterances from her students such as "That's us," "We," "America," and simply "Us." Mrs. Hartman proceeded,

> Good morning. We are from the United States. We live in Pennsylvania. We are in the western part of Pennsylvania in a city called Woodview and this is the kindergarten at Lovand Catholic School. There are 25 children in our school, I mean in our class. We have a 162 children in the school. We range in age from 3 to 14, Grades prekindergarten through 8 and our children wear uniforms once they reach first grade. Our curriculum consists of reading, language arts, mathematics, religion, physical education, science, social studies, and Spanish. We study Spanish and computer. We have a very good technology program here. Our children would like to introduce themselves and say good morning. So, we're going to start in the front and just say good morning and say hi, my name is…Okay, Kevin we will start with you. Kevin? Say, hi my name is Kevin.

One by one, the children announced themselves. Sometimes, Mrs. Hartman urged a student to repeat their name if they were especially quiet. But for the most part, the student introductions went smoothly with each child smiling as they waited for their turn to announce their names. They also waived at the camera quite regularly. Details of the dialogue are depicted in Appendix U. After the final student pronounced their name, Mrs.

Sullivan and the researcher introduced themselves. The researcher proceeded to explain where Lovand School was located with the aid of an atlas. However, it took a few seconds to zoom the camera onto the upright atlas that she stood in her lap. While the researcher navigated the camera to zoom in on the atlas, the students' comments guided her zooming efforts.

"Boom," said one child as the atlas was finally centered in the middle of the picture.

"Ahhhh" and "wow," commented others.

When the researcher accidently hit the wrong button on the remote control, Haley asked, "What did they do?" as a different image appeared on the monitor. The image showed only text and was not a screen anyone had ever viewed before.

The researcher remarked quizzically, "The researcher doesn't know what she did."

In response to her comment, Ben glanced backwards over his shoulder to look at the researcher, smiled slyly, and rebuked the researcher by poignantly pronouncing her name. Subsequently, other students chimed in telling the researcher to get the screen off. These statements are highlighted within the discussion of the social and cultural introductions to emphasize that by time of the astronomy interactive videoconference (the fourth during the research study), Mrs. Hartman's students understood the normal operation of the videoconferencing equipment. They knew when it was working well and when it was not. When the researcher hit the wrong button, they wanted to know what had happened. This example highlights the technological literacy level of the kindergartners at Lovand School. They knew when the equipment was operating in a normal fashion and did not hesitate to ask about any irregularities experienced during the videoconferences.

In order to visually demonstrate where Woodview was located in the United States, the researcher pointed to the atlas with her finger and said,

> We are located about right here, we are about a 7 hour drive from the Atlantic Ocean. It is over here. So, we have to go all the way across the Atlantic Ocean to get over to England. Right now, outside it is snowing. We have less than an inch of snow on the ground and we were a little fearful that we might not be able to videoconference because of the snow. But, the weather cooperated.

Building Trust in a New, Socially Constructed Space

After Lovand finished their introductions, Laura resumed her description of the videoconferencing process. However, she first noted, “So great to have all of you with us here, the first school in the United States that we have video conferencing with us. So, this is a first for us.” The Lovand teachers appreciated her comment about being the first school in the USA to videoconference with the British university. They quietly remarked amongst themselves about how this made them feel special.

During the meet and greet portion of the videoconference, Laura supported the building of rapport and camaraderie between the young community of learners. Smith School students described their class, the school day, their uniforms, and even their lunch details. Mr. Thomas added information about the school’s proximity to the sea. Later, Mrs. Hartman described her school, their curriculum, and let her students introduce themselves. Both schools used maps to point out where they were located. The researcher described the weather in Woodview, while Laura proclaimed the weather as wet and messy at her university. These activities emphasized the important role of language in cognition (Vygotsky, 1978, 1986). Vygotsky stressed the social origins of meaning making. In these introductory moments, the two classrooms formed a new, virtual bond. Mrs. Hartman's and Mr. Thomas' students used language in a dual mode. First, they used language to describe themselves to the other classroom. Mr. Thomas' students identified themselves through their attire, their location, their ages, and a point on a map. Mrs. Hartman's class described their affiliation with Lovand School, their class, and their nearness to the Atlantic Ocean. Each school had the opportunity to present their own uniqueness while listening to the description of the other class. They began to recognize commonalities (e.g., age, school uniforms, lunch time, the Atlantic Ocean, class size, and maps) and differences (e.g., accents, whether they were seated on the floor or at tables, male or female teacher, and countries) as they talked and shared.

Thus, the first astronomy videoconference enabled Mrs. Hartman's kindergartners to form meanings about learners who were their own age but not physically located anywhere near them. They understood that the videoconferencing equipment let them interact with different places and people. From a Vygotskian perspective, the Lovand kindergartners formed meanings about students who were thousands of miles away based on the dialogue and descriptions from Mr. Thomas and his 23 students. Vygotsky (1978) believed that a child's speech and action in terms of their development were intertwined and indistinguishable. Based on the opportunity afforded by the meet and greet portion of the meeting, Mrs. Hartman's students began to develop an understanding of what happened in Mr. Thomas' classroom.

Astronomy Concepts

During the two astronomy videoconferences, Elizabeth defined several key concepts for the kindergartners. She used these definitions early in the first astronomy collaboration and continued to remind the children about their definitions for the duration of the virtual field trips. She defined the following concepts: star, constellation, galaxy, solar system, planet, moon, orbit, and constellation. Figure 30 shows Elizabeth's astronomy concepts and definitions used during the pair of astronomy videoconferences. She encouraged the children to use the correct terminology through multiple-learning exercises: (a) construction of a human model depicting the Sun, Earth, and moon, (b) estimating planet sizes in relation to the sun using balls, (c) recounting what is seen in the night sky, (d) playing a game of name that astronomy concept of star, planet, or galaxy, (e) presentations of student astronomy works, and (f) playing an open-ended question and answer game. These learning exercises featured multifaceted opportunities for the students to learn in a social context, share cultures, use new vocabulary words associated with the astronomy concepts, interact with one another both in the local sense and in the remote sense, and develop their knowledge of astronomy. In these situations, the students first developed an understanding of these concepts on a social level. In the second astronomy videoconference, some of the children's dialogue indicated that they had begun to internalize the astronomy concepts by using the terminology appropriately during their learning activities and especially while presenting their student works.

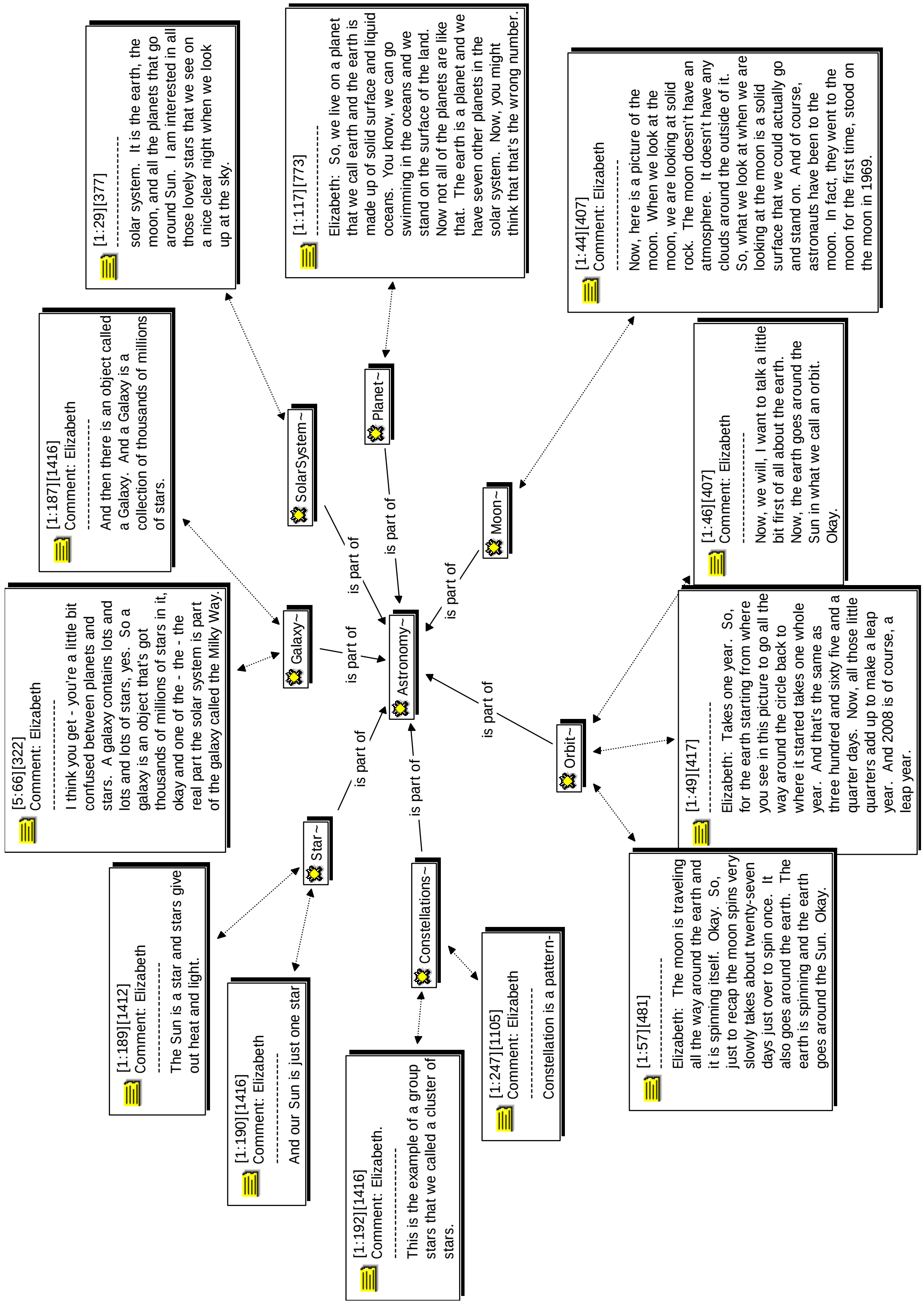


Figure 30. Astronomy concepts defined by Elizabeth, the astronomer.

The Sun, Earth, and Moon

The next section of the meeting focused on the Sun, Earth, and Moon and was laden with many different sign and tools to develop mediated activities in order to stimulate thinking about these concepts. Elizabeth, the astronomer, used an inflatable globe-like image of the Earth to represent the planet (Figure 31). She manipulated the inflatable model of the Earth to illustrate multiple ideas. For instance, when she talked about the Earth spinning, she would spin the Earth between her two fingers in front of the videoconferencing camera to demonstrate to the students how the planet spins.

The inflatable globe also helped Elizabeth to show the children about the moon's orbit pattern. She used an apple as a symbol for the Earth's moon. She explained, "We've got another object. I didn't have a little ball so we are going to use an apple." To demonstrate the orbital pattern of the moon around the Earth, Laura held the inflatable globe while Elizabeth pinched the apple stem between her fingers and physically moved the apple around the spinning Earth to show the children how the moon revolves around the Earth (Figure 32).

Figure 31. An inflatable globe used as a symbol for the Earth.

Figure 32. The moon, represented by an apple, orbited around the Earth.

During the astronomy interactive videoconferences, there were several other examples of how symbols and tools were used during mediating activities (Vygotsky 1978, 1986) in order to help the children understand more information about the planets. During one event, the children were asked to form human models showing the relationship between the Sun, Earth, and moon. Elizabeth directed the schools to select three students for the roles of the Sun, Earth, and moon. Smith selected three students and Lovand selected three students. Each school muted their microphone while the teachers and students worked offline to develop a moving model about the orbits of the Earth around the Sun and the moon around the Earth.

At Lovand, Mrs. Hartman selected Ben as the Sun, Jasmine as the Earth, and Maria as the moon (see Table 15). It was easy for Jasmine to walk around Ben in a counterclockwise pattern as she pretended to be the Earth. However, it was much harder for Jasmine when she had to spin while circling Ben. Making sure that no one fell, Mrs. Hartman cautioned, “Jasmine stop to get your balance. You are going to trip.” The class often giggled and smiled as they watched their 3-person model.

Table 15

Astronomy Roles and Names for the 3-person Model of the Solar System

Astronomy Roles	Lovand Catholic School	Smith School
Teacher	Mrs. Hartman	Mr. Thomas
Sun	Ben	Rosemary
Earth	Jasmine	Sabrina
Moon	Maria	Katie

When Maria, the moon, joined the moving model, Ben and Jasmine needed to make accommodations for another spinning person. Mrs. Hartman asked Maria, “Where do you think you are going to be? Remember what she said [Elizabeth] about where the moon is?” Maria kept bumping into Ben and Jasmine as she circled Jasmine, the Earth. Mrs. Hartman continued to guide the children and told Maria, “You are going to go very slowly and you're going to go around the Earth like this.” Mrs. Hartman gestured the proper direction to take. She said, “But, you are also going to be walking with her [Jasmine], going, while she is going around the Sun. So, you just keep your eye on Jasmine. And, you are going to be going around her.” Figure 33 depicts an aerial view of the 3-person moving model the children made during the videoconference and the directions they spun.

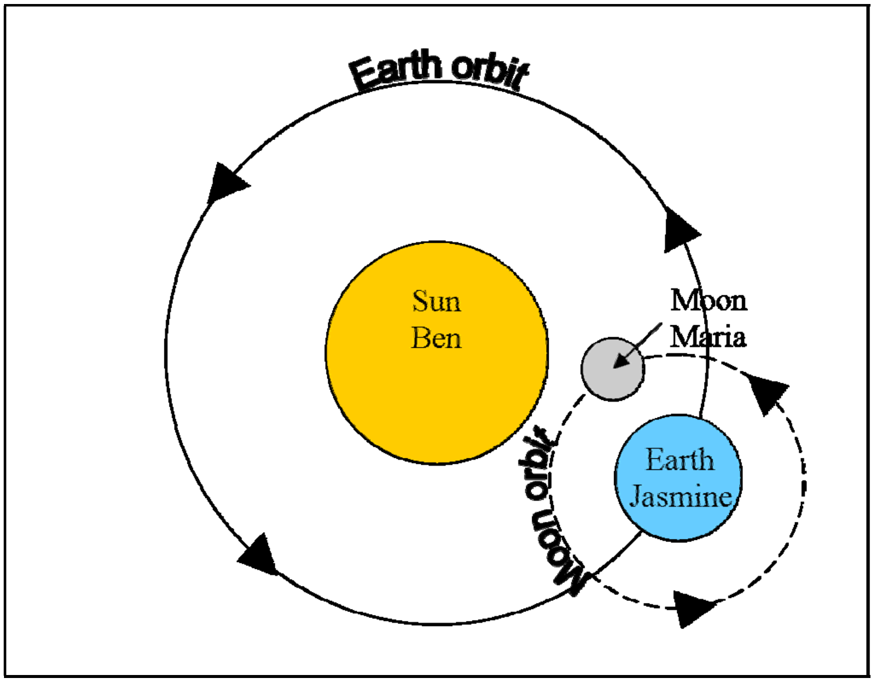


Figure 33. Aerial view of 3-person moving model of the Sun, Earth, and moon.

While giving directions to Ben, Jasmine, and Maria, Mrs. Hartman referred to an artifact that her kindergarten students completed as part of their science curriculum, a moon phase worksheet (Figure 34). This worksheet was a standard component of Mrs. Hartman's science curriculum, but she rearranged her lesson plans so that the moon phase unit coincided with preparations for the astronomy videoconference. Thus, she was able to use familiar lesson plans ideas to prepare for the collaborations. Students completed the moon phase worksheet after a hands-on class exercise where Mrs. Hartman demonstrated how the sun created a shadow on the moon using a lamp for the Sun and two Styrofoam balls for the Earth and moon. The children cut and pasted black and white pictures of the moon onto their worksheets in the same pattern as Mrs. Hartman illustrated on the moon poster. Then, children received a colorful earth sticker to place in the middle of their worksheet. After they were done, students put their worksheets in their 3-ringed science binders that they kept in their desks.

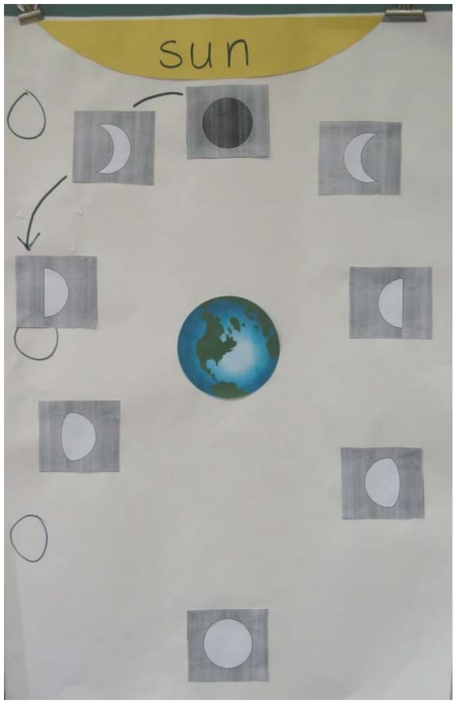


Figure 34. Moon phases poster/worksheet.

During the interactive videoconference, the poster-sized worksheet assisted the kindergartners in recalling the sizes, shapes, names of the moon phases, and the orbit direction. Kozulin referred to symbols such as the moon phase worksheet as “artificial formations” (1986, p. xxv). During the task of creating a moving model of the Sun, Earth, and moon, Mrs. Hartman showed the familiar, poster-sized worksheet to the students while giving Ben, Jasmine, and Maria directions about spinning,

Mrs. Hartman related assurance and directions to Ben, Jasmine, and Maria as they continued to pretend to be orbiting model of the Sun, Earth, and moon,

> That’s right keep going around. Keep around the surface around her. Keep going around. Jasmine, you need to slow it down, so that you can keep going around and

> when you're going around her, remember what we said when we were learning about the moon. Can you bring up our picture on the moon? [Mrs. Hartman gestured to Mrs. Sullivan to pick up the poster-sized moon worksheet.] The moon goes around the Sun in *this* direction. So, you are going to keep coming around her toward me. Keep going around her toward me.

Meantime, Ben (the Sun) was dancing in place with his fists closed, sometimes even closing his eyes. Jasmine and Maria slowly circled Ben, staggering a little from dizziness. The sound of laughter filled the room as the children practiced and pretended. The children sitting on the floor pleaded with Mrs. Hartman to have a turn to be the Sun, Earth, or moon. They longed to be part of the human symbol that represented the new concept of orbits. Unfortunately, the limited physical size of the library prohibited more than one 3-person model to move around at one time. One child directed a question to Mrs. Hartman, “How about you let us take turns?”

To appease the children’s desire to be part of the model, Mrs. Hartman advised the students, “Okay. Right. You know what, the next time you have gym class I will tell the gym teacher to let you practice this in the gym.” The children responded with nodding heads and utterances about taking turns. Again, Mrs. Hartman assured the children that they would all get a chance to be the Sun, Earth, or Moon when she said, “We will go to the gym and everybody have a turn, okay?...We will get into eight groups of three.”

After the 5 minutes elapsed, both schools rejoined Laura and Elizabeth for the presentation of the human orbital patterns of the Sun, Earth, and moon. Elizabeth requested that Lovand School go first. Ben, Jasmine, and Maria turned to face the camera. While rehearsing, they faced their classmates. Slowly, Jasmine rotated around

Ben in a counter clockwise direction. Maria started circling Jasmine, also following a counter clockwise pattern. However, it was difficult for her to keep up with Jasmine's revolutions. While Lovand School demonstrated their 3-person model, they could not see the other school, but could see and hear the exclamations of Laura and Elizabeth. Laura enthusiastically told the children at Lovand, "Brilliant! Give yourselves a big clap!" The children applauded for themselves and she reinforced their efforts with a gleeful compliment of "That was very well done."

Next it was Smith School's turn. First, the Sun, Earth, and Moon introduced themselves. Three girls stood before the camera in the center of the room. Rosemary softly said, "My name is Rosemary. I am the Sun." Rosemary was standing on a chair. Mr. Thomas reiterated that Rosemary was the Sun (see Table 15).

Next, Sabrina stepped up and stated, "Hi, my name is Sabrina. I am the Earth."

Finally, Katie announced, "Hi, my name is Katie. I am the moon."

After introducing themselves, Sabrina started to slowly spin around Rosemary on the chair. Katie quickly rotated around Sabrina, but sometimes their revolutions started to slow down. Mr. Thomas came forward to help guide the girls moving them in the proper direction. He told them to, "Keep going. Keep going. That's it," as he gently motioned their position. To Katie he said, "Turn around Sabrina. That's it. Turn."

Laura and Elizabeth responded with big smiles. Once again, Laura praised the students, "Well, that was fantastic because she was spinning as well. You must all give yourself a big clap as well. Well done. Give yourselves a big clap."

Building on their tremendous efforts, Elizabeth reiterated,

> That was excellent. Oh that was very difficult to do, isn't that, not bumping into each other while you're trying to spin at the same time. So, when we have the breakup of this videoconference, you can actually have a go. We have even more space if you go into the playground and you could perhaps. We will see in a minute that the other planets go around themselves as well. So, you could perhaps have other people be other planets as well. So, you can make up a really big model of how the solar system fits together. But, that was brilliant. I really enjoyed seeing it a lot.

In this example, the kindergartners used multiple signs to help them learn about astronomy. Some of these signs originated in the culture of their local classroom while other signs were introduced from remote sources. Mrs. Hartman’s classroom used a poster-sized moon worksheet to remind the children about the shapes of the moon as it revolved around the Earth. They also built a living model using three children to illustrate the relationship of the orbit patterns of the Sun, Earth, and moon. Lovand’s kindergarten culture was shared with Smith School in the social context of an interactive videoconference, thereby creating a multicultural experience for the students while sharing their own classroom cultures.

The 3-person moving model first represented a sign to the individual schools on a local plane. The students at both schools were delighted to see the similarity of the models they created. First, Lovand School showed Jasmine and Maria moving around Ben in a counter clockwise direction to represent their human model. Smith demonstrated a very comparable model except that Rosemary, their Sun, stood on a chair while Sabrina and Katie spun around her. At both of the schools, the teachers coached the children about direction, speed, and other precautions to keep the children safe. Elizabeth reminded both schools that although only three persons from each school demonstrated the orbits during the videoconference, that they could also practice these same solar system patterns in bigger school areas such as the playground or gym. While each classroom independently created a cultural model of the orbits on the local level, by sharing their ideas of the 3-person model, they created a larger classroom culture bringing the local and remote together to construct knowledge about their universe. They found meaning in the likenesses of their models, their desire to all have a turn, and the physical act of moving around another person to experience the actual orbital routes of the Sun, Earth, and moon, making the collaboration a multicultural experience. Their meaning making of these orbital patterns was elevated to a higher level by first handedly experiencing the movements. Later, this same concept was reinforced when Elizabeth showed an animation video of the orbital patterns.

Estimating Planet Sizes with Balls

During the first astronomy videoconferences, each school was given an estimation task, or game as Elizabeth put it. She told the students to imagine that they were going to "shrink the sun down to a meter." Then, she gave each school the names of two planets. Each school needed to pick different balls to best estimate the size of the planets against the Sun. They received 5 minutes to figure out their ball choices. Elizabeth assigned Jupiter and Mercury to Lovand. The kindergartners had about seven balls to choose from ranging in size from a one inch bouncy ball to a medium-sized pilates ball. The students immediately told Mrs. Hartman that the largest ball, the pilates ball, should be the sun. Since the metric system isn't the standard measurement scheme for the USA, Mrs.

Hartman asked Mrs. Sullivan to retrieve a meter stick so that she could better assist the children with their ball choices.

Next, Mrs. Hartman began a dialogue with the students about which planet was larger, Jupiter or Mercury. Minutes ago, Elizabeth presented content about the planets that showed their relative sizes compared to the Sun. The children had no difficulty identifying the larger planet, and they selected Jupiter as the bigger one. Selecting a ball size to represent Jupiter proved to be a more difficult task than just picking the bigger planet. The students finally settled on a red playground ball to represent Jupiter. Mrs. Hartman guided the students by reminding them that Mercury probably required a smaller ball. They agreed and picked the yellow, small bouncy ball to be Mercury. The discussion surrounding these choices is located in the Appendix V concept map.

After a few minutes, Elizabeth announced that it was time to rejoin the group. Both schools presented their findings. The teachers and students announced their choices of balls. Lovand's choices of balls were much bigger than Mercury and Jupiter's sizes when compared to a meter-sized Sun. Elizabeth then illustrated how small Mercury would actually be if the Sun was reduced to a meter. She clued the children about its size. She said that it was smaller than a fingernail and "you might use it for grinding pepperoni - for dinner or for lunch." The Lovand students were still baffled by the clues as they tried to figure out exactly what Elizabeth meant. She placed a peppercorn under the camera, but it was hard to make out its identity.

One child remarked, "It's the tiniest thing that I've ever saw."

While the students seemed unfamiliar with the term "peppercorn," they were definitely impressed by the tiny size of the object that was supposed to resemble the size of Mercury. They understood that Mercury was a very tiny object when compared to the Sun. This problem-solving activity required much scaffolding and support from the teachers as well as by Laura and Elizabeth. By asking guiding questions, the students did not necessarily understand the size of the planets in relation to the Sun, but they minimally came away knowing the smallest one —Mercury.

What Do You See When You Look Up in the Sky At 9?

After completing the difficult ball estimation game, the videoconference turned to a calmer discussion about what the children saw in their evening skies. Lovand started talking about the moon phases that they had worked on just a few days prior to the videoconference. Mrs. Hartman asked Elliott to start the conversation. Elliott remarked, “The sun does it - the sun um, - makes the moon light up.”

Mrs. Hartman nodded and replied, “Okay. And we also learned that the reason, you want to explain why we only see parts of the moon?”

Elliott continued while pointing at the moon phase worksheet (Figure 34) that Mrs. Hartman showed before the camera, “When um - It turns this way then - when in fact, the new moon it will - it will light up.” Elliott then proceeded to announce the moon phases—the crescent moon, the first quarter, the waxing gibbous, the full moon, the waning gibbous (with some hesitation in his voice), the waning gibbous, the waning crescent, and the new moon. The poster-sized worksheet helped Elliott to name the moon phases. Elliott was able to call on his internalized knowledge about the moon to share with a British astronomer and a classroom of students across the ocean.

Elizabeth responded with these affirming words, “You know I’m really impressed, well, you know about Waxing Gibbous and Waning Gibbous. Brilliant.”

Next, it was Smith's chance to talk about what they see in the night sky. Children named objects such as stars, the moon, clouds, and constellations. Elizabeth also mentioned that sometimes planets and even communication satellites might be visible depending on the time of year. In this example, there were widespread responses about what could be seen in the night sky. However, the use of symbols such as diagrams of constellations and moon phase worksheets assisted the students in reflecting about their answers while using new vocabulary terms.

Closing Activities for Astronomy I

The final learning activity of the first videoconference was a game where students had to identify the astronomy object as a cluster of stars, a planet, or a galaxy. Elizabeth posted a picture of an object, one at a time onto the monitor. Schools took turns identifying the object. After eight questions, four for each school, the astronomer congratulated the students, "100% correct. Every single one. Good job." Then, she opened the microphones for questions from the students.

First, Haley from Lovand asked, "What's the Milky Way made of?"

Elizabeth replied that the Milky Way was made up of lots and lots of stars. She also added that the Milky Way is a spiral galaxy. She elaborated that "So galaxy is a word that astronomers use to describe a very, very big collection of stars."

Both schools had many questions, but Ben had the chance to ask the next one. He inquired, "What - why is Mars made of rock?"

Mrs. Hartman clarified the question with some additional words and asked, "I think the question is why are there some rock planets and why are some gas?"

Ben voiced his agreement, "Yeah."

Elizabeth launched right into an answer,

> Okay. The - It depends on how planets are made. Okay. So, planets are made when our Sun was first born. And our Sun is a - a ball of very, very hot gas. Of all the gas and - dust and bits of materials that didn't go into the Sun that were left over, there what the planets were made out of. Okay. And some of them were pressed together so hard that they became rock whereas others made much larger planets - uh - made of gas. And it could be, that right at the very, very center of Jupiter, there is something that's rock. But it's very, very difficult for us to find that out.

A few seconds later a small voice at Smith asked, "How do you know all those things?"

Elizabeth smile and replied, "Well, I have. I could say I've learned a lot more from working with children like you."

Student Project Presentations in Astronomy II

Lovand School's Astronomy Projects

The Figure 35 concept map portrays three different signs and tools used during the Astronomy II videoconference: (a) a coloring book individually completed by Mrs. Hartman's students in class and presented to Smith Church of England School, (b) the mnemonic employed to help remember the planet names from the Sun outwards, and (c) a planet mural prepared cooperatively by Lovand's kindergartners showing the relative size and distance of the planets from the Sun. In addition, the Figure 35 concept map illustrates the 10 planet coloring pages decorated by the Lovand's kindergartners including a Sun cover page, eight pages of planets following the mnemonic order, and a dwarf planet page. These student artifacts were imported into the ATLAS.ti software as primary documents, and therefore could be coded along with the text. In subsequent concept maps, Appendix W through Appendix EE, the concept maps feature a similar hierarchy with the addition of dialogue from the videoconference that supports different Vygotskian principles in terms of sign and tool use, the importance of language, and the ZPD (three of the four Vygotskian tenets discussed in chapter 2). The dialogue in Appendix W through Appendix EE resulted from peer-to-peer collaboration after Lovand presented their coloring pages. Once the final coloring page of dwarf planets was viewed by the British classroom, the microphones were opened so that the Smith students could ask the Lovand students about their artifacts. This same procedure was followed by the Lovand students after they presented their works and is described in more detail later in this chapter. In addition, the concept maps in Appendix W through Appendix EE also include a picture of the planet coloring page that served as a presentation resource while Mrs. Hartman's children showcased their work to Mr. Thomas' classroom.

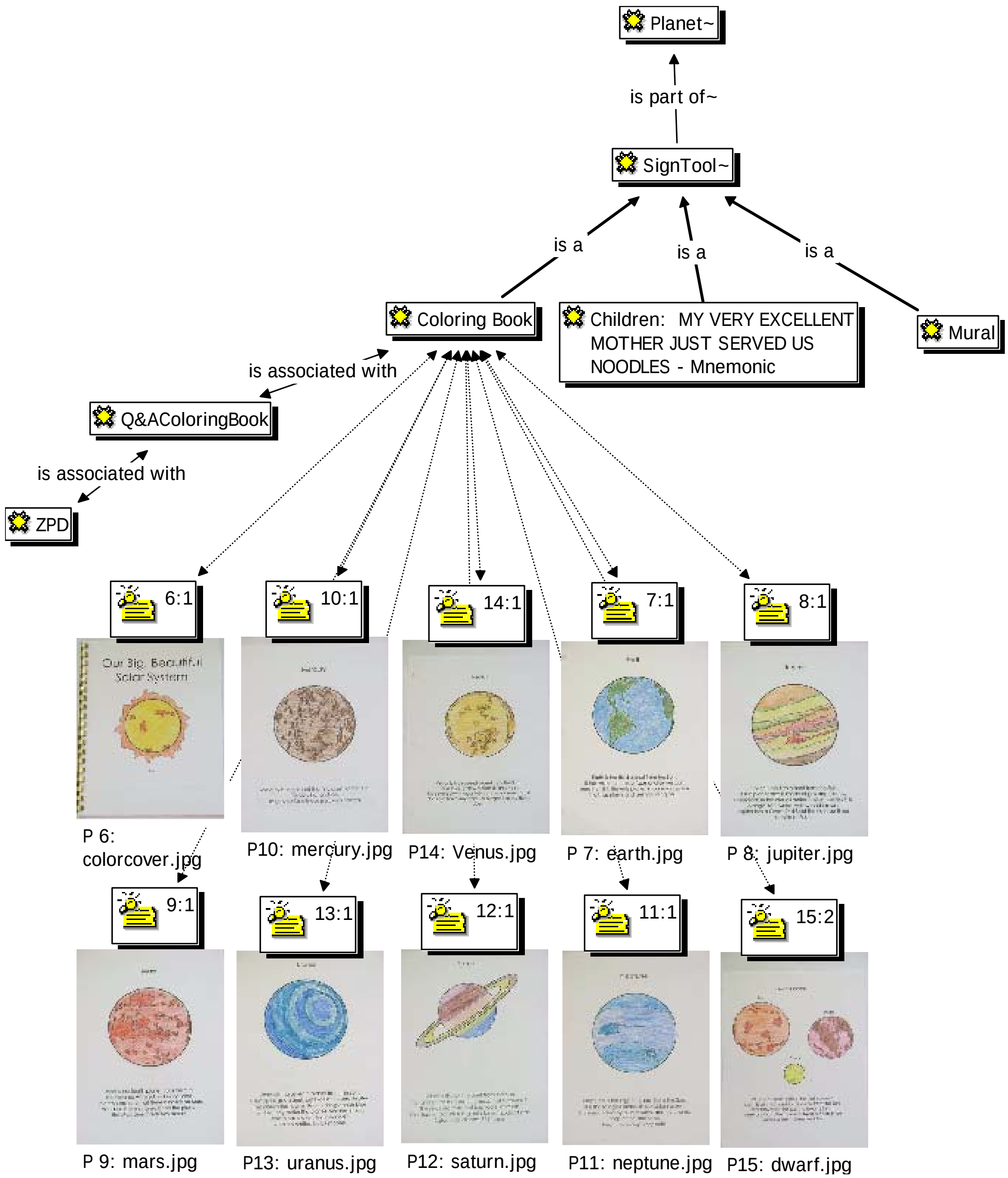


Figure 35. Signs and tools used during the Astronomy II videoconference.

The Figure 36 concept map is similar to Figure 35 because it depicts another student-created artifact, the planet mural. Figure 36 provides three pictures of the mural. The planet map was so large that in order to get a better view of the mural, a left and right view are provided in addition to a panoramic version. These pictures were also assigned as primary documents in the ATLAS.ti software and pulled into the concept map during after the coding process. In addition, the Figure 36 concept map shows the peer to peer question and answer dialogue poised to Lovand School from the Smith students at the conclusion of their artifact presentation. In order to for Smith to view the mural, Mrs. Hartman called on several students to hold up the large poster at the back of the library. Only the tops of the tallest students were visible as they held up the mural. Due to the mural's enormous size, coloring and gluing of the planets, Sun, and distance strips took place in the school's gymnasium.

During the Lovand School student presentations, Mrs. Hartman reviewed the planet names using coloring book pages her students finished. Individual students answered questions about the planets names and held up their pictures to the camera so that the Smith students, Laura, and Elizabeth could view them. Sometimes, Mrs. Hartman elaborated about a special planet fact. For instance, when talking about Mars, she asked "Can anybody remember why the planet is red?" One child guess that is was because the planet was close to the sun. But Mrs. Hartman negated the response and requested another explanation. The next answer poised by her students was, "Because it's so hot!" After not receiving the right answer in the first two tries, she reminded her students that Mars was red due to the soil content. This approach proved more positive when the students talked about Jupiter. Mrs. Hartman asked the students, "What does Jupiter have on it?" Several students exclaimed, "The great red spot." It was obvious that this fact intrigued the kindergartners because they also offered details about "hurricane" winds on Jupiter that "could tear you apart." Similarly, the students had no difficulty in describing the composition of Saturn's rings—"ice, rocks, and dirt." Students enthusiastically launched into a discussion about *Poor Pluto!* (Tokay Colony Elementary School (Lodi, Calif.), 2007), the planet that was no longer a planet, but just a dwarf planet.

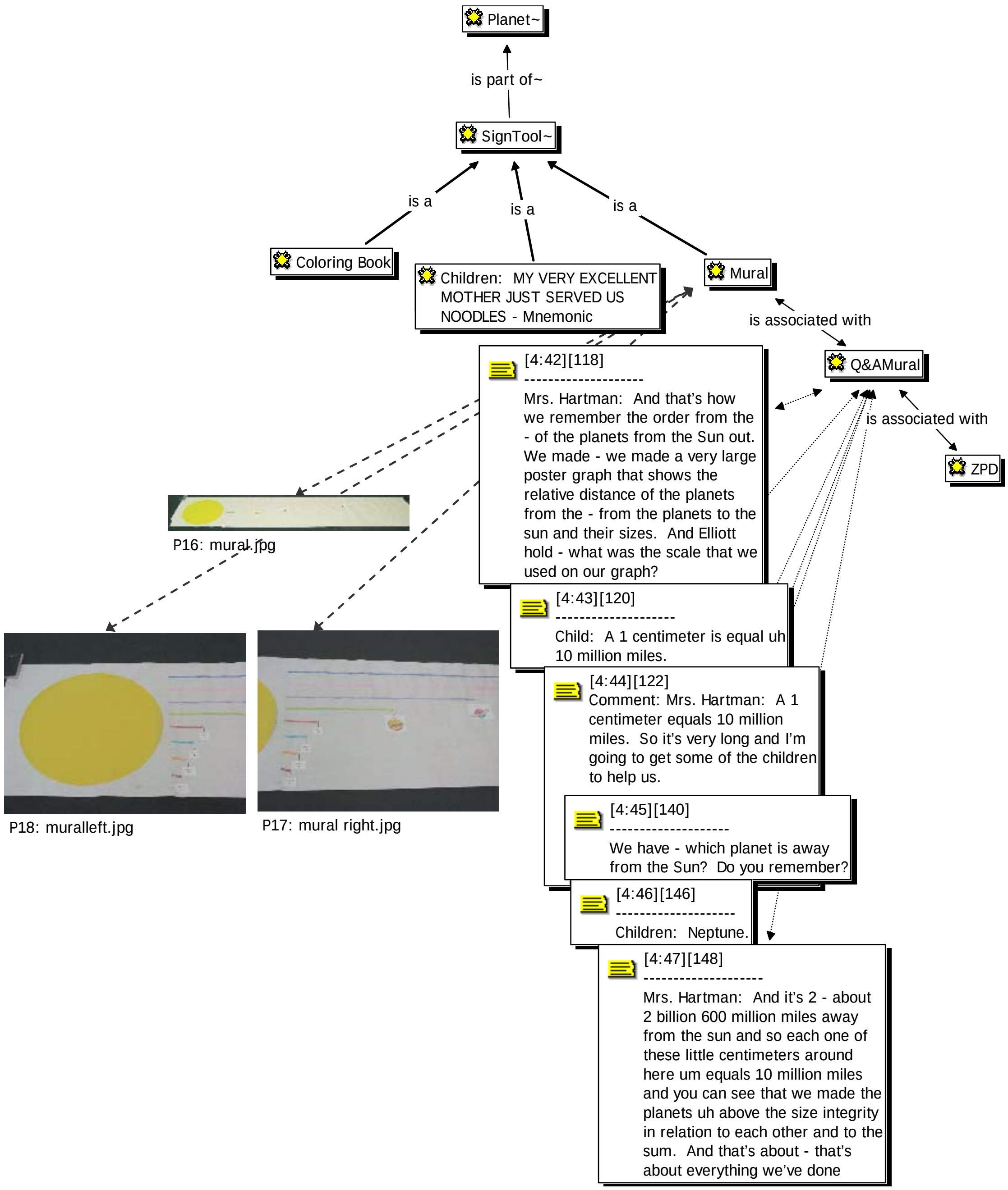


Figure 36. Planet mural and dialogue.

After the students discusses Pluto, they shouted the mnemonic, "My Very Excellent Mother Just Served Us Noodles!" that helped them to recall the order of the planets from the sun. Finally, they held up a scaled drawing of the planets in relation to the sun. The mural was too large to assemble in the classroom, so they glued the components together on the floor of the gymnasium. In the process of assembling the mural, Mrs. Hartman reviewed facts about the planets with her students. After Lovand's presentation, the Smith students asked multiple questions to the Lovand kindergartners. The latter responded to the several questions about their favorite planets and how they made the coloring books and mural, as well as to inquiries from Laura and Elizabeth. These responses are portrayed in Appendix FF.

Smith School's Astronomy Projects

Next, the Smith School students presented their projects. Mrs. Jones, a teacher who worked alongside Mr. Thomas, introduced their projects by saying that the students pretended that they were on the moon and were sending home postcards. Unlike the Lovand kindergartners, the Smith students presented individual and small group works rather than a unified project. The first project was a postcard reading from a young girl followed by a foursome singing *Five Little Men in a Flying Saucer Flew Round the World One Day.* These renderings were followed by a series of posters about the Sun, galaxies, specific stars, the Earth's moon, other planets' moons, and the space shuttle. Most of the posters were drawn by hand, but one was even done on the computer. Lovand School's presentations culminated in several boys' descriptions of rocket ships. They built rocket ship models and explained the various components and their purpose to Lovand School. Laura and Elizabeth commended the Smith students on their wonderful projects and this was followed by a question and answer session from the Lovand kindergartners to the Smith students. Lastly, Laura and Elizabeth asked Smith about their artifacts. Figure 37 shows the multiple kinds of astronomy projects.

Of particular interest was the fascination by both Lovand and Smith students for rocket ships. This appeared in multiple different ways. First, there was the creation of space shuttles and rockets by several Smith students as the basis for their projects. Second, there was the construction of a make believe rocket ship in Smith's play area that was visible during the videoconference. Third, the Lovand students were fascinated by the ability of the Smith students to go into the rocket and wave. They wanted to see inside, but they could get the camera in the make believe space ship. Lastly, it was evident that the Smith students took great pleasure in making their rockets. Appendix GG showcases the rocket ship dialogue between Laura, Elizabeth, and the Lovand students to Smith.

Smith students had many more project ideas than those represented by the Lovand students. They used their language skills to talk about their posters. The posters themselves served as signs, giving the students a note to themselves to remind them of their research ideas. Some of the boys when presenting rockets appeared to have internalized their research. They knew all about the rocket ships they constructed, easily disassembled and reassembled them, and could freely talk about their research. Through the mediating action of psychological or mental tools (mnemonics and coloring pages for Lovand and postcards, songs, posters, and rockets for Smith) the students reached higher, cultural forms of learning shared across a remote, global videoconferencing link.

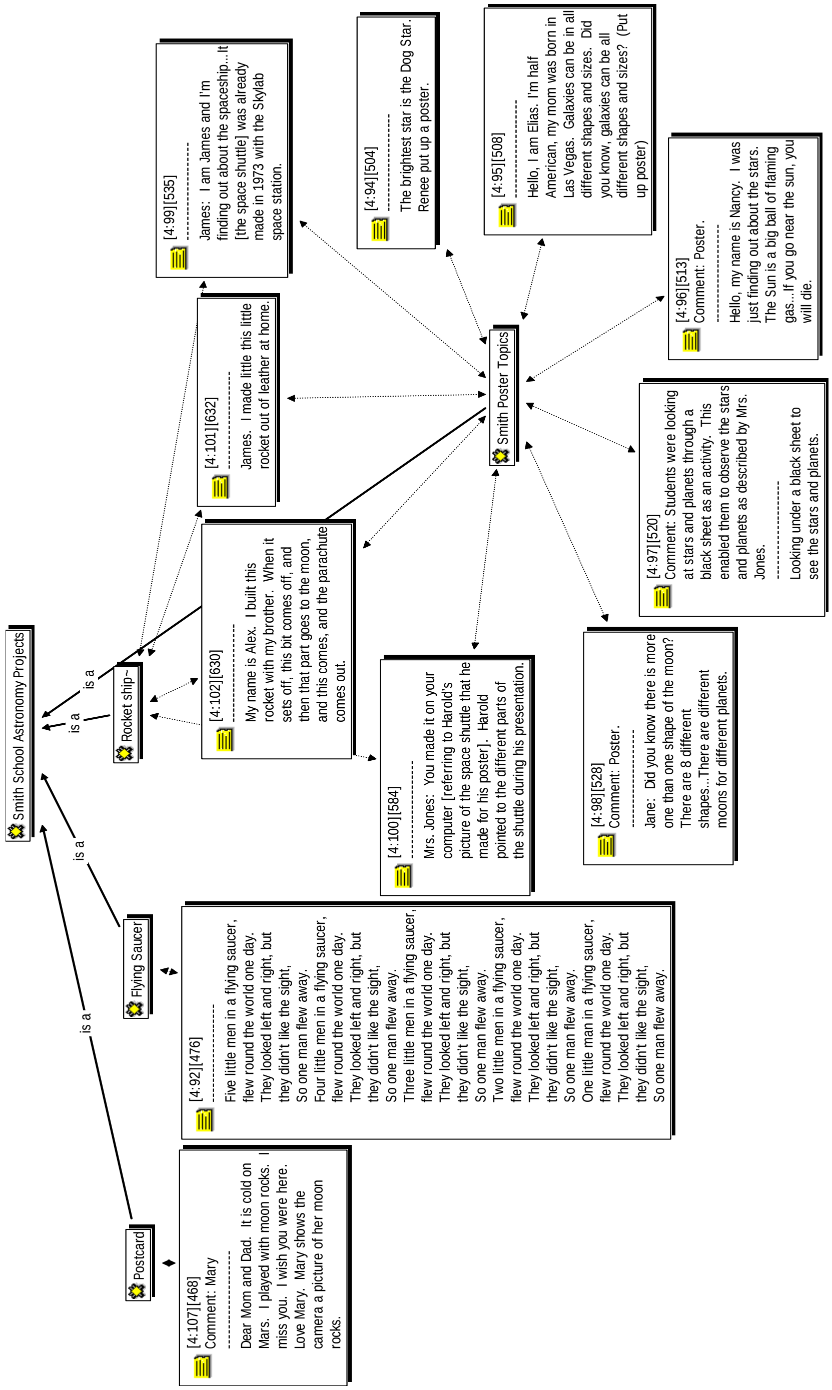


Figure 37. Smith astronomy project types.

Vygotsky (1978, 1986) proposed that language was the principle form of semiotic mediation linking interpsychological (social) and intrapsychological (individual) processes.

The second astronomy videoconference's final activity was an interactive game where each school received a question from Elizabeth about naming an astronomy object. The game started on Lovand's side. Elizabeth asked them to name the largest planet in the solar system. Lovand answered, "Jupiter." They had the opportunity to ask the Smith students to pretend to be elephants. The kindergartners laughed giggled at the Smith students who were doing a great job at pretending to be elephants. Next, Smith had their turn. The game proceeded back and forth between sides with the questions getting progressively harder. In Round 1, Lovand students had to stand on one leg, rub their stomach, and pat their heads. They laughed while performing their forfeit. Most of the forfeits were executed very well. However, in Round 2, Lovand students were told to say a joke as their forfeit. Mrs. Hartman recommended telling a knock, knock joke. They Lovand students said, "Knock, knock" to Smith.

However, the joke didn't go very smoothly. It was difficult to say whether the students did not understand one another or perhaps their timing and delivery was off. Nonetheless, Mrs. Hartman and her students repeated the joke several times, but received little feedback from Smith.

The Smith children easily recited *Mary had a Little Lamb.* Smith School asked Lovand to sing a song. Mrs. Hartman led the children in a round of *Twinkle, Twinkle Little Star* and Laura commented that it was "absolutely the right song to choose." By the fourth round of questions, the children were just guessing at the answers rather than answering them correctly on the first or second try. Elizabeth asked Lovand, "How many moons has Venus?"

The kindergartners guessed answers of “two,” “seven,” “twenty-five,” “eight,” and “zero.” Elizabeth let the children have the correct answer, but they clearly were stumped by the question.

The same was true in the fourth round question for Smith. Elizabeth asked, “How many moons has Mars got?”

Smith students answered, “two,” “sixteen,” and other numbers. Once again, Elizabeth gave credit to the students for answering it correctly. The final forfeit given to Lovand was quite fitting. They were asked to count backwards from 100 by tens and then said blastoff.

Mrs. Hartman started the children counting, “100 - 90 - 80 - 70 - 60 - 50 - 40 - 30 - 20 - 10 - 0 - Blast off!”

One child commented, “That was good.”

Another said, “I thought so too.”

Laura exclaimed, “Brilliant! Excellent! Well that’s a fantastic way to finish.”

It was truly a brilliant ending to the videoconference.

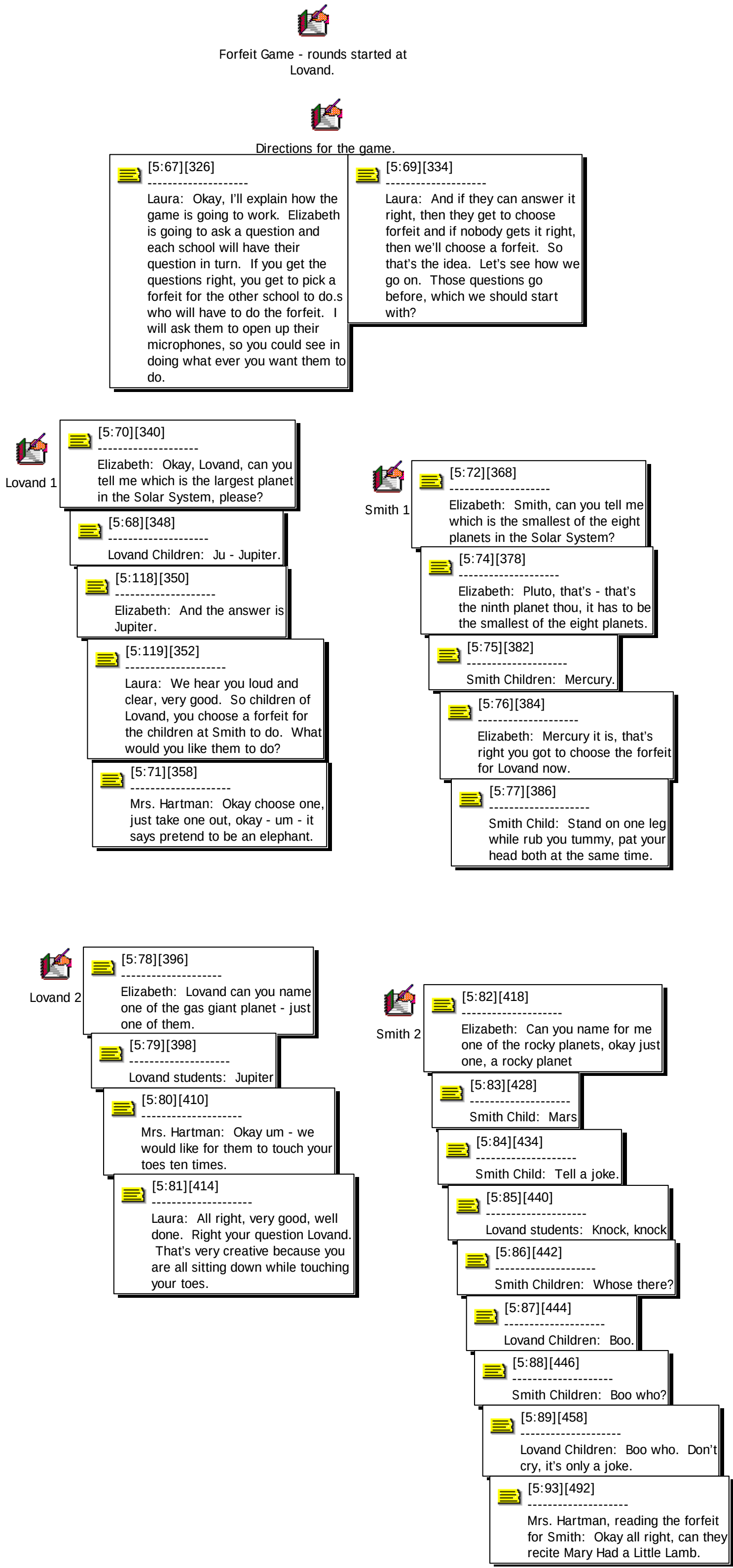


Figure 38. Forfeit game - Rounds 1 and 2.

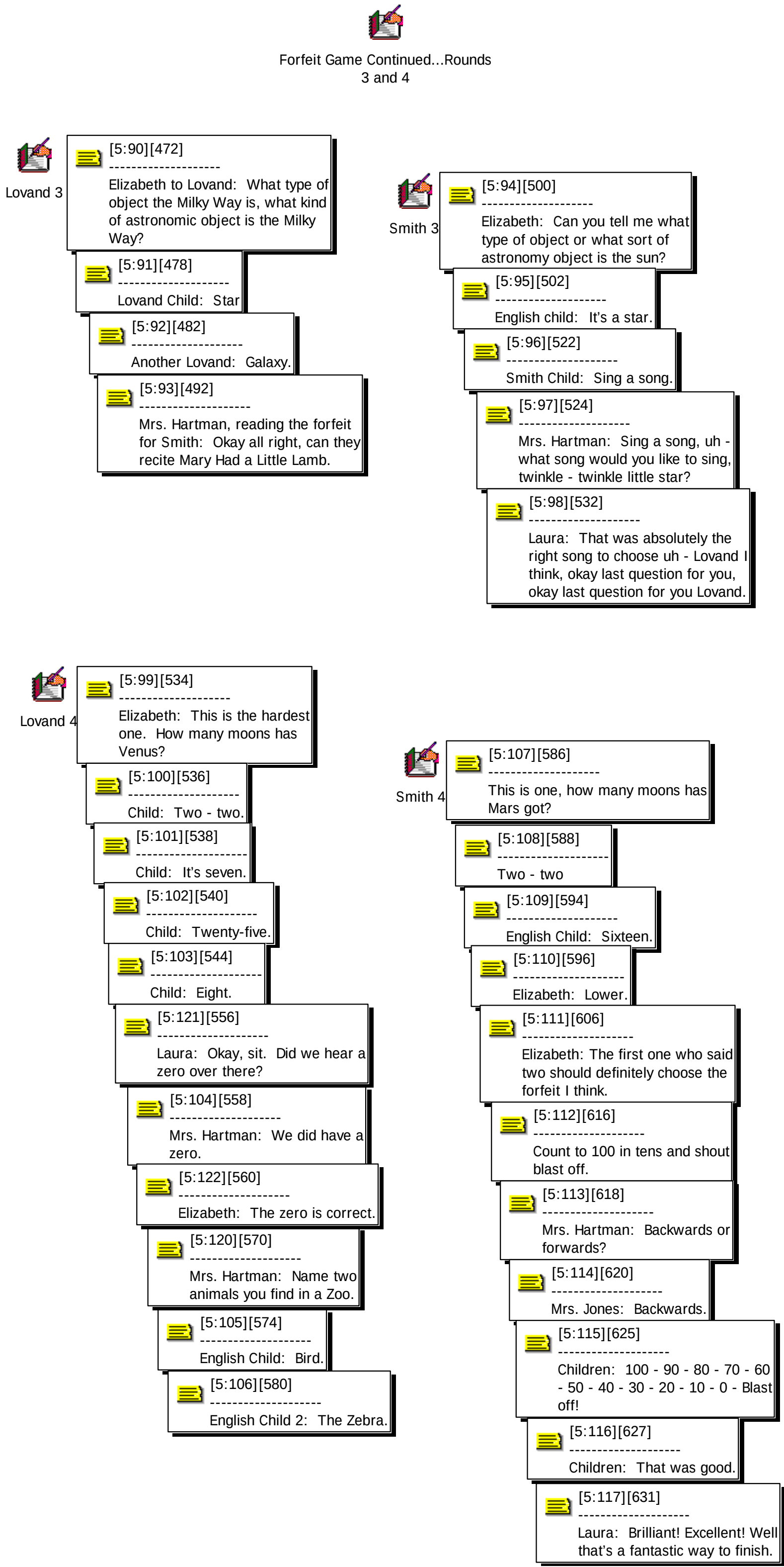


Figure 39. Forfeit game - Rounds 3 and 4.

Cultural Observations

While the study did not specifically address cultural observations made by adults, it is noteworthy to point out the number of observations made by adults during the interactive videoconferences. This was particularly true in the astronomy videoconference. From the very start, Mrs. Hartman, Mrs. Sullivan, and the researcher listened to the different accents spoken by the British classroom. They remarked amongst themselves and asked the students whether they also heard the difference tone in their conversation. Although the children remarked that they did, the adults continued to take note of how different the British sounded. Other language differences noted in this classroom included the use of certain words such as “brilliant” and “lovely.” While these word are also common to the vocabulary of adults in western Pennsylvania, they were not used in the same way as Laura and Elizabeth, who used them in such a positive and supportive manner.

During the second astronomy videoconference, Mrs. Hartman noted the Wellington boots worn by the students. She enjoyed this and pointed it out. Other cultural differences identifiable to the adults included the position of the verb in some of the British sentences, particularly in the questions. One example was asked by Elizabeth, “How many moons has Venus?”

Normally, the question in Woodview would be posed as, “How many moons does Venus have?”

Perhaps the most outstanding difference in classroom culture was the observation of the play space ship that stood at the back of the Smith classroom. Students and adults were both fascinated with the play area and wanted to know how the space ship was built, whether the camera could go inside so that the students could glimpse the interior, how Mr. Thomas' students played in the space craft, why they put an old computer in it, and whether someone could go into the space ship and wave through the window. It was a fun topic of conversation.

The Astronomy Videoconferences and the ZPD

Throughout the month long period of the astronomy videoconferences, the ability of the Lovand students to understand astronomy concepts greatly improved with scaffolding from Mrs. Hartman, Laura, Elizabeth, the Smith class, Mr. Thomas, and Mrs. Jones. When Mrs. Hartman began the moon phases worksheet work in preparation for the videoconferences, very few of the students could answer questions about why the moon looked different in the night sky during the month. Most realized that the Earth only had one moon, and most could name at least one planet besides Earth. However, it was difficult to assess the exact level of unassisted development of the students when considering the ZPD before they began their interactive videoconferencing. However, the concept maps and descriptions of the events earlier in this chapter, point to many examples of critical thinking and higher order psychological skills demonstrated by the Lovand students by the end of their second astronomy interactive videoconference. Figure 40 portrays many learning examples of assisted levels of development indicated Mrs. Hartman. The next part of this section examines these learning examples.

During the month after the first astronomy videoconference, students worked to prepare their projects. In Mrs. Hartman's class, students colored their coloring books usually first thing in the morning. Mrs. Hartman hung a previously colored example on the blackboard and talked about some planet facts before students started coloring. As the students worked with their colored pencils (Mrs. Hartman used colored pencils over crayons for precise coloring), she reviewed the planet facts. The kindergartners would often repeat certain facts that appealed to them while they colored. These same appealing facts were revealed during Lovand's presentation of the student-created artifacts where the kindergartners identified the eight planets of the solar system from the sun outward and finally shouted the mnemonic, "My very excellent mother just served us noodles." They were so proud of themselves as a class. They smiled from ear to ear while they delivered their planet information. While the class may have been able to perform in exactly the same manner without the videoconference, the added support of the encouragement from the British classroom and exclamations of "very good" and "brilliant" from Elizabeth and Laura gave confidence to the children.

Evidence of Lovand's level of assisted development was not just revealed during the student presentation. Rather, this level was depicted through countless points in the interactive videoconference including the students' ability to defend their choice of their favorite planet, answer questions about the composition of planets (gaseous or nongaseous) while playing an interactive game, create a human, physical model about the orbital patterns of the Earth and moon, talk with confidence about the work the class completed, identify that the Sun casts as shadow on the moon to create the moon phases, and converse at great length about Pluto, the demoted planet.

The same expertise and confidence was also demonstrated by Mr. Thomas' class. Post cards referred to items found on the moon (moon rocks); a flawless, flying saucer song engaged the Lovand students and teachers who were quietly singing and humming along by the fifth verse; a young boy proudly announced that he composed his picture poster picture on a computer; a young girl stated that her favorite part of making her poster was coloring her sun; rocket ship models were created using tubes, soda bottles, and Velcro so that they could come apart just like space ships do as they propel upwards to outer space; facts about the space shuttle included the year it was operational; and boys shared their knowledge about the various parts or rocket ships.

Throughout the second videoconference, children responded to questions from their teachers and peers about different astronomy objects including stars, constellations, galaxies, planets, meteors, and asteroids. Their correct answers indicated that they had a new working vocabulary about these items. While this information was first shared on the social level, many students had internalized these concepts at a level where they could not only present facts about them, but would go on and on about their favorite planet facts or other expertise about outer space. Another interesting note is the students' highest level of expertise. During the final, interactive forfeit game, students had difficulty identifying two questions from Elizabeth, "How many moons has Venus?" and "How many moons has Mars got?" Elizabeth prefaced her inquiries telling the students that these were difficult topics, but the children did not seem unnerved even one bit. They did not know the answers as they guessed away, but they definitely wanted to please the astronomer by displaying their knowledge and they guessed widely with clues from Elizabeth about "lower." Eventually, their guesses were fruitful and the students were pleased with Elizabeth and Laura's praises, despite the random answers.

Another final area of the students' newly acquired proficiency relates to their understanding of the interactive videoconferencing equipment. Students spoke loudly and clearly, although sometimes at the wrong time, so that the remote sight could hear their presentations and questions. Often, teachers assisted the children by rephrasing the comments and questions or simply just restating them so that all could have an opportunity to hear and respond. They approached the microphone when speaking and learned to hold up their work while the camera took a few moments to adjust its focus on a child or their pictures. Of particular significance, were the comments about taking the videoconferencing camera into the British make believe space ship. The Lovand students desperately wanted to see the inside of this pretend rocket and they asked their teachers to show this view. They were disappointed to learn that the camera could not go in, but they were somewhat appeased when a British student walked into the spacecraft and waved through the cellophane window. The students also wanted a close up picture of the rocket ships. They wanted to see the details, especially of the parachute dropping out of the rocket.

The final student level of assisted development discussed in this section concentrates on the differentiation of astronomy objects. Students understood the difference between stars and constellations as signaled by their identification of the proper items. However, they had more trouble and required more support when talking about galaxies. They were eager to learn about the Milky Way and other terms that they had heard such as black holes, but their language was not a sign that they had internalized these concepts. However, their eagerness to learn was very apparent, especially when a British student asked, “How did you know all of these things?” to Elizabeth.

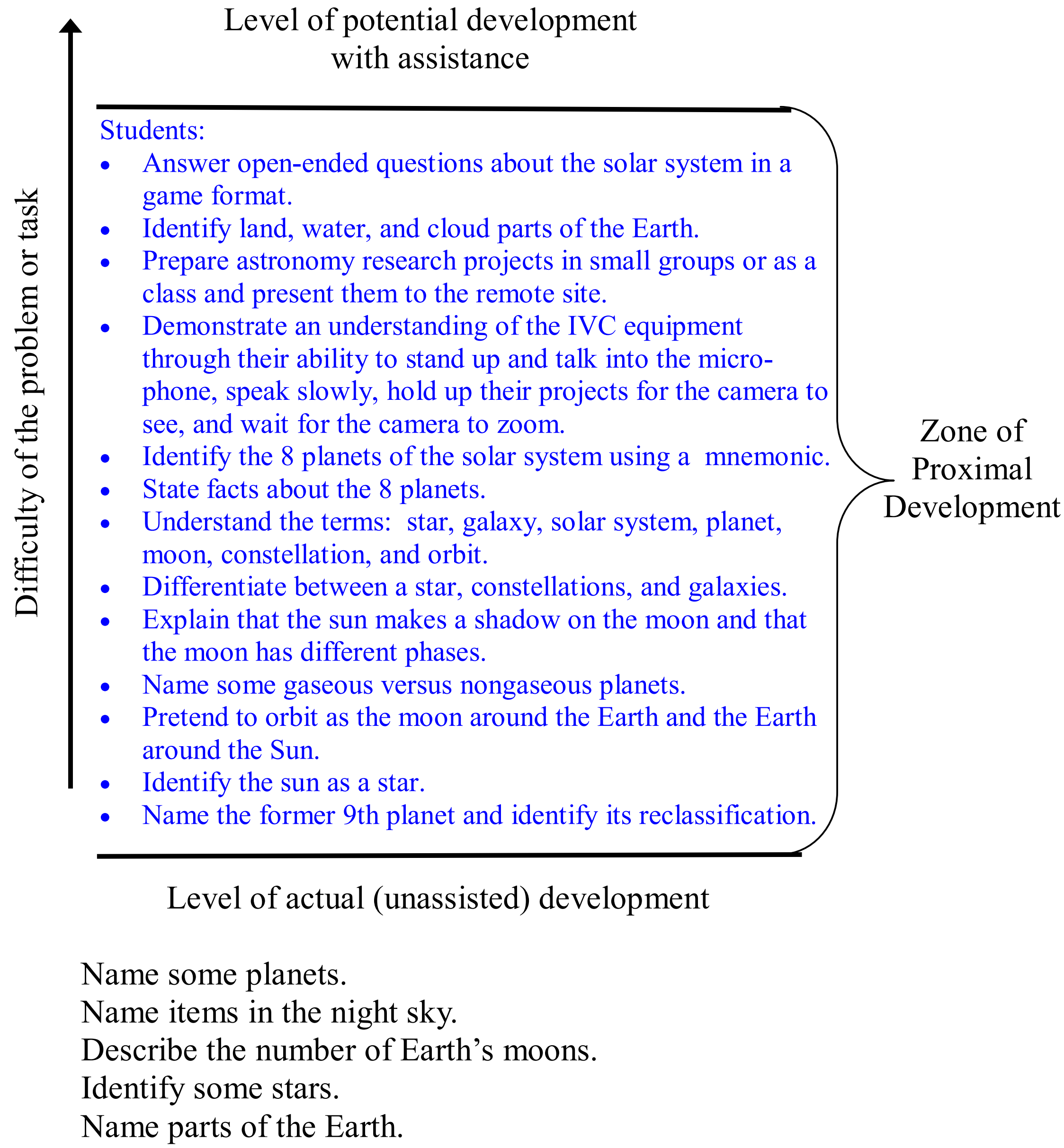


Figure 40. Astronomy videoconference ZPD.

Summary

The purpose of this study was to understand how children make meaning using interactive videoconferencing technology in a kindergarten classroom. The study examined the types of meanings being formed by the kindergartners during the interactive videoconferences and the nature of their emerging inquiries. Data collection procedures included field notes, journal entries, movies from the videoconferences, transcriptions, pictures, and artifacts. Documents and pictures were loaded into the ALTAS.ti software for coding. This chapter revealed students' examples of meaning making during the gingerbread boy and puppetry videoconferences in addition to the pair of astronomy collaborations based on four Vygotskian tenets of 1) the social origin and context of development, 2) the use of signs and tools in mediated activities, 3) the important role of language, and 4) the zone of proximal development (Vygotsky, 1978, 1986).

During the Gingerbread boy and puppet videoconference, five different stories featuring characters that came alive and ran away were compared and contrasted featuring discussions of about cultural context, the character in the story, as well as the plot and outcome of the story. Throughout the gingerbread videoconference, evidence of development preceding learning abounded (Vygotsky 1978, 1986). The kindergartners learned about diet and natural surroundings when they talked about *The Musubi Man: Hawaii's Gingerbread Man* (Takayama, 2007) and *The Runaway Ricecake* (Compestine, 2001). They also discussed differences found in an urban rendition of the gingerbread boy set in New York City. Students were introduced to shadow puppets, heard about their Chinese ancestry, discussed how they moved and functioned in light, and saw a performance of *The Gingerbread Boy* performed with shadow puppets.

Audio psychological tools such as gingerbread man singing "Na, na, na, I won't come back. I'd rather run than be a snack" as well as the animal sounds of the characters in the plays made the children laugh as these cultural signs and tools brought the context of the story into a kindergartner's realm. Mrs. Hartman's class also made meaning about the making of gingerbread through signs and tools as them mimicked mixing and baking their make believe gingerbread in their pretend mixing bowl. The importance of language helped Miss Peterson, the puppetry instructor, to raise the assisted level of development of the students as they engaged in dialogue about cultural differences, folktales, shadow puppets, gingerbread ingredients, *The Gingerbread Boy* characters and plot, and learned with and through the distance connection via videoconferencing.

The astronomy pair of interactive videoconferences provided many opportunities for students to use language to describe their classroom culture. Smith School students described the room layout, the school schedule, their uniforms, and even their lunch details. Later, Mrs. Hartman described her school, their curriculum, and let her students introduce themselves. Meantime, the teachers commented on the remote sites' British accent and they noticed the children wearing Wellington boots.

Multiple signs and tools assisted students to learn about astronomy concepts as they engaged in mediating activities where they identified stars, planets, constellations, galaxies, and moons after looking at pictures. An inflatable globe and apple helped Elizabeth to show the children about the moon's orbit pattern. A moon phase poster helped Lovand students to recall their prior learning from their classroom work and to present this information to Laura, Elizabeth, and Mr. Thomas' class. Both Lovand and Smith schools built human models of the Earth and moon's orbital patterns. Students on both side of the Atlantic giggled as their classmates got dizzy trying to revolve around one another.

During an estimation exercise, the knowledge of the students blossomed as they compared and contrasted the sizes of planets against a meter-sized Sun. Laura, Elizabeth, Mrs. Hartman, and Mr. Thomas worked with the children to help them problem solve this difficult activity. The students were charged with selecting a toy ball that best represented their assigned planets against the purple, pilates ball Sun. Then, the classes defended their choices to one another.

Throughout the Lovand School student presentations, Mrs. Hartman reviewed the planet names using coloring book pages her students completed. Individual students answered questions about the planets names and facts and held up their pictures to the camera so that the Smith students, Laura, and Elizabeth could view them. Mrs. Hartman's students also showcased their mural and shouted their planet mnemonic to remind them about the order of the planets from the sun.

The Smith students' presentations were unlike the unified projects prepared by Lovand. Their projects were presented by individuals and small group and featured postcards, songs, posters, and space rockets. Presentations by both groups were followed by a question and answer session directed by the remote sites, Laura, and Elizabeth. During these discussions, students had the opportunity to talk about their choices and what they learned. Of particular interest was the fascination by both Lovand and Smith students for rocket ships, especially the pretend space craft in the Smith students' room. Throughout the month long period of the astronomy videoconferences, the ability of the Lovand and Smith students to understand astronomy concepts greatly improved with scaffolding from Mrs. Hartman, Laura, Elizabeth, Smith class, Mr. Thomas, Mrs. Jones, and the students.

CHAPTER 5: DISCUSSION

Introduction

The purpose of this study was to understand how children make meaning using interactive videoconferencing technology in a kindergarten classroom. Kindergarten is usually the starting point of K-12 formal education in the United States. These students enter kindergarten as digital natives (Prensky, 2001). They use the computer frequently and many already use the Internet. Many students listen to music on family CD-ROM or MP3 players at home, and DVD films are commonplace for entertainment. Many kindergartners even use edutainment systems with their families. Today's kindergartners are ready to commence their academic experience using information and communications technologies among a repertoire of instructional activities.

Based on a literature review concentrating on interactive videoconferencing, primary education, and meaning making, coupled with the pilot study results, two research questions were posed that focus on learning from a Vygotskian perspective. The second research question was very similar to a question asked by Hyun and Davis (2005) in their study investigating the dialogue of children working in pairs on a computer mapping project. Appendix II summarizes the relationships between the research questions, literature review, methodology, findings and analysis, and implications showing how the process informed each stage of the research.

This study examined two research questions that addressed the meaning making of the kindergarteners.

1. What types of meanings are being formed by the kindergartners during the interactive videoconferences?

2. What is the nature of young children's emerging inquiries and dialogue surrounding their use of interactive videoconferencing in their classroom? Emerging inquiries refers to the questions children ask while participating in the interactive videoconference.

The findings from this study will contribute to the sparse research pertaining to young children while learning with technology and will hopefully commence a line of inquiry about primary students' interactions with multiple forms of technology outside of just computers. The information acquired from this study will also play a part in providing a theoretical framework for further investigation of kindergartners and young children's understanding and development while participating with interactive technologies that is inherently difficult due to the limited numerical and literacy skills of young learners. Additionally, this information will assist teachers and educators to better understand the value of integrating interactive videoconferencing into their school's curriculum in order to prepare students to be global citizens.

Analysis of the meaning making of the kindergartners from a Vygotskian perspective entails examination of four tenets of this theoretical framework, namely: (a) individual development is rooted within a social context, (b) development represents a process whereby tools, signs, and mediated activity work together to advance psychological functioning to a higher level of behavior, (c) language plays an important role in cognitive development and precedes development for children, and (d) the ZPD distinguishes and describes the differences between the unassisted versus assisted level of potential development of the learner (Vygotsky, 1978, 1986). Given these tenets, the analysis of the research questions focuses on an examination of meaning making from these four principles.

The design structure for a study involving interactive videoconferencing in kindergarten implored a qualitative methodology to describe the interactions, learning processes, and exchanges. The natural classroom environment afforded a safe and empowering environment for young learners where they could talk, learn, and play (Brown, 1992; Eisenhart, 2001a, 2001b; Emerson et al., 2001; Erickson, 1986; Miles & Huberman, 1994a; Nespor, 1997). The research inquiry followed an intrinsic, case-study approach where the bounded system and functioning specific (Carter, 1993; Coles, 1989, as cited in Stake, 2000) were represented by a single kindergarten classroom of students, a lead teacher, and other supporting educators.

This study employed an ethnographic, participant observation methodology that is common within social anthropology (Miles & Huberman, 1994a) and early childhood education (Knupfer, 1996; Lomangino et al., 1999; Turbill, 2001; Wyeth, 2006). Three criteria informed the study's methodological framework including (a) a pilot study conducted in April 2007, (b) Miles and Huberman's recurring themes in qualitative data analysis, and (c) an emphasis on addressing the nuances of contemporary culture, especially in terms of selecting a methodological approach for both collecting data and its analysis while considering technological concerns about working with interactive videoconferencing and kindergartners.

In line with this methodological approach, data collection included the recording of manual field notes during classroom observation, journal entries, memo writing (Emerson et al., 2001; Erickson, 1986; Miles & Huberman, 1994a), video and audiotapes (Knupfer, 1996; Miles & Huberman), professional transcriptions, and teacher- and student-created artifacts such as worksheets, pictures, and posters. Data analysis procedures commenced by importing transcriptions into the ATLAS.ti (Muhr, 2004) qualitative data analysis software for open coding and grounded theory development. Open coding efforts considered the knowledge gleaned from 4 months of participant observation in the classroom. The researcher, considered this background contextual effort while determining the codes. Later, ATLAS.ti concept maps representing the nodes and their relationships enabled the researcher to represent graphically the collaborative sessions' meaning making.

To protect the confidentiality of all participants, pseudonyms were used for all participants, personnel, and institutions. Participating adults signed consent forms. Letters explaining the study's purpose along with copies of the parental/guardian consent permission form and minor assent form were sent to the parents and guardians of all students. Students also signed a minor assent form that explained the study's purpose to them in terms they could understand.

Subjects for the study were selected using a purposeful sample. Participant benefits consisted of coordination of classroom to classroom videoconferences and procurement of videoconferencing content programs. Lovand Catholic School, the final site choice, was based on the following sampling criterion: (a) proximity, (b) accessibility of interactive videoconferencing equipment, (c) ease of entrance into the classroom during the fall 2007 school calendar, (d) full-day kindergarten schedule, (e) eagerness of teachers and administrators to participate in the study, and (f) the researcher's perceived "opportunity to learn" (Stake, 2000, p. 446). The kindergarten classroom included 25 students with 13 girls and 12 boys along with their teacher and a part-time teacher's aide. At the study's beginning, students' ages ranged from 4 years 9 months old to 6 years and 10 months old. Data collection commenced in October 2007 and ended in February 2008 and comprised over 500 hours of participant observation.

The kindergarten classroom participated in six videoconferences during the participant observation period and one later in May 2008. The topics covered during the interactive videoconferences included (a) backyard birds, (b) the folktale *The Gingerbread Man* and related puppets, (c) birdfeeders and happy holidays, (d) Astronomy I, (e) polar world discussions about penguins and polar bears, (f) Astronomy II, and (g) a shark-content program featuring the book *Smiley Shark* (Galloway, 2003). Four months of field notes, journal entries, and memos combined with transcriptions, movie files, and classroom artifacts provided abundant sources of data. In order to tailor the data analysis process, the researcher incorporated Miles and Huberman's (1984) flow model of data analysis that consists of four interrelated components: data collection, data display, data reduction, and conclusions: drawing/verifying [author's nomenclature]. Using the research questions to inform the data analysis, the researcher sought to use poignant examples from the interactive videoconferences to demonstrate how the kindergartners formed meaning from a Vygotskian perspective during the collaboration encounters. This tactic permitted the researcher to focus on a particular set of her data, thereby anticipating the types of data she collected and consequently implementing data reduction. The results section includes analysis of the gingerbread puppetry and astronomy I and II videoconferences.

After uploading the transcripts into ATLAS.ti, coding began. During this process, the researcher read the transcripts numerous times to break down, examine, compare, and conceptualize the data. ATLAS.ti provided easy and efficient ways to name and organize the codes. Coding methods included open coding and in vivo. Open coding used names designated by the researcher such as "questioning," "games," or "planets." In vivo names featured actual words used in the students' dialogue such as "rocket ship" and "know so much."

Throughout the coding process, the researcher generated ATLAS.ti concept maps to create a better picture of what the data portrayed (Miles & Huberman, 1984). Patterns that represented the actual interactions and learning events of the videoconferences emerged to support conclusions from the codes.

Findings

The data revealed several results pertaining to the two research questions. The summary of findings is organized sequentially in Table 16. After analyzing the results in Chapter 4, the ATLAS.ti codes were placed into categories according to their Vygotskian tenet. Thus, the category names were social context, sign and tool use, the importance and role of language, and the ZPD. These categories are shown in the code list in Appendix P.

Table 16

Summary of Research Question Findings

Vygotskian framework/ tenet	Research questions and findings
The social origins of meaning making	1. What types of meanings are being formed by the kindergartners during the interactive videoconferences? RQ1.1. The teachers and kindergartners formed a community of learners in a virtual learning environment with context experts, teachers, and peers over an videoconferencing connection that afforded high levels of interaction. Students formed knowledge about the remote participants' culture as well as the content material to further their progress towards making them global learners while basing their understandings in the social context of their virtual learning environment. This outlook represented a more diverse point of view than that of just their local classroom.
Sign and tool use in mediated activities	RQ1.2. The kindergartners and their teacher made use of signs and tools for mediated activities that led the children to higher levels of cognitive development during the interactive videoconferences.
The importance and role of language	RQ1.3. The role of language was critical for the students as they made meaning of the interactive videoconferences through dialogue using their language to demonstrate new vocabulary, ask and receive questions, compare and contrast various concepts, present and respond to others' work, critically reflect and explain their points of view, develop multicultural understanding, and reveal their technological literacy.
The ZPD	RQ1.4. During the interactive videoconferences, students were able to complete more difficult problems or tasks with the assistance of content experts, teachers, and knowledgeable peers than if they were unassisted. These developmental gains show evidence of critical thinking, reflection, internalization, creativity, and language use by the students in the process of making meaning of their virtual learning experience. Furthermore, using the framework of the ZPD is useful in reviewing the developmental progress and meaning making of kindergartners while learning with interactive videoconferencing.

Table 16 (*continued*)

Vygotskian framework/ tenet	Research questions and findings
The importance and role of language	What is the nature of young children’s emerging inquiries and dialogue surrounding their use of interactive videoconferencing in their classroom? Emerging inquiries refers to the questions children ask while participating in the interactive videoconference. RQ2.1. Children’s conversations about the interactive videoconferencing equipment started and remained at the exploratory talk level for the gingerbread and astronomy videoconferences.
The importance and role of language	RQ2.2. Children’s inquiry and dialogue was purposeful, reflective, and self-directed.
The social origins of meaning making, sign and tool use in mediated activities, the importance and role of language, and the ZPD the social origins of meaning making, sign and tool use in mediated activities, the importance and role of language, and the zone of proximal development	Finding 3. The four Vygotskian tenets used in this study are rarely evident in isolation when learning with interactive videoconferencing. Instead, learning from a Vygotskian perspective involves the entwining of the origins of learning in a social context, sign and tool use in mediated activities to raise the children's psychological functioning, the importance and role of language, and assisted development of the learners as measured by the ZPD.

The subsequent sections review these key findings in light of the extended results of the study. After disclosing the results of the children’s meaning making from a sociocultural perspective, the discussion provides confirmation of these findings through agreement from the literature review.

Findings for the research question What is the nature of young children's emerging inquiries and dialogue surrounding their use of interactive videoconferencing? was determined to be a subset of the of third Vygotskian tenet, the importance and role of language, in Finding RQ1.3. Emerging inquiries referred to the questions and dialogue surrounding children's use of interactive videoconferencing for instructional purposes. Since the results and discussion of the importance and role of language in students' meaning making are explained in their respective chapters, discussion of the emerging inquiries and dialogue research question (RQ2) focuses on exploratory talk characteristics.

Discussion of Findings

Finding RQ1.1: Social Origins of Meaning Making

The teachers and kindergartners formed a community of learners in a virtual learning environment with context experts, teachers, and peers over a videoconferencing connection that afforded high levels of interaction. Students formed knowledge about the remote participants' culture as well as the content material to further their progress towards making them global learners while basing their understandings in the social context of their virtual learning environment. This outlook represented a more diverse point of view than that of just their local classroom.

The process of analyzing the meaning making of kindergartners learning with interactive videoconferencing is to understand how the social context of the collaborative activity is related to the cultural dimension of the classroom. Vygotsky (1978, 1986) explained learning as being embedded in social contexts where a child interacts with other people, objects, and the events in the social environment. Likewise, for interpretive qualitative research, Miles and Huberman (1994a) emphasized the importance of classifying social meaning according to Erickson's (1977, as cited in Miles & Huberman) definition - what people do is a byproduct of embedded social fact and social action.

Before the gingerbread boy puppetry videoconference, Mrs. Hartman's kindergartners prepared for the activity within the confines of their classroom, representing the local culture. The gingerbread interactive videoconference enlarged the boundaries of Mrs. Hartman's class as they connected with a remote folklore and puppetry instructor and expert, Ms. Peterson. The kindergartners' interplay with Ms. Peterson represented an opportunity to learn within a social context larger than their traditional classroom. The children constructed meaning based on the two-way dialogue between their classmates and the puppetry expert. The children recognized that Sophie, their classmate, was born in the same place as the story location in *The Runaway Ricecake* (Figure 22). They also compared and contrasted the characters and their cultures originating from several folktale versions of *The Gingerbread Boy* from Hawaii, New York City, China, and the traditional rural setting. The children used symbols including their language to interact and share meaning with Ms. Peterson to develop an understanding of *The Gingerbread Boy*, folktales from different cultures having a similar theme to the gingerbread tale, the history of shadow puppets in China, a performance of the tale performed by shadow puppets, the ingredients of the gingerbread recipe, and how to use student-created, gingerbread boy puppets.

The astronomy interactive videoconferences presented a different form of social context because in addition to content experts, another classroom of similar age joined the culture of the session. Thus, Mrs. Hartman's class represented the local, Laura and Elizabeth were the content experts, and Mr. Thomas' class was the remote classroom. Together, these three entities formed a community of learners in a virtual learning environment. During the first astronomy videoconference, time was set aside at the beginning so that the students and teachers could get to know one another. Mrs. Hartman's class observed the school uniforms and "wellies" worn by the children. They also commented on their British accents. Children and teachers learned about what they had in common as well as their differences. They conversed about their favorite school subjects, their ages, the layout of their room, the location of the toilets, the Atlantic Ocean, time, and weather while building rapport with one another.

The social context of the interactive videoconferences provided an environment for the children to communally construct knowledge with one another. The social context of the interactive videoconferences provided an environment where the students spoke about their values and viewpoints; they built on the knowledge of content experts, teachers as facilitators, and more capable peers; the culture of the videoconference empowered the kindergartners to share their ideas and viewpoints as well as extend their use of language (vocabulary and new concepts); and the students shaped new discourses based on previous discussions through interactive videoconferencing.

The findings about the social origins of meaning making experienced by primary children during interactive videoconferences are consistent with the literature (Arnold et al., 2005; BECTA, 2002; Yost, 2001). Likewise, the social origins of learning during interactive videoconferencing with older elementary students is also recognized (Arnold et al., 2005; Cifuentes & Murphy, 1999, 2000a, 2000b, 2000c; Kinnear et al., 2002). Many studies describe the community of learners as building the rapport of the participants and being filled with enthusiasm (Arnold et al.; BECTA, 2002; Cifuentes & Murphy; Gage et al., 2002; Kinnear; Yost, 2001).

Mrs. Hartman's students found little difficulty establishing common ground with Mr. Thomas' class. Similar to other primary students' videoconferencing events, students found shared meaning in learning that they had similar names (Yost, 2001), common areas of their rooms such as play areas, toilets, reading areas, and computers (Arnold et al., 2005), and even ate lunch while at school (Arnold et al.). The sense of community found in this study is analogous to the community of learners in other early childhood classrooms that do not include distance education technologies as a focus of the study (Harada et al., 2002; Hyun & Davis, 2005; Turvey, 2006; Wartella et al., 2000; Wartella et al., 2002), thereby building the foundation for continued investigation of learning communities via online methods.

The results of this study in terms of multicultural awareness, technological literacy, increased self esteem and motivation, and improved presentation and communication skills were also cited by several studies as benefits of using interactive videoconferencing (Abbott et al., 2004; Cifuentes & Murphy, 1999, 2000a, 2000b, 2000c; Thurston, 2006). Cifuentes and Murphy (2000c) reported that students involved in distance education connections developed multicultural understanding and positive self concept. They defined multicultural understanding as "the appreciation of both differences and similarities in beliefs, experiences, values, and behavior across distinct and identifiable cultures within and across groups and societies" (Timm, 1996, as cited in Cifuentes & Murphy, 2000c). Two of Mrs. Hartman's students were born outside of the USA (field note, October 29, 2007). Understanding this information, the kindergartners were comfortable with the details and it regularly crept into their conversations. This was apparent during the gingerbread videoconference when Sophie remarked, "I'm from China" and her classmates nodded and uttered their affirmations. Several children in Mrs. Hartman's class had internalized the diverse origins of their peers.

The findings of this study show that while engaging in the interactive videoconferences, the kindergartners improved their communication skills in terms of speaking and listening. Similar results were reported by Abbott et al. (2004), Arnold et al. (2005), Kinnear et al. (2002), Gage et al. (2002), and Yost (2001). Rather than exclusively presenting to their individual classmates, interactive videoconferencing provides a broader audience for student presentations. It is no different than the favorite children's pastime *Show and Tell*, except that the classroom is bigger and more diverse. So, children share their culture in the virtual classroom just as in their face to face one, with the added benefits of more viewers, perspectives, and chances to build their communication skills.

Within the past decade, two dissertation studies contributed to the research about constructivist themes in K-12 videoconferencing that concur with some points of this study. Hayden (1999) ascertained four characteristics of interactive videoconferencing that support constructivism. Two of them, connections and interaction, are relevant to the social context of meaning making according to the Vygotskian perspective. Hayden's connections theme related to synchronous connections between students and other sites that foster activities and hence, this theme agrees with the social context of learning found in this study. The Interaction theme also reinforces Finding RQ1.1 and is predicated on students working in groups to solve authentic problems with online sets of tools. Both of these themes emphasize the active learning and learner directed attributes of constructivism. Along these same lines, Sweeney (2007) found that videoconferencing educators consider their activities to include higher level thinking and real world problem solving that are also indicative of the Finding RQ1.1 results.

The focus of Finding 1 centers on the social origins of meaning making. Today's interactive technologies challenge qualitative educational researchers to address the nuances of contemporary culture (Eisenhart, 2001a, 2001b; Nespor, 1997) and the resulting shifting and emerging relationships (Charmaz, 2000; Charmaz & Mitchell, 2001; Eisenhart, 2001a; Erickson, 1986; Glaser, 2002) that occur in virtual environments. This study extends a current group of sociocultural investigations about children working with computers (Hyun & Davis, 2005; Klerfelt, 2007; Lomangino et al., 1999) to interactive videoconferencing.

Finding RQ1.2: Sign and Tool Use in Mediated Activities

The kindergartners and their teacher made use of signs and tools for mediated activities that led the children to higher levels of cognitive development during the interactive videoconferences.

There were abundant examples of signs, tools, and mediated activity during the interactive videoconferences to assist the children in reaching higher mental functions. During the gingerbread boy puppetry videoconference, the image of the gingerbread boy reminded children of a folktale character who came alive and ran away. When the kindergartners discussed folktales from different cultures, they learned that the gingerbread boy-shaped characters were made from different foods in other countries. However, all of these characters looked like the gingerbread boy-shape of rounded arms and legs. As the children learned about shadow puppets, they held their hands up to the light while using them as a tool, mimicking the hand formations of Ms. Peterson, the instructor. They viewed different shadows being formed on the monitor; the kindergartners tried to do the same formations with their own hands, but it was difficult to see shadows in the light of the room. Ms. Peterson encouraged the children to try making shadows with their hands at home.

One of the most vivid examples of signs and tools during the gingerbread videoconference was when Ms. Peterson prepared the pretend gingerbread boy recipe. Children grabbed their imaginary mixing bowls that were as big as their arms when their hands were clenched: first flour, then eggs, sugar, ginger, and cinnamon. With the addition of each ingredient, children stirred their imaginary batter. Finally, it was ready and time to roll out the gingerbread dough. The kindergartners removed the batter from their bowls, and rolled out the dough "back and forth, back and forth." Next, the students cut out a head, arms, and legs before putting their gingerbread men on a cookie sheet to bake.

Ms. Peterson guided this activity with many questions. She asked the children to tell her what the next ingredient of the recipe might be, and she explained the source and purpose of each addition. When students guessed at an ingredient that was not quite in line with the gingerbread recipe, like papaya, she reassured them and would solicit new ideas while providing clues. While these types of scaffolded activities may be commonplace in the classrooms of dedicated and nurturing teachers, the addition of a remote connection through interactive videoconferencing brings a different element into the mix. These kindergartners were able to experience a virtual classroom that combined the use of symbols such as their pretend mixing bowls, spoon, and ingredients to better understand exactly how gingerbread was made, smelled, and tasted.

Using signs and tools in mediated activities at a distance to enhance the mental development of children is consistent with the findings of several studies in the literature (Arnold et al., 2005; BECTA, 2002; Cifuentes & Murphy, 1999, 2000a, 2000b, 2000c; Gage et al., 2002; Thurston, 2006; Yost, 2001). In addition, several research articles (Hyun & Davis, 2005; Klerfelt, 2007; Lomangino et al., 1999) about children's collaboration (usually in dyads) at the computer also conclude that the technology is a useful tool in mediated activities to advance the thinking of the learners. However, computers do not provide the same level of collaboration opportunity as interactive videoconferencing. When considering learning from a Vygotskian perspective where shared social activity is the foundation for development, interactive videoconferencing offers opportunities for whole class instruction. Therefore, a teacher can include multiple levels of learners together while offering guidance and support. Computers offer an excellent opportunity to manipulate shapes and witness pictures in an interactive way, but for the most part, they cannot share student-created artifacts in the same way as the live, synchronous capabilities of interactive videoconferencing.

Vygotsky (1978) recognized mediating devices as the cultural tools and artifacts that people share during the course of their daily lives and are essential to their learning and development. Throughout the interactive videoconferences, students used signs and tools as medicating devices as means to associate new concepts and cultural ideas into their existing knowledge base, in other words as a memory or cognition aide. Vygotsky also noted that mediating devices play a role in self control and behavior. Holland and Lachiotte (2007) interpreted a mediating device as being “constructed by assigning meaning to an object and then placing it in the environment so as to affect mental events” (p. 110). In addition, Holland and Lachiotte and Holland and Valsiner (1988) remarked when interpreting these devises that Vygotsky saw them as cultural and social in nature. Assuming this viewpoint, discussion of Finding RQ1.2 now focuses on the use of signs and tools in mediated activities for the astronomy videoconferences.

The astronomy pair of collaborative sessions demonstrated many uses of signs and tools. From the opening meet and greet session where Lovand and Smith schools pinpointed their location on maps to the presentation of student reports, the children used a variety of symbols to recall and understand new concepts in astronomy along with cultural reminders of one another’s schools. Vygotsky (1978) mentioned several examples of cultural tools in his writings. Pertaining to signs, Vygotsky highlighted that signs are “artificial formations” (Vygotsky, 1981, p. 137) that are social in nature. He also named various types of signs including, “language; various systems for counting; mnemonic techniques; algebraic symbol systems; works of art; writing; schemes; diagrams, maps, and mechanical drawings; all sorts of conventional signs” (Vygotsky, 1981, p. 137). Vygotsky (1978) poignantly recognized such artificial devices as knots to be cultural tools that served to remind people that there was something to do. Signs are an internal means of mastering oneself.

The poster-sized worksheet of the moon phases reminded the children that the moon revolves around the Earth and the Earth around the Sun. In the classroom, Mrs. Hartman made Earth's shadow appear on the moon using a lamp and Styrofoam balls. This poster helped the children remember this orbital pattern as they were called to create and demonstrate a human model of this pattern. Better yet, both Lovand School and Smith School had the opportunity to perform their rotating models for one another. Students from both schools made their way around one another while stumbling and giggling when they got dizzy and couldn't take another step. Elizabeth and Laura even used an inflatable globe of the Earth to represent the planet and an apple to be the moon as they moved these objects around one another. The students had many artificially constructed models to choose from to help them recall these details. Pictures of the planets both during the interactive videoconference and in coloring books provided memory tools to remind Mrs. Hartman's class about the color, composition, and topography of the planets as demonstrated by their language and dialogue about these facts.

One of the children's most influential signs was the mnemonic to help them remember the order of the planets from the Sun—My Very Excellent Mother Just Served Us Noodles. The mnemonic assisted the children in multiple ways. When Mrs. Hartman's class was coloring the planet pages, some of the children remembered what the next planet to color would be by reciting the mnemonic. The kindergartners also recited the mnemonic device when they made their planet mural and presented it to Laura, Elizabeth, and Mr. Thomas' class. Before Pluto was declared a dwarf planet, the mnemonic was My Very Excellent Mother Just Served Us Noodles Promptly. During the interactive videoconference the students cleverly divulged that the word “promptly” stood for Pluto, but the poor planet had been renamed as a dwarf planet. Other kinds of signs involved songs such as *Na. Na. Na. I won’t come back. I’d rather run than be your snack.*; “oink” and “moo” animal sounds, and; the verses from *Five Little Men in a Flying Saucer Flew Round the World One Day.* These signs assisted the students to reach higher mental levels when talking with remote participants. The mnemonics became internalized and the children voiced their understandings with confidence.

Mr. Thomas’ class exhibited completely different types of signs or cultural artifacts for their student presentations. While Mrs. Hartman’s class created a joint mural and individual coloring books, the British children formed different types of psychological tools including a postcard, a song about five little men flying around the world, Sun and moon posters, space shuttle posters, and replicas of space ships and rockets. One of the favorite signs for Mrs. Hartman’s class was a large space ship that was built in Mr. Thomas’ class so that his students could pretend to be in outer space. The kindergartners were fascinated by the cellophane, see-through windows of the rocket and they desperately hoped to see the inside of the spaceship. But unfortunately, the videoconferencing camera, that the students viewed as a tool to enter virtual worlds, could not be moved or zoomed far enough to see inside the aircraft.

The importance of the sign and tool use in mediated activities in videoconferencing (Finding RQ1.2) was consistent with several studies (Abbott et al., 2004; Arnold et al., 2005; BECTA, 2002; Cifuentes & Murphy, 1999, 2000a, 2000b, 2000c; Gage et al., 2002; Yost, 2001), however it was not the point of discussion in most of research. Cifuentes and Murphy stressed the value of collaborating with pictures, artwork, or diagrams with students in different cultures and Thurston (2006) summarized the benefits of having students create and share videos with one another. These studies stressed the cultural value of sharing these artifacts in an analogous way to that of the astronomy videoconferences. Since the students were in the middle and upper elementary grades in the Cifuentes and Murphy and Thurston studies, the types of signs used by the students differed from those in videoconferencing studies with younger children such as the Arnold et al., BECTA, and Yost papers. In the younger students' studies, children read stories aloud, and displayed and talked about objects common to their worlds such as the weather, lunch boxes, and toys. In these cases (Arnold et al.; BECTA; Cifuentes & Murphy; Thurston; Yost), the pictures, artwork, and items displayed represented cultural tools shared in their virtual environments.

In future research endeavors, analysis of sign and tool use through mediated activity may provide insight into cultural meaning making that has gone unnoticed in the past. Bodrova and Leong (2001) explained the importance of cultural tools in early childhood education.

> The kind of learning (and, consequently, teaching) that leads to changes in development was described by Vygotsky (1978) as the situation in which children acquire specific cultural tools, handed to them by more experienced members of society. These cultural tools facilitate the acquisition of higher mental functions—deliberate, symbol-mediated behaviors that may take different forms dependent on the specific cultural context.
>
> Higher mental functions exist for some time in a distributed or 'shared' form, when learners and their mentors use new cultural tools jointly in the context

of solving some task. After acquiring (in Vygotsky's terminology "appropriating") a variety of cultural tools, children become capable of using higher mental functions independently. (p. 9)

Results from Hayden (1999) and Sweeney (2007) emphasized interactions and learner directedness, but not sign and tool use through mediated activities directly except for language. Hence, these studies show a different emphasis; one based on constructivism, and do not reinforce the direct use of signs and tools as in Finding RQ1.2.

Finding RQ1.3: The Importance and Role of Language

The role of language was critical for the students as they made meaning of the interactive videoconferences through dialogue using their language to demonstrate new vocabulary, ask and receive questions, compare and contrast various concepts, present and respond to others' work, critically reflect and explain their points of view, develop multicultural understanding, and reveal their technological literacy.

Central to the findings of this study is the importance and role of language. The kindergartner's dialogue represents a psychological tool that resulted in change in the children's cognitive development. Vygotsky (1978) observed the dual role played by language as children are engaged in solving problems—they talk about what they are doing while at the same time acting on their speech, and hence their language and action become "one of the same complex psychological function" (p. 25). In terms of their development, there is an undividable relationship between children's action and speech. .

The results of Finding RQ1.3 align with the studies in the literature review that are associated with interactive videoconferencing (Arnold et al., 2005; BECTA, 2002; Cifuentes & Murphy, 1999, 2000a, 2000b, 2000c; Gage et al., 2002; Hayden, 1999;

Kinnear et al., 2002; Sweeney, 2007; Thurston, 2006; Yost, 2001) and with young children working or composing on computers in small groups (Hyun & Davis, 2005; Klerfelt, 2007; Lomangino et al., 1999). In all of these studies, language and interaction played pivotal roles with the students' dialogue serving to mediate higher order thinking.

Three different aspects of the students' language are discussed relating to the areas of communication skills, multicultural awareness, interaction, and technological literacy. In this study, communication skill refers to speaking and listening ability. For the speaking component, kindergartners needed to talk clearly, slowly, and loudly enough so that remote participants could make out their words. Listening skills related to how well the students could hear information and act upon it in the form of being respectful, recounting information, and responding to questions and comments when directed towards them.

Communication skills used by the kindergartners were evident in several parts of the astronomy videoconferences. At the beginning, Smith School (Appendix T) and Lovand School (Appendix U) introduced themselves and provided facts about their locations, classrooms, and the general makeup of their student bodies. Another example of the students' use of language was indicated in their use of new vocabulary words associated with the astronomy concepts. At the beginning of the videoconferences, few students recognized the names of all eight planets in the solar system. By the end of the second videoconference, Mrs. Hartman's students eagerly answered questions about planets while describing their coloring books and planet mural (Appendix W through Appendix FF) and other astronomy objects in the forfeit game (Figure 38 and Figure 39). The kindergartners spoke confidently about their choices in estimating the sizes of planets compared to the Sun (Appendix V) and were eager to respond to questions about stars, galaxies, and the solar system—they had started to internalize their new knowledge about astronomy.

Similar findings were reported by Yost (2001). Students had the opportunity to visit a television studio to see and learn about meteorologists' equipment and responsibilities. They likewise played and practiced being weatherpersons with their class cameras, weather sites on the computer, and Web camera. In their classroom, they created bar graphs about the daily weather. During the videoconferences, they often asked and received questions about the weather in Western Pennsylvania.

The improved communication skills of the students are consistent with several studies in the literature. In Abbott et al. (2004), a teacher commenting about learner benefits in the collaborative sessions remarked, "These included improved conversation etiquette—listening more carefully, posing appropriate questions, more eye contact and better overall language skills." (p. 235).

When considering what their next steps would be in regards to using interactive videoconferencing in the class room, the British Educational Communications and Technology Agency (2002) concurred that

> The pupils were impressed with the technology and thoroughly enjoyed the experience. They have started coming up with their own ideas for using the system. Their social skills improved because of the necessity to maintain conferencing etiquette and they even arranged football matches and other events so that they could meet up with their counterparts. (p.6)

Likewise, Cifuentes and Murphy's (2000c) study was consistent with Finding

RQ1.3 as verified by following passage

> According to a teacher-observer's reflection regarding the students' positive reactions to Cultural Connections, "Students were enthralled; they loved it! Students were clamoring to be a part of the project . . . . The students said that videoconferencing helped them get over stage fright and enabled them to become better speakers and researchers." Once students became active participants in Cultural Connections, they demonstrated positive self-concept by their heightened poise and skills in leadership and public speaking. (p. 79)

Constructivist research studies (Hayden, 1999; Sweeney, 2007) also emphasized the importance of the role of language for improved student communication skills and agree with Finding RQ1.3. Hayden (1999) identified three themes, questioning, learning, and interaction that emphasize that students are in charge of their learning through their ability to develop and ask questions to investigate topics as well as to present to remote partners and thereby develop their language skills. Sweeney (2007) concluded that three keys for student interactivity in interactive videoconferencing were questioning, getting feedback from remote participants, and debating, comparing, and exchanging multiple viewpoints with remote participants (p. 114).

Besides improvement in communication skills, Finding RQ1.3 also emphasized the importance of language in building multicultural awareness amongst learners of multiple levels and cultures. During the interactive videoconferences, word choices, intonations, and pronunciations reflected the culture of the participants. Mrs. Hartman's class noticed the accents of the British children along with the words, "lovely" and "brilliant." The children would often repeat the words "lovely" and "brilliant" to themselves after being commended by Laura and Elizabeth, particularly after the Lovand students had a chance to direct questions or present. After those moments, the microphone was usually muted, and the children would practice these words quietly, trying to pronounce them with a British accent. Mrs. Hartman had to interpret some word such as "trousers." The kindergartners were more familiar with the term "pants" for "trousers."

Cifuentes and Murphy (1999, 2000a, 2000b, 2000c) found similar cultural observations during interactive videoconferences in two different sets of interactive videoconferences: (a) between a northern Texan elementary schools with a southern Texan elementary schools adjacent to the Mexico and Texas border, and (b) between two elementary schools in College Station, Texas and two Mexico City, Mexico elementary schools. In the first set of partnerships, the schools sustained a videoconferencing connection for an entire school year. Students shared multimedia portfolio they created in the HyperStudio software via interactive videoconferencing to develop a better multicultural understanding of one another (Cifuentes & Murphy, 2000a). In addition, four themes emerged: growth, empowerment, comfort with technology, and mentoring. (Cifuentes & Murphy, 2000a, 2000c).

During the second pair of videoconferences, the Texan children realized that their Mexican fourth-grade counterparts were not only bilingual, but also knew much about the U.S. culture (Cifuentes & Murphy, 1999, 2000a). However, the Texan fourth graders knew little Spanish and had little knowledge of Mexico (Cifuentes & Murphy, 1999, 2000a). Online and offline activities in this partnership were aimed at letting students walk in each others shoes that "led to a flood of student questioning regarding the life of the distant others" (Cifuentes & Murphy, 2000a, p. 11). Results of this Texan partnership revealed increased student multicultural understanding, positive student self-concept, and heightened poise while speaking publicly (Cifuentes & Murphy, 2000a).

In Thurston's (2006) study involving students from Missouri and Scotland, he concurred about the critical function of language in addressing multicultural issues. He observed, "The children's use of language to define ethnicity also became more complex and their attitudes toward ethnic minorities became more inclusive" (p. 165).

In addition to serving as a tool for learners to discuss multicultural issues, this research study also aligns with the findings from early childhood interactive videoconferencing case studies (Arnold et al., 2005; BECTA, 2002; Yost, 2001) to Learners of even the youngest ages and varying academic abilities found reported positive learning experiences when using interactive videoconferencing to facilitate curricular investigations.

The interaction findings from the interactive videoconferencing studies in the literature review are consistent with Finding 3. Language was used to discuss common interests and reflect on socially shared ideas (Arnold et al., 2005; BECTA, 2002; Cifuentes & Murphy, 1999, 2000a, 2000b, 2000c; Gage et al., 2002; Thurston, 2006; Yost, 2001); understand others' culture and community (Abbott et al., 2004; Arnold et al.; BECTA; Cifuentes & Murphy; Thurston; Yost); answer and ask questions (Arnold et al.; BECTA; Cifuentes & Murphy; Gage et al.; Yost); compare and contrast a variety of topics including murals (Cifuentes & Murphy), periscope designs (BECTA), mathematical questions (Gage et al.), and, toys (Arnold et al.; BECTA); play games (BECTA), and; present student artifacts or projects including dramas, poems, and limericks (Arnold et al.; BECTA; Cifuentes & Murphy; Gage et al.; Thurston). These examples emphasize the multidisciplinary nature of interactive videoconferencing. Teachers and students integrated learning activities in cross-curricular fields including reading, language arts, fine and performing arts, science, mathematics, technology, social studies and global citizenry, and foreign language.

The final discussion area focusing on findings of the importance and role of language in this study pertain to technological literacy. As mentioned earlier in this analysis about the function of language in learning from a Vygotskian perspective, there is a dual role associated with dialogue. The literature review findings are consistent with Finding RQ1.3 in this regard. Both in the interactive videoconferencing studies (Arnold et al., 2005; BECTA, 2002; Cifuentes & Murphy, 1999, 2000a, 2000b, 2000c; Gage et al., 2002; Hayden, 1999; Kinnear et al., 2002; Sweeney, 2007; Thurston, 2006; Yost, 2001) and the collaborative computing research, this same observable phenomenon occurred (Hyun & Davis, 2005; Klerfelt, 2007; Lomangino et al., 1999). Dialogue mediated comprehension about the capabilities of the technology. For interactive videoconferencing, students quickly recognized that remote participants could hear what they said as well as see their actions. They realized that close up views were possible and that cameras could move from side to side. They did not need to understand the intricacies of telecommunications networking; however, they did learn that technology enabled the connections between the parties.

Finding RQ1.4: The ZPD

During the interactive videoconferences, students were able to complete more difficult problems or tasks with the assistance of content experts, teachers, and knowledgeable peers than if they were unassisted. These developmental gains show evidence of critical thinking, reflection, internalization, creativity, and language use by the students in the process of making meaning of their virtual learning experience. Furthermore, using the framework of the ZPD is useful in reviewing the developmental progress and meaning making of kindergartners while learning with interactive videoconferencing.

Finding RQ1.4 was consistent with studies in the review of literature including the interactive videoconferencing studies (Abbott et al., 2004; Arnold et al., 2005; BECTA, 2002; Cifuentes & Murphy, 1999, 2000a, 2000b, 2000c; Gage et al., 2002; Kinnear et al., 2002; Thurston, 2006; Yost, 2001), the collaborative computer research (Hyun & Davis, 2005; Klerfelt, 2007; Lomangino et al., 1999), and the noncomputer collaborative studies (Daskagianni et al., 2004; Harada et al., 2002; Pantaleo , 2007). However, most of these studies do not examine learning from the context of the ZPD. Instead, analysis using the ZPD has been inferred for the basis of this discussion. While the results indicate that the learners have attained levels of assisted development, the authors do not refer to this outcome using Vygotsky's terminology of the ZPD.

Recall that the ZPD is the distance between the actual development level and the development level as determined through assistance via problem-solving guidance under an adult or teacher or in collaboration with more knowledgeable peers (Vygotsky, 1978). Vygotsky contended that "Experience has shown that the child with the larger ZPD will do much better in school. This measure gives a more helpful clue than mental age does to the dynamics of the intellectual progress" (1986, p. 187). Likewise, Vygotsky (1978,

1986) stressed that learning is embedded in social contexts where a child interacts with other people, objects, and the events in social surroundings.

Given these parameters, the ZPD for the gingerbread and puppetry videoconference can be shown in Figure 28 and for the astronomy videoconferences in Figure 40. These diagrams show assisted levels of development determined by the shared activities during collaborative learning activities. These diagrams are informed by the meaning making of the children from three Vygotskian tenets of social context, sign and tool use, and the role of language. Hence, it may be argued that the ZPD may be used as a framework for depicting the assisted learning potential of children involved in interactive videoconferencing.

Finding RQ2.1: Emerging Inquiries and Dialogue and Exploratory Talk

RQ2.1. Children's conversations about the interactive videoconferencing equipment started and remained at the exploratory talk level for the gingerbread and astronomy videoconferences.

Two different interactive videoconferencing topics were selected for data analysis. The gingerbread puppetry videoconference was the fourth of the seven during the participant observation period, and the astronomy videoconferences represented the fifth and seventh in the series. By this time, the technology was not novel to the kindergartners. They were comfortable with its operation as evidenced by their dialogue.

For the gingerbread videoconference, children filed into the library to sit at tables. They needed to have a table surface so that they could make gingerbread puppets in the latter part of the collaboration. The students filed in sitting boy, girl, boy, girl. Mrs. Hartman provided some precautionary notes about the microphone wires. The children knew that the microphone wire was attached to the equipment, and they realized what would happen if they tripped over the wire. The following dialogue shows this understanding.

> Mrs. Hartman: It should be girl boy, girl boy, girl boy, girl boy. If anyone has to get up for any reason there's a wire here on the floor. Listen, you have to be very careful, watch carefully you could hurt yourself.
>
> Child: Yeah, I believe you could break the wire.

Another portion of dialogue evidencing the kindergartner's comfort and knowledge of the interactive videoconferencing equipment occurred during the Smith School's project astronomy presentations. When Joel, Christine, and Haley observed the large rocket ship in Smith's play area, they wanted to learn all about its use and design. The Lovand students really wanted to play in the space ship, but that was one thing that the videoconferencing equipment could not do—it could teleport the students inside the play space ship. However, the following vignette portrays the Lovand kindergartner's fascination with the play rocket ship, the creativity of Mr. Thomas' class in building the ship, and relentless request of the Lovand students to *please* take them inside the spacecraft. The dialogue was

> Joel: How did you make the rocket ship?
>
> Mrs. Hartman: I think there—he wants to know about the rocket ship behind, how did you make the rocket ship behind you?
>
> Joel: Yeah that's one.
>
> Mrs. Hartman: Yeah that's the one.
>
> Mrs. Jones: This one? We have some big frames that we changed into different things from the old play area. So we just stuck some cardboard, cut out the portals, and put different cellophane acetate on it so we could look out in the green window, and an orange window and there is the purple one.

Children: Yes.

Mrs. Jones: And then we got an old computer that we pretend we are driving the ship with.

Christine: I have a question.

Mrs. Hartman: That's creative recycling with the computer, okay any other questions?

Christine: I do.

Mrs. Hartman: What's your question Christine?

Christine: Can you go in the big rocket ship?

Mrs. Hartman. She wants to know can if you can go inside your big rocket ship.

Mrs. Hartman: Can you can answer that one?

Child: Yes, before you try the big rocket. [Some of the boys were explaining how they made their model space ships.]

Mrs. Hartman: Can we have some—can we see someone go inside and look out maybe that yellow window at us?

Mrs. Jones: I know you want that.

Mrs. Hartman: She's going to go inside.

Mrs. Jones: Can you wave through the window?

[Smith school child is looking through the cellophane camera of the play space ship and waving at the videoconferencing camera.]

Children: Bye-bye

Children: Tootles.

[The Lovand kindergartners say goodbye to the Smith student as she waves through the cellophane window of the play spacecraft.]

Laura: Okay, I think that's about all. Does anybody else have any questions?

Haley: I have a question?

Mrs. Hartman: Haley.

Haley: Can we see the inside of the rocket ship?

Mrs. Hartman: No, I don't think they can take their camera inside there. Haley, you can see the girl inside though, look at her.

Haley: Yeah it—what I'm asking is can I look a little um—closer?

Finding RQ2.2: Emerging Inquiries and Dialogue Characteristics

Finding RQ2.2. Children's inquiry and dialogue was purposeful, reflective, and self-directed.

During both the gingerbread puppetry and astronomy interactive videoconferences, students were provided with opportunities to use their communication skills to learn by: comparing, deciding, estimating, imitating, listening, observing, practicing, predicting, questioning, reflecting, trying, and verifying. Examples of these learning activities included naming common characters in the gingerbread folktales (Figure 25), mixing gingerbread ingredients (Figure 26), comparing the attire and accents of the British students (Figure 29), estimating planet sizes in relation to the Sun using balls (Appendix V), recounting what is seen in the night sky, playing a game of name that astronomy concept , presenting astronomy projects (Figures 35, 36, and 37 and Appendices W to GG), and playing the forfeit game (Figures 38 and 39). Additional analysis of the importance and role of language is discussed under Finding RQ1.3.

Finding 3. Co-occurrence of Vygotskian Tenets in Meaning Making

Finding 3. The four Vygotskian tenets used in this study are rarely evident in isolation when learning with interactive videoconferencing. Instead, learning from a Vygotskian perspective involves the entwining of the origins of learning in a social context, sign and tool use in mediated activities to raise the children's psychological functioning, the importance and role of language, and assisted development of the learners as measured by the ZPD.

After the analyzing the data in Chapter 4, the ATLAS.ti codes were categorized using the Vygotskian tenet names of social origins of meaning making, sign and tool use in mediated activity, the importance and role of language, and the ZPD. It was hard to overlook the number of "Xs" and the number of overlapping categories that the codes fit into. It was overwhelming. However, all of these "Xs" depicted what Vygotsky was trying to indicate in his sociocultural theory about learning—that the study of learning involves "the study of the social context, social practices, and intervening mediating agents as they intertwine in an international relationship whether it is situated in the community, family, classroom, or after-school activity." (Vásquez, 2006, p. 37)

Nasir and Hand (2006) also noted the complex, interrelated nature of learning using sociocultural theory. They described the process in this manner:

> [S]ociocultural theory is characterized by its focus on (1) multiple intertwined levels of analysis, (2) cultural practices as a unit of analysis, (3) the role of artifacts and tools, and (4) social others in the learning process and learning as shifts in social relationships—all concerns grounded in the early work of Vygotsky. In general, this perspective holds that culture unfolds at multiple levels of development, which appear intertwined in activity. More specifically, it considers individual engagement in activity as being shaped by sociocultural processes acting simultaneously on different planes of development, by the cultural tools and forms that individuals employ to achieve their goals, and by their interactions with each other. Learning, then, as an aspect of cultural activity,

> is profoundly influenced by this joint social enterprise where transformation of activity occurs within the interplay of global and local processes. (Nasir & Hand, p. 463)

Hence, the overlapping and intwined categories found in the ATLAS.ti codes, support the method of studying learning form Vygotsky's sociocultural theory.

Implications

Implications for this research represent the multidisciplinary nature of interactive videoconferencing and this study. Results of the study suggest impact on multiple fields including educational technology and distance learning, early childhood education, sociocultural-learning theory, and qualitative-research methods. Discussion of these areas remains intertwined as considerations in the field overlap, weave together, and impact one another.

Implications for Educational Technology and Distance Learning

Schrum (2005) advocated for the importance of developing doctoral student studies that investigate educational technology research questions not yet explored. She contended that "The process of preparing doctoral students to design, conduct, and analyze good research is a nontrivial task, and yet we continue to see repetition of research that does not move our community forward" (p. 220). This study examined kindergartners' meaning making while learning with interactive videoconferencing. Both the area of investigation and the theoretical framework of Vygotskian learning theory, represented unexplored topics. Thus, the research aim is to commence a line of inquiry about learning with interactive videoconferencing in the primary grades.

Another implication of the study relating to the field of educational technology pertains to the applicability of the research for classroom use. Schrum (2005) criticized the current state of educational technology research as having little impact on educational reform and proposed a stronger collaboration of dialogues between educators and researchers. The research design of the study emphasized a close examination of the daily happenings and culture of the classroom in order to evaluate student meaning making during the videoconferences from a contextual viewpoint. Results indicated the important role of the kindergarten teacher in obtaining parental/guardian permission forms for all students as well as in selecting the videoconferencing topics for integration into the curriculum. These authentic descriptions provide insight into the important role of teachers involved with classroom-based research including their influential position in obtaining parental/guardian permission forms for students and other participants. Discussions provide a vivid picture about what transpires when a kindergarten teacher implements interactive videoconferencing into their repertoire of teaching strategies.

Besides the research study's concern for applicability to the classroom and usefulness for educators, the study also featured a "rationale" for technology use as endorsed by Roblyer and Knezek (2003). The state of educational research about interactive videoconferencing and distance education in the K-12 classroom is similar to the position of computers in the classroom just a decade or two ago. While distance learning technologies in today's K-12 classrooms abound, the rationale for their use lags behind. Results from the study provide insight into kindergartners' meaning making from four tenets of Vygotskian learning theory: the social context of learning, sign and tool use in mediated activities, the importance and role of language, and the ZPD. Thus, the study discloses the underlying principles behind student learning with interactive videoconference or a rationale about the benefits of student meaning making.

Another important implication of the dissertation research pertains to the emerging field of computer-supported collaborative learning or CSCL. The field includes many aspects of learning considered in the study including collaboration, computer mediation, and distance education and (Stahl, Koschmann, & Suthers, 2006) and therefore is relevant to education. In CSCL, the focus of leaning centers on examination of learning through collaboration (Suthers, 2006) amongst students rather than directly from the teacher to student (Stahl et al., 2006). Unlike the historical roots of CSCL, the role of the computer is not seen as providing instruction, but instead is a tool to both provide media for communication and scaffolding for student collaboration.

While the first "C" in CSCL stands for the word computer, collaboration support for multiple medium forms other than computers are associated with CSCL including e-mail, chat, discussion forums, videoconferencing, and instant messaging (Stahl et al., 2006). Koschmann (2002, as cited in Suthers, 2006) described CSCL as "a field centrally concerned with meaning and practices of meaning-making in the context of joint activity and the ways in which these practices are mediated through designed artifacts" (p. 2). Herein, there is a startling similarity between the study and the changing and emerging field of CSCL as both investigate meaning making in the social context of group learning through mediated activities. Other commonalities between the dissertation and CSCL studies include a focus on the spontaneous interaction between participants afforded by technology; a forum for shared activities and knowledge building, especially through project and artifact presentations; the problem-solving environment; promotion of reflection and critical thinking, and; the building of a community of learners. While investigations of CSCL in the primary education classroom are just beginning, this study provides a significant contribution about learning with interactive videoconferencing in kindergarten.

Another area of significance related to this study is the establishment of a community of learners for young students while collaborating online. A review of the literature for this study revealed a frequent concern for the creation of community of learners. In fact, research about community building in primary classrooms (Bodrova & Leong, 2007; Harada et al., 2002; Hyun & Davis, 2005; Klerfelt, 2007; Lomangino et al., 1999; Murphy et al., 2003; NCREL, 2003; Turvey, 2006) as well as the impact of distance learning on learners of all ages, is inseparable from the concept of a community of learners (Abbott et al., 2004; Alberta Education, 2006; Amirian, 2003; Anderson & Rourke, 2005; Arnold et al., 2005; Bouhnik & Marcus, 2006; Cavanaugh, 2001; Cavanaugh et al., 2004; Cifuentes & Murphy, 1999, 2000a, 2000b, 2000c; Greenberg & Colbert, 2003; Harada et al., 2002; Hung, Chee, Hedberg, & Seng, 2005; Kinnear et al., 2002; McCombs & Vakili, 2005; McCombs, Ufnar, Shepherd, 2006; Misanchuk & Anderson, 2001; Van Scoter & Boss, 2002). Likewise, the importance of a community of learners is emphasized in CSCL (Stahl et al., 2006; Suthers, 2006). Further research is needed to investigate the impact of building a community of learners when engaging in interactive videoconferencing in the early childhood classroom. However, in order for the technology to be considered developmentally appropriate, great concern must be given to creating a healthy and secure environment for young learners (Cooper, 2005; Murphy et al., 2003; NAEYC, 1996).

Implications for Qualitative Research

This study contributes to the sparse amount of ethnographic research about young children (Gordon et al., 2001) and builds on the limited base of qualitative research investigating information and communication technologies with young children (Hyun & Davis, 2005; Klerfelt, 2007; Labbo & Kuhn, 2000; Lomangino et al., 1999; Turbill, 2001).

The methodological framework for the dissertation is significant due to the developmental process involved in its pursuit and selection criteria. The progression began with an appraisal of the characteristics inherent in qualitative research. Synthesizing a broad selection of chapters and journal articles about qualitative research assisted in fabricating the rationale for the methodological design. The review of the qualitative-research literature identified key points inherent to studies about educational fieldwork, classroom culture, young children, and information and communications technology. This process culminated in the articulation of a methodological design for a pilot study and ensuing dissertation about learning with interactive videoconferencing in a kindergarten classroom setting that met three criteria including

1. The "creation, testing, and revision of simple, practical, and effective analysis methods" (Miles & Huberman, 1994a, p. 3),

2. The alignment of themes common to qualitative data analysis together with the preservation of a naturalistic setting, and

3. Emphasis on addressing the nuances of contemporary culture, especially in terms of selecting a methodological approach for both collecting data and its analysis,

while considering technological concerns about working with interactive videoconferencing.

Hence, the research design was informed by three different criteria. The pilot study, the first criteria, evaluated sampling strategies, entry and access opportunities, the theoretical suppositions of the study, data collection methods (technology concerns), ATLAS.ti software coding procedures, data analysis including concept maps, and findings and limitations for future research. The second criteria that informed the research design was Miles and Huberman's (1994a) eight recurring themes in qualitative research: (a) extended field experience, (b) the researcher's quest to gain an interdependent picture of the situation, (c) intent to capture data from an insider's perspective (seeing the situation from the inside out), (d) integrity in preserving the original form of the data despite the need to isolate or sift some information, (e) explanation of how participants determine meaning in their situations (meaning-making), (f) interpretation of the data based on grounds of internal consistency, (g) the researcher as the focal "measurement device" of the study, and (h) words portray the analysis. The final criteria that informed the design was based on contemporary culture and data collection and analysis choices. Data collection was determined to be an ethnographic, case-study approach while data analysis consisted of a grounded theory approach using the ATLAS.ti software.

This study makes a significant contribution towards providing an alternative form of evaluating student learning with technology. According to Erickson (1986), standard process-product research about relationships between classroom interaction and student achievement fall short in three areas. First, these studies examine one-way causal influence rather than investigating the "reciprocal exchange of phenomenonologically meaningful action" (p. 22). Another problem occurs in the narrow data definitions and codes of the data being collected. In these studies, systematic methods of capturing and coding data omit details about classroom processes. Lastly, the product being studied is too narrow in scope and usually consists of end-of-the-year test scores. The 4-month data collection period allowed for extensive observation of the enacted curriculum and the contextual meaning making of the kindergartners during their interactive videoconferences.

Another implication of the dissertation focuses on strategies employed to address quality and rigor in qualitative study. Credibility issues were realized through prolonged engagement in field and data triangulation of field notes, journal entries, videoconferencing transcripts, and classroom artifacts. Transferability matters were attended to through thick description and purposive sampling. Concerns about dependability were addressed by two strategies—code and recode strategies as well as triangulation. Coding in the ATLAS.ti software provided for a way to create an audit trail of decisions concerning codes in addition to the flexibility of recoding when necessary. Lastly, confirmability of the interpretations of the data leading to conclusions was accomplished through reflexivity in journal entries and memos along with triangulation of the data from multiple sources.

The dissertation research design meets challenges posed by leading qualitative researchers through its attention to addressing contemporary culture (Eisenhart, 2001b; Erickson, 1986; Nespor, 1997; Schwandt, 2000); technology orientations (Charmaz, 2000; Charmaz & Mitchell, 2001; Eisenhart, 2001a; Erickson, 1986; Glaser, 2002);

shifting and emerging relationships (Eisenhart, 2001a; Heath, 1996, Willis, 1977, as cited in Eisenhart, 2001b; Nespor; Schwandt; Stake, 2000); changing boundaries (Eisenhart, 2001a) of local, remote, and virtual environments (Eisenhart, 2001a, 2001b); participants' voices (Charmaz; Eisenhart, 2001a, 2001b; Glaser); data reduction and data display (Miles & Huberman, 1984, 1994b); capture of data through participant observation and field notes (Emerson et al., 2001; Erickson) and videotaping.

Implications for Early Childhood Education

The findings from the study are significant to the field of early childhood education and promote the position of interactive videoconferencing as a tool for enriching the teaching and learning environment in the early childhood classroom. The Vygotskian perspective represents a learning theory commonly put into daily practice by kindergarten teachers. A large percentage of the kindergarten day is devoted to whole class instruction where students learn in the social context of their peers. Signs and tools are abundant as reminders of play areas, the weather, months of the year, numbers, and letters. Language is of paramount importance as students form meanings together, listen to directions from their teacher, offer interpretations of their learning, and express their emotions. Teachers regularly scaffold the efforts of their young learners, thereby raising their ability to solve problems with assistance. Hence, the meaning making results found in this study are applicable to early childhood educators and provide a "rationale" for using interactive videoconferencing technology.

Another important implication of this study focuses on integration of interactive videoconferencing into the curriculum. Decisions about content programs and lesson plans were made by the teacher. The researcher provided programming ideas to the teacher, but all curriculum decisions were made by the teacher. When considering the astronomy videoconferences, Mrs. Hartman modified the timing of her moon phase unit to coincide with the first astronomy session. In this way, Mrs. Hartman integrated interactive videoconferencing learning activities into her existing curriculum. The same was true of the gingerbread puppetry videoconference. Lesson plans for this session involved the reading of several folktales. Mrs. Hartman met this demand by using the folktales during her classes' daily story time. The students did not notice any change in their regular routine—they read classic folktales such as *The Little Red Hen* and *How the Camel Got His Hump* during their read aloud times while they unknowingly prepared for a discussion about gingerbread characters.

Another implication of the study relates to the ZPD and the developmental appropriateness of interactive videoconferencing as a technology medium. Figure 28 and Figure 40 show the potential development level of the students with the assistance of either their teacher other knowledgeable peers. The kindergartners expanded their ability to solve difficult problems like estimating the size of planets and creating human models of Sun, Earth, and moon orbital patterns during the videoconferences. These developmental gains show evidence of critical thinking, reflection, internalization, creativity, and language use by the students in the process of making meaning of their virtual learning experience. Thus, it may be argued that the developmental gains shown in the kindergartners' ZPD indicate the development appropriateness of using interactive videoconferencing in their classroom.

The final implication of this study in relation to the early childhood classroom focuses on the changing views of literacy. To illustrate how interactive videoconferencing addresses the NCREL (2003) 21st Century Digital Literacy Areas (as previously summarized in Table 1), the gingerbread puppetry and astronomy videoconferences were mapped onto the matrix showing the eight literacy skill areas of basic literacy, scientific literacy, economic literacy, technological literacy, visual literacy, information literacy, multicultural literacy, and global awareness. Table 17 shows the results. The only literacy skill area not addressed by these videoconferences was economic literacy. It may also be argued that in terms of basic literacy, Finding RQ1.3 (relating to the importance and role of language) provides evidence of kindergartners' meaning making through language during the interactive videoconferences.

Table 17

21st Century Digital Literacy Areas for the Gingerbread Puppetry and Astronomy Videoconferences (NCREL, 2003, p. 15)

No.	Literacy Skill Area for 21st Century Learners	Gingerbread Puppetry	Astronomy I and II	Description
1.	Basic Literacy	X	X	Language proficiency (reading, writing, listening, speaking) and numeracy skills using conventional or technology-based media to adequately meet one's goals (student or professional) (NCREL, 2003).
2.	Scientific Literacy	X	X	Knowledge and understanding of scientific concepts and processes in order to use and apply the information, to identify questions, and to make evidence-based conclusions for decision making, participation in the natural world, and economic productivity (NCREL, 2003).
3.	Economic Literacy			The ability to identify economic problems, alternatives, costs, and benefits. Understand that money is a tool to be used wisely whether saved or invested for the future, used for purchases, or given away (NCREL, 2003).
4.	Technological Literacy	X	X	"Knowledge about what technology is, how it works, what purposes it can serve, and how it can be used efficiently and effectively to achieve specific goals" (NCREL, 2003, p. 15).

Table 17 (*continued*)

No.	Literacy Skill Area for 21st Century Learners	Ginger-bread Puppetry	Astro-nomy I and II	Description
5.	Visual Literacy	X	X	"The ability to interpret, use, appreciate, and create images and video using both conventional and 21st century media in ways that advance thinking, decision making, communication, and learning" (NCREL, 2003, p. 15).
6.	Information Literacy	X	X	The ability to evaluate information across many media platforms; know when there is a need for information; be able to identify, locate, evaluate, and effectively use information for the issue or problem at hand; and accomplish these functions using technology, communication networks, and electronic resources (National Forum on Information Literacy, 2007; NCREL, 2003)
7.	Multicultural Literacy	X	X	"The ability to understand and appreciate the similarities and differences in the customs, values, and beliefs of one's own culture and the cultures of others" (NCREL, 2003, p. 15)
8.	Global Awareness	X	X	"The need to recognize, wrestle with, and reconcile diversity and unity as an integral part of citizenship" (Florida International University College of Education, 2003, para. 1). The celebration of our differences while exploring our similarities.

Implications for Using Sociocultural-Learning Theory as the Theoretical Framework

The implications of this study for the continued application of Vygotskian learning theory to student learning with technology are widespread. Although there is an established basis of early childhood education studies that investigate learning with computers, none examined alternative forms of technology such as videoconferencing, gaming, or virtual software citing multiple Vygotskian tenets. While most of these studies emphasized the social context of learning and the importance and role of language, elaboration about sign and tool use in mediated activities was nonexistent and the ZPD was only discussed on a cursory level.

This study begins a dialogue about using sociocultural theory as an alternative pedagogy for learning due to its sensitivity in "understanding cultural diversity and its complexities in a rapidly changing globalized world" (Lim & Renshaw, 2001, p. 11). Lim and Renshaw contend that features of sociocultural theory such as the ZPD and learning in a social context are relevant to guiding teaching and learning necessary for valuing cultural differences and scaffolding cross-cultural interactions.

Another important implication of this dissertation in relation to sociocultural theory is attention to the design of distance education to promote multicultural understanding. Beldarrain (2006) highlighted, "Current trends in the field of distance education indicate a shift in pedagogical perspectives and theoretical frameworks, with student interaction at the heart of learner-centered constructivist environments" (p. 139). With this trend comes a focus on appropriate application of technologies that foster interaction such as interactive videoconferencing. Beldarrain further noted, "Collaboration and contribution further prepare students to become part of a more expert community, a community of practice" (p. 148). Designing online instruction to account for the ZPD includes consideration about how to open a dialogue of mutual trust and understanding while building an appreciation for diverse points of view and cultural awareness.

The final area of impact pertaining to this dissertation addresses education in the changing light of globalization. Kindergartners from different countries can find ways to recognize differences while valuing one another. It is important to continue the reconceptualization of education as pointed out by Lim and Renshaw,

> The promise of culturally inclusive communities in context of changing local and global environments demands that education play a vital role in teaching and learning about cultural diversity in a world where differences and cultural identities are continuous and uncertain rather than discrete and preconceived. For this task, education needs to reconceptualize learning about cultural differences and with cultural differences as a transformative act towards the future because it involves taking people "beyond the world they already know but in a way that does not insist on a fixed set of altered meanings" (Simon, 1992, p. 47). (2001, p. 13)

Summary

This dissertation is unique in the way that it maps the meanings formed by kindergartners during interactive videoconferencing to four Vygotskian tenets: the social origins of cognition, signs and tools through mediated activities, the importance and role of language, and the ZPD. The study maps the kindergartners' meaning making to Vygotskian learning theory as a framework for further evaluation about learning with interactive videoconferencing in the primary grades. Today's young students enter school as technologically savvy learners, ready to be stimulated and challenged by their learning environment. Previously, research about learning with information and technology communications in the early childhood classroom failed to show how digital natives or Generation i students made meaning when learning with technologies that allowed these multitaskers to both hear and see their peers and other distant, knowledgeable others at the same time.

Another unique feature of this dissertation is the anthology of fields considered in the design and the number of fields it impacts. The research design followed an ethnographic data collection approach to observe, capture, and interpret children's meaning making on multiple planes – their local environment, the remote setting, and the global or virtual context created by the participatory and negotiated knowledge construction during the videoconferences. Another qualitative significance of the research was that data analysis consisted of a grounded theory approach using the ATLAS.ti software.

Implications for the research are widespread and include disciplines of CSCL, classroom-based research, communities of learners, qualitative methods, strategies to address qualitative research quality and rigor, interactive videoconferencing as an information and communication technology tool in the early childhood classroom, designing distance education for young learners using the ZPD, literacy studies, sociocultural theory as a theoretical framework for meaning making with technology, and multicultural learning environments for primary classrooms.

In terms of a methodological research design, the study followed a line of inquiry based on the Vygotskian sociocultural perspective. It examined the development and meaning making of kindergartners over a prolonged period of time while they engaged in their face to face classroom learning activities as well as instructional collaborations via interactive videoconferencing.

Findings from the study relate how the kindergartners made meaning during the interactive videoconferences in line with the four Vygotskian tenets outlined in the research. In regards to the kindergartners' emerging inquiries, during sustained interactive videoconferencing use, children's inquiries and dialogue evidenced talk that was purposeful, reflective, and self-directed. It also indicated comfort with the technology. Findings for the first research question, What types of meanings are being formed by the kindergartners during the interactive videoconferences? are

1. The teachers and kindergartners formed a community of learners in a virtual learning environment with context experts, teachers, and peers over a videoconferencing connection that afforded high levels of interaction. Students formed knowledge about the remote participants' culture as well as the content material to further their progress towards making them global learners while basing their understandings in the social context of their virtual learning environment. This outlook represented a more diverse point of view than that of just their local classroom.

2. The kindergartners and their teacher made use of signs and tools for mediated activities that led the children to higher levels of cognitive development during the interactive videoconferences.

3. The role of language was critical for the students as they made meaning of the interactive videoconferences through dialogue using their language to demonstrate new vocabulary, ask and receive questions, compare and contrast various concepts, present and respond to others' work, critically reflect and explain their points of view, develop multicultural understanding, and reveal their technological literacy.

4. During the interactive videoconferences, students were able to complete more difficult problems or tasks with the assistance of content experts, teachers, and knowledgeable peers than if they were unassisted. These developmental gains show evidence of critical thinking, reflection, internalization, creativity, and language use by the students in the process of making meaning of their virtual learning experience. Furthermore, using the framework of the ZPD is useful in reviewing the developmental progress and meaning making of kindergartners while learning with interactive videoconferencing.

Findings for the second research question, What is the nature of young children's emerging inquiries and dialogue surrounding their use of interactive videoconferencing in their classroom?, are actually a subset of the language tenet in research question one. For this research question, the first finding is that children's conversations about the interactive videoconferencing equipment started and remained at the exploratory talk level for the gingerbread and astronomy videoconferences. The second finding is that children's inquiry and dialogue during the interactive videoconferences was purposeful, reflective, and self-directed.

Limitations and Opportunities for Future Research

The general findings of this study are limited by the single, case-study approach. Each kindergarten classroom has a unique sociocultural history determined by the interaction of the teacher and students. Codes depicted in the gingerbread puppetry and astronomy interactive videoconferencing sessions may be quite different under circumstances of different teaching styles and student populations. Likewise, this limitation actually represents a potential area for future research. It would be interesting to conduct a similar study with a different demographic population of students.

While the dissertation study represents a case study involving only a single classroom, there was plentiful data generated in the form of field notes, journal entries, transcribed files, student- and teacher-created artifacts, photographs, and memos. Even though the general availability of kindergarten classrooms with access to interactive videoconferencing remains small in western Pennsylvania, decisions about the participant site emphasized the choice of a location that presented open access and learning opportunity. Different geographical locations may generate different results.

This study examined three of the kindergarten interactive videoconferences, the gingerbread puppetry videoconference and the pair of astronomy videoconferences. These collaborative sessions related to different topic areas. The gingerbread puppetry videoconference centered on a language arts theme, while the astronomy videoconferences focused on science content. The other four unanalyzed videoconferences also represent a strong science influences. Results of the study may be different depending on the content area of the videoconferences, but findings from the dissertation highlight ample examples of kindergarten meaning making from a Vygotskian perspective for the topic areas of gingerbread puppetry and astronomy.

Likewise, the pilot study showed similar results using videoconferencing examples about bird reports and sharks.

This study is limited by the selection of four Vygotskian tenets as the theoretical framework: the social origins of learning, sign and tool use in mediated activities, the importance and role of language, and the ZPD. As a pilot study, the research was exploratory in nature. Future research may limit the application of these four tenets or expand the theoretical framework to include tenets such as the importance of play and scientific concepts. For the purposes of this study, the literature review considered translations of the original Vygotskian (1978, 1986) texts that are supplemented by interpretations from other Vygotskian scholars. Vygotsky lived a relatively short life and during the last two decades there has been a surge of Vygotskian-related research by neoVygotskian researchers. Thus, future research endeavors may be expanded to include the interpretations of neoVygotskian scholars, especially in light of technology innovations and globalization.

This study is limited by the single-handed research opportunity presented by the doctoral dissertation process. This dissertation represents a segue into professional educational research responsibilities. The multidisciplinary emphasis of the study begs for collaboration with researchers from the additional fields of early childhood education, educational psychology, qualitative-research methodology, CSCL, distance learning, content area experts, and multicultural studies.

REFERENCES

Abbott, L., Austin, R., Mulkeen, A., & Metcalfe, N. (2004). The global classroom: Advancing cultural awareness in special schools through collaborative work using ICT. *European Journal of Special Needs Education, 19*(2), 225-240.

Alberta Education. (2006). Video-conferencing research community of practice research report. Retrieved January 2, 2008, from http://vcalberta.ca/community/Research_Summary_Report_word_version_final.pdf

Allen, A. T. (2006). The kindergarten in Germany and the United States, 1840-1914: A comparative perspective. *History of Education, 35*(2), 173-188.

American Psychological Association Work Group of the Board of Educational Affairs. (1997, November). *Learner-centered psychological principles: A framework for school reform & redesign*. Washington, DC: American Psychological Association. Retrieved April 15, 2008, from http://www.apa.org/ed/cpse/LCPP.pdf

American Society for Training & Development [ASTD]. (2008). Learning circuits: E-learning glossary. Retrieved October 23, 2008, from http://www.astd.org/lc/glossary.htm

Amirian, S. (2003, October 31). *Pedagogy & videoconferencing: A review of recent literature.* Paper presented at the First NJEDge.NET, Plainsboro, NJ.

Anderson, T., & Rourke, L. (2005). *Videoconferencing in kindergarten-to-grade 12 settings: A review of the literature*. Alberta, Canada: Crown in Right of the Province of Alberta.

Anfara, V. A., Brown, K. M., & Mangione, T. L. (2002). Qualitative analysis on stage: Making the research process more public. *Educational Researcher, 31*(7), 28-38.

Arnold, T., Cayley, S., & Griffith, M. (2005). Video conferencing in the classroom: Communications technology across the curriculum: Coventry, UK: The British Educational Communications and Technology Agency.

AT&T Knowledge Network Explorer. (2008). Videoconferencing collaboration collage. Retrieved June 1, 2008, from http://www.kn.att.com/wired/vidconf/ed1vidconf.html

AT&T Knowledge Ventures. (2007). Videoconferencing directories. Retrieved March 31, 2008, from http://www.kn.att.com/wired/vidconf/directory.cfm

Australian Government. (2008). Study in Australia. Live. Learn. Grow. Retrieved June 30, 2008, from http://www.studyinaustralia.gov.au/Sia/en/WhatToStudy/Schools/SchoolSystem.htm

Becker, H. J., Ravitz, J. L., & Wong, Y. (2000). *Teacher and teacher-directed student use of computers and software* (Teaching, Learning, & Computing: 1998 National Survey Report No. 3). Center for Research on Information Technology and Organizations, University of California, Irvine and the University of Minnesota. Retrieved December 15, 2007, from http://www.crito.uci.edu/TLC/FINDINGS/COMPUTERUSE/REPORT_3_PDF_REV.PDF

Bedard, S., & Knox-Pipes, B. (2006). Online distance learning: The k-12 student's perspective. *Distance Learning, 3*(4), 13-19.

Beldarrain, Y. (2006). Distance education trends: Integrating new technologies to foster student interaction and collaboration. *Distance Education, 27*(2), 139-153.

Betrus, A. K., & Molenda, M. (2002). Historical evolution of instructional technology in teacher education programs. *TechTrends, 46*(5), 18-21.

Bodrova, E., & Leong, D. J. (2001). *Tools of the mind: A case study of implementing the Vygotskian approach in American early childhood and primary classrooms*. Geneva, Switzerland: International Bureau of Education.

Bodrova, E., & Leong, D. J. (2007). *Tools of the mind: The Vygotskian approach to early childhood education* (2nd ed.). Upper Saddle River, NJ: Prentice Hall.

Borthick, A. F., & Jones, D. R. (2003). Designing learning experiences within learners' zones of proximal development (zpds): Enabling collaborative learning on-site and online. *Journal of Information Systems, 17*(1), 107-134.

Bouhnik, D., & Marcus, T. (2006). Interaction in distance-learning courses. *Journal of the American Society for Information Science and Technology, 57*(3), 299-305.

Brett, J. (2003). *The gingerbread baby*. New York: Putnam.

British Council. (2008). USA education - school curriculum: K-12 and primary education in England, Wales and Northern Ireland. Retrieved June 30, 2008, from http://www.britishcouncil.org/usa-education-uk-system-k-12-curriculum-england.htm

British Educational Communications and Technology Agency [BECTA]. (2002). *The nut e-cluster project: ICT advice case study*. Coventry, England: BECTA.

Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *The Journal of the Learning Sciences, 2*(2), 141-178.

Cavanaugh, C., Gillan, K. J., Kromrey, J., Hess, M., & Blomeyer, R. (2004). The effects of distance education on k–12 student outcomes: A meta-analysis. Naperville, IL: Learning Point Associates.

Cavanaugh, C. S. (2001). The effectiveness of interactive distance education technologies in k-12 learning: A meta-analysis. *International Journal of Educational Telecommunications, 7*(1), 73-88.

Center for Interactive Learning and Collaboration (CILC). (2008a). Collaboration center. Retrieved March 31, 2008, from http://www.cilc.org/c/community/collaboration_center.aspx

Center for Interactive Learning and Collaboration. (2008b). Resources. Retrieved June 1, 2008, from http://www.cilc.org/c/products/products_and_resources.aspx

Center for Interactive Learning and Collaboration (CILC). (2008c). Videoconferencing site directory. Retrieved March 31, 2008, from http://www.cilc.org/videoconferencing_site_all.aspx

Charmaz, K. (2000). Grounded theory: Objectivist and constructivist methods. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed., pp. 509-535). Thousand Oaks, CA: SAGE Publications, Inc.

Charmaz, K., & Mitchell, R. G. (2001). Grounded theory in ethnography. In P. Atkinson, A. Coffey, S. Delamont, J. Lofland & L. Lofland (Eds.), *Handbook of ethnography* (pp. 160-174). London: Sage Publications, Inc.

Christensen, P., & James, A. (2000). Introduction: Researching children and childhood: Cultures of communication. In P. Christensen & A. James (Eds.), *Research with children: Perspectives and practices* (pp. 1-8). New York: Falmer Press.

Cifuentes, L., & Murphy, K. (2000a). Cultural connections: A model for eliminating boundaries and crossing borders. *Quarterly Review of Distance Education, 1*(1), 17-30.

Cifuentes, L., & Murphy, K. L. (1999). Distance learning among Mexican and Texan children. *Educational Technology Research & Development, 47*(4), 94-102.

Cifuentes, L., & Murphy, K. L. (2000b). Images of Texan and Mexican cultures shared in a telecommunications partnership. *Distance Education, 2*, 300-322.

Cifuentes, L., & Murphy, K. L. (2000c). Promoting multicultural understanding and positive self-concept through a distance learning community: Cultural connections. *Educational Technology Research & Development, 48*(1), 69-83.

Clements, D. H., & Sarama, J. (2003a). Strip mining for gold: Research and policy in educational technology—a response to “fool’s gold”. *AACE Journal, 11*(1), 7-69.

Clements, D. H., & Sarama, J. (2003b). Young children and technology: What does the research say? *Young Children, 58*(6), 34-40.

Cole, C., Ray, K., & Zanetis, J. (2004). *Videoconferencing for k-12 classrooms: A program development guide*. Eugene, OR: International Society for Technology in Education.

Cole, M., & Scribner, S. (1978). Introduction. In M. Cole, V. John-Steiner, S. Scribner & E. Souberman (Eds.), *Mind in society: The development of higher psychological processes* (pp. 1-14). Cambridge, MA: Harvard University Press.

Compestine, Y. C. (2001). *The runaway rice cake*. New York: Simon & Schuster.

Cooper, L. Z. (2005). Developmentally appropriate digital environments for young children. *Library Trends, 54*(2), 286-301.

Curtis, S., Gesler, W., Smith, G., & Washburn, S. (2000). Approaches to sampling and case selection in qualitative research: Examples in the geography of health. *Social Science & Medicine, 50*(7-8), 1001-1014.

Daskagianni, C., Leontitsis, A., & Pange, J. (2004). *New technologies in the Greek kindergartens as learning and communication tools.* Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications 2004, Lugano, Switzerland.

DeBell, M., & Chapman, C. (2005). Rates of Computer and Internet Use by Children in Nursery School and Students in Kindergarten Through Twelfth Grade: 2003 [NCES 2005–111rev]. In U.S. Department of Education (Ed.): Washington, DC: National Center for Education Statistics.

DeBell, M., & Chapman, C. (2006a). Computer and internet use by students in 2003. In U.S. Department of Education (Ed.): Washington, DC: National Center for Education Statistics.

DeBell, M., & Chapman, C. (2006b). Computer and internet use by students in 2003: Statistical analysis report [NCES 2006–065]. In U.S. Department of Education (Ed.): Washington, DC: National Center for Education Statistics.

Delamont, S. (2002). *Fieldwork in educational settings: Methods, pitfalls and perspectives*. New York: Routledge.

Department of Instructional Technology at the University of Georgia. (2008). Instructional technology forum. Retrieved June 1, 2008, from http://it.coe.uga.edu/itforum/

Devers, K. J., & Frankel, R. M. (2000). Study design in qualitative research–2: Sampling and data collection strategies. *Education for Health, 13*(2), 263-271.

Digital bridges: Glossary. (2005). *Digital Bridges: K-12 Videoconferencing.* Retrieved April 12, 2007, from http://www.netc.org/digitalbridges/glossary/#roomvid

Egielski, R. (1997). *The gingerbread boy*. New York: HarperCollins Publishers.

Eisenhart, M. (2001a). Changing conceptions of culture and ethnographic methodology: Recent thematic shifts and their implications for research on teaching. In V. Richardson (Ed.), *Handbook of research on teaching* (4th ed., pp. 209-225). New York: American Educational Research Association.

Eisenhart, M. (2001b). Educational ethnography past, present, and future: Ideas to think with. *Educational Researcher, 30*(8), 16-27.

Elkind, D. (1998, February 6-8). *Educating young children in math, science, and technology.* Paper presented at the Forum on Early Childhood Science, Mathematics, and Technology Education, Washington, DC. Retrieved March 13, 2007, from the EBSCO database (ED416993).

Ellis, C., & Bochner, A. P. (2000). Autoethnography, personal narrative, reflexivity: Researcher as subject. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed., pp. 733-768). Thousand Oaks, CA: SAGE Publications, Inc.

Emerson, R. M., Fretz, R. I., & Shaw, L. L. (2001). Participant observation and fieldnotes. In P. Atkinson, A. Coffey, S. Delamont, J. Lofland & L. Lofland (Eds.), *Handbook of ethnography* (pp. 352-368). London: SAGE Publications, Inc.

Erickson, F. (1986). Qualitative methods in research on teaching. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed., pp. 119-161). New York: American Educational Research Association.

Fisher, E. (1993). Distinctive features of pupil/pupil classroom talk and their relationship to learning: How discursive exploration might be encouraged. *Language and Education, 7*(4), 239-257.

Florida International University College of Education. (2003). Global awareness program. Retrieved November 1, 2007, from http://www.fiu.edu/~globprog/

Fox, M. A., Connolly, B. A., & Snyder, T. D. (2005). Youth indicators 2005: Trends in the well-being of American youth: U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Froebel Foundation USA. (2007). The Froebel kindergarten philosophy. Retrieved October 17, 2007, from http://www.froebelfoundation.org/philosophy.html

Gage, J., Nickson, M., & Beardon, T. (2002, February 12-14). *Can videoconferencing contribute to teaching and learning? The experience of the motivate project.* Paper presented at the Annual Conference of the British Educational Research Association, Exeter, England.

Galloway, R. (2003). *Smiley shark*. London: Little Tiger Press.

Generation i. (1999). Retrieved September 15, 2007, from http://www.microsoft.com/issues/essays/1999/11-01geni.mspx

Glaser, B. (2002). Conceptualization: On theory and theorizing using grounded theory. *International Journal of Qualitative Methods, 1*(2), 1-31.

Goldstein, L. S. (2007). Beyond the dap versus standards dilemma: Examining the unforgiving complexity of kindergarten teaching in the United States. *Early Childhood Research Quarterly, 22*(1), 39-54.

Gordon, T., Holland, J., & Lahelma, E. (2001). Ethnographic research in educational settings. In P. Atkinson, A. Coffey, S. Delamont, J. Lofland & L. Lofland (Eds.), *Handbook of ethnography* (pp. 188-203). Thousand Oaks, CA: SAGE Publications, Inc.

Greenberg, A., & Colbert, R. (2003). Best practices in live content acquisition by distance learning organizations: Enhancing the primary and secondary school classroom by tapping content resources via two-way interactive video. Retrieved December 1, 2005, from http://www.polycom.com/common/documents/whitepapers/best_practices_in_live_content_acquisition_by_distance_learning_organizations.pdf

Harada, V. H., Lum, D., & Souza, K. (2002). Building a learning community. *Childhood Education, 79*(2), 66-71.

Harvey, F. A., & Charnitski, C. W. (2003). Vygotsky revisited: The relevance of Vygotsky's theories for 21st century technology-rich education. In C. Crawford, D. A. Willis, R. Carlsen, I. Gibson, K. McFerrin, J. Price & R. Weber (Eds.), *Proceedings of society for information technology and teacher education international conference 2003* (pp. 1453-1456). Chesapeake, VA: AACE.

Hayden, K. L. (1999). Videoconferencing in k-12 education: A delphi study of characteristics and critical strategies to support constructivist learning experiences. *Dissertation Abstracts International, 60*(06), 1990A. (UMI No. 9934596).

Heath, M. J., & Holznagel, D. (2002, October 17-18). *Interactive videoconferencing: A literature review.* Paper presented at the K–12 National Symposium for Interactive Videoconferencing, Dallas, TX.

Hendrick, H. (2000). The child as a social actor in historical sources: Problems of identification and interpretation. In P. Christensen & A. James (Eds.), *Research with children: Perspectives and practices* (pp. 36-36). New York: Falmer Press.

Holland, D., & Lachiotte, M., Jr. (2007). Vygotsky, mead, and new sociocultural studies of identity. In H. Daniels, M. Cole & J. V. Wertsch (Eds.), *The Cambridge companion to Vygotsky* (pp. 101-135): Cambridge University Press.

Holland, D. C., & Valsiner, J. (1988). Cognition, symbols, and Vygotsky's developmental psychology. *Ethos, 16*(3), 247-272.

Holt, L. (2004). The 'voices' of children: De-centering empowering research relations. *Children's Geographies, 2*(1), 13-27.

Howard, D. E., Kaljee, L., Rachuba, L. T., & Cross, S. I. (2003). Coping with youth violence: Assessments by minority parents in public housing. *American Journal of Health Behavior, 27*(5), 483-492.

Hung, D., Chee, T. S., Hedberg, J. G., & Seng, K. T. (2005). A framework for fostering a community of practice: Scaffolding learners through an evolving continuum. *British Journal of Educational Technology, 36*(2), 159-176.

Hyun, E., & Davis, G. (2005). Kindergartners' conversations computer-based technology classroom. *Communication Education, 54*(2), 118-135.

International Information and Communication Technologies (ICT) Literacy Panel. (2002). Digital transformation: A framework for ICT literacy. Princeton, NJ: Educational testing services. Retrieved November 10, 2007, from http://www.ets.org/Media/Tests/Information_and_Communication_Technology_Literacy/ictreport.pdf

International Society for Technology in Education. (2008a). ISTE educational computing and technology standards for technology leadership advanced program. October 22, 2008, from http://www.iste.org/Content/NavigationMenu/NETS/ForTechnologyFacilitatorsandLeaders/Technology_Leadership_Standards.htm#Plan

International Society for Technology in Education (ISTE). (2000a). *ISTE national educational technology standards (NETS) and performance indicators for teachers.* Eugene, OR: International Society for Technology in Education.

International Society for Technology in Education (ISTE). (2007). National educational technology standards for students: The next generation. Retrieved November 15, 2007, from http://www.iste.org/inhouse/nets/cnets/students/pdf/NETS_for_Students_2007.pdf

International Society for Technology in Education (ISTE). (2000b). *Profiles for technology literate students: Performance indicators for technology-literate students grades prek-2.* Eugene, OR: International Society for Technology in Education.

International Society for Technology in Education (ISTE). (2008b). Special Interest Group for Interactive Videoconferencing. Retrieved June 1, 2008, from http://sigivc.iste.wikispaces.net/

International Society for Technology in Education (ISTE). (2000c). *Technology foundation standards for all students.* Eugene, OR: International Society for Technology in Education.

Internet2. (2008). *The Intenet2 commons.* Retrieved March 31, 2008, from http://commons.internet2.edu/

Internet2: The National Internet2 K20 Initiative. (2006). Internet2 k20 initiative connectivity survey: Individual state results: Pennsylvania. Retrieved November 26, 2007, from http://k20.internet2.edu/connectivity/state/33

Johnson, L. (2004). Utah deaf videoconferencing model: Providing vocational services via technology, *Journal of Rehabilitation.* Retrieved November 30, 2007, from http://findarticles.com/p/articles/mi_m0825/is_4_70/ai_n8688135

Jonassen, D. (2003). Using cognitive tools to represent problems. *Journal of Research on Technology in Education, 35*(3), 362-381.

Jonassen, D. H. (2001, September 26-28). *Computers as mindtools for engaging learners in critical thinking.* Paper presented at the 3º Simpósio Internacional de

Informática Educativa, School of Education of the Polytechnic Institute of Viseu, Viseu, Portugal.

Jonassen, D. H., Howland, J., Moore, J., & Marra, R. M. (2003). *Learning to solve problems with technology: A constructivist perspective* (2nd ed.). Upper Saddle River, NJ: Merrill Prentice Hall.

Jones, H., Yeoman, K., & Cockell, C. (2007). A pilot survey of attitudes to space sciences and exploration among British school children. *Space Policy, 23*, 20-23.

Kinnear, H., McWilliams, S., & Caul, L. (2002). The use of interactive video in teaching teachers: An evaluation of a link with a primary school. *British Journal of Educational Technology, 33*(1), 17-26.

Klerfelt, A. (2007). Gestures in conversation – the significance of gestures and utterances when children and preschool teachers create stories using the computer. *Computers & Education, 48*(3), 335-361.

Knupfer, A. M. (1996). Ethnographic studies of children; the difficulties of entry, rapport, and presentations of their worlds. *International Journal of Qualitative Studies in Education, 9*(2), 135-149.

Kozulin, A. (1986). Vygotsky in context. In A. Kozulin (Ed.), *Thought and language: The development of higher psychological processes* (pp. xi-lxi). Cambridge, MA: MIT Press.

Labaree, R. V. (2006). Encounters with the library: Understanding experience using the life history method. *Library Trends, 55*(1), 121-139.

Labbo, L., & Kuhn, M. (2000). Weaving chains of affect and cognition: A young child's understanding of cd-rom talking books. *Journal of Literacy Research, 32*(2), 187-210.

Laffey, J. (2003). Appropriation, mastery and resistance to technology in early childhood preservice teacher education. *Journal of Research on Technology in Education, 36*(4), 361-382.

Lankshear, C., & Knobel, M. (2003). New technologies in early childhood literacy research: A review of research. *Journal Of Early Childhood Literacy, 3*(1), 59-82.

Lappalainen, S. (2002). As a researcher between children and teachers. In G. Walford (Ed.), *Debates and developments in ethnographic methodology* (pp. 61-71). Oxford, UK: Elsevier Science Ltd.

Learning and Teaching Scotland. (2002). ICT in pre-school: A 'benign addition'? A review of the literature on ICT in pre-school settings. Retrieved October 23, 2008, from http://www.ltscotland.org.uk/earlyyears/images/benignaddition_tcm4-122419.pdf

Lim, L., & Renshaw, P. (2001). The relevance of sociocultural theory to culturally diverse partnerships and communities. *Journal of Child & Family Studies, 10*(1), 9.

Lomangino, A. G., Nicholson, J., & Sulzby, E. (1999). The influence of power relations and social goals on children's collaborative interactions while composing on computer. *Early Childhood Research Quarterly, 14*(2), 197-228.

Lincoln, Y., & Guba, E. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage.

Lutz, W., & Scherbov, S. (2006). *Global age-specific literacy projections model (galp): Rationale, methodology and software*. Montréal, Canada: UNESCO Institute for Statistics (UIS). Retrieved December 5, 2007, from http://www.uis.unesco.org/TEMPLATE/pdf/Literacy/GALP.pdf

MacMillan, J. H., & Schumacher, S. S. (2001). Introduction to designing qualitative research. In *Research in education: A conceptual introduction* (pp. 394-426). New York: Addison Wesley Longman, Inc.

Mallory, J. R. (2001). *Desktop video conferencing for remote tutoring/teaching of deaf students.* Paper presented at the Instructional Technology And Education of the Deaf Symposium, National Technical Institute for the Deaf, Rochester, NY, June 2001.

Marsh, G. E. (2000). A brief history of instructional technology. Retrieved April 1, 2008, from http://www.healthnet.org.np/training/software/WW198.htm

Matthews, H., Limb, M., & Taylor, M. (1998). The geography of children: Some ethical and methodological considerations for project and dissertation work. *Journal of Geography in Higher Education, 22*(3), 311-324.

McCombs, B. I., & Vakili, D. (2005). A learner-centered framework for e-learning. *Teachers College Record, 107*(8), 1582-1600.

McCombs, G. B., Ufnar, J. A., & Shepherd, V. L. (2006). The virtual scientist: Connecting university scientists to the k–12 classroom through videoconferencing. *Advances in Physiology Education, 31*, 62-66.

Mid-Atlantic Gigapop in Philadelphia for Internet2 (MAGPI). (2008). K20 resources for magpi members. Retrieved March 31, 2008, from http://www.magpi.net/k20resources.html

Miles, M. B., & Huberman, A. M. (1984). Drawing valid meaning from qualitative data: Toward a shared craft. *Educational Researcher, 13*(5), 20-30.

Miles, M. B., & Huberman, A. M. (1994a). Introduction. In M. B. Miles & A. M. Huberman (Eds.), *Qualitative data analysis: An expanded sourcebook* (2nd ed., pp. 1-15). Thousand Oaks, CA: SAGE Publications, Inc.

Miles, M. B., & Huberman, A. M. (1994b). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage Publications.

Misanchuk, M., & Anderson, T. (2001). *Strategies for building community in an online learning environment: Communication, cooperation and collaboration.* Paper presented at the Sixth Annual Mid-South Instructional Technology Conference, Middle Tennessee State University, Murfreesboro. Retrieved June 1, 2006, from http://frank.mtsu.edu/~itconf/proceed01/19.pdf

Moore, M. G. (1989). Three types of interaction. *The American Journal of Distance Education, 3*(2), 1-6.

Moore, M. G. (1993). Theory of transactional distance. In D. Keegan (Ed.), *Theoretical principles of distance education* (pp. 22-38). New York: Routledge.

Muhr, T. (2004). *User's manual for ATLAS.ti 5.0*. Berlin: Scientific Software Development.

Murphy, K. L., DePasquale, R., & McNamara, E. (2003). Meaningful connections using technology in primary classrooms. *Young Children, 58*(6), 12-18.

Nasir, N. S., & Hand, V. M. (2006). Exploring sociocultural perspectives on race, culture, and learning. *Review of Educational Research, 76*(4), 449-475.

National Association for the Education of Young Children (NAEYC). (2008). Retrieved June 1, 2008, from www.naeyc.org

National Association for the Education of Young Children (NAEYC). (1996). Technology and young children—ages 3 through 8: A position statement. Washington, DC.

National Association for the Education of Young Children (NAEYC). (2002). Early learning standards: Creating the conditions for success. Executive summary. Retrieved May 31, 2007, from http://www.naeyc.org/about/positions/pdf/executive_summary.pdf

National Education Technology Plan. (2004). Toward a new golden age in American education: How the internet, the law and today's students are revolutionizing expectations: Washington, DC: U.S. Department of Education, Office of Educational Technology.

National Forum on Information Literacy. (2007). What is information literacy? Retrieved November 2, 2007, from http://www.infolit.org/

Nespor, J. (1997). *Tangled up in school: Politics, space, bodies, and signs in the educational process*. Mahwah, NJ: Lawrence Erlbaum Associates.

Newman, D. L., Du, Y., Bose, M., & Bidjerano, T. (2006). A content analysis of videoconference integration plans. In C. Crawford, D. A. Willis, R. Carlsen, I. Gibson, K. McFerrin, J. Price & R. Weber (Eds.), *Proceedings of the society for* *information technology and teacher education international conference 2006* (pp. 2347-2352). Chesapeake, VA: AACE.

No Child Left Behind Act of 2001, Pub. L. No. 107-110, 115 Stat. 1425 (2002).

Nordtveit, H. (2005). *Family literacy*: Paper commissioned for the EFA Global Monitoring Report 2006, Literacy for Life. Retrieved November 7, 2007, from http://unesdoc.unesco.org/images/0014/001460/146074e.pdf

North Central Regional Educational Laboratory (NCREL). (2003). *Engauge 21st century skills: Literacy in the digital age*. Naperville, IL: North Central Regional Educational Laboratory and the Metiri Group. Retrieved October 30, 2007, from http://www.ncrel.org/engauge/skills/engauge21st.pdf

Onwuegbuzie, A. J., & Leech, L. (2007). A call for qualitative power analyses. *Quality & Quantity, 41*(1), 105-121.

Özkan, B. C. (2005). Pros and cons of internet2 videoconferencing as a new generation distance education tool. *Computers in the Schools, 22*(1/2), 33-42.

Pantaleo, S. (2007). Interthinking: Young children using language to think collectively during interactive read-alouds. *Early Childhood Education Journal, 34*(6), 439-447.

Papert, S. (1993). *Mindstorms: Children, computers and powerful ideas* (2nd ed.). New York: Basic books.

Pennsylvania Department of Education & Pennsylvania Department of Public Welfare (PDE & PDPW). (2006). *Pennsylvania's standards for kindergarten*. Harrisburg, PA: Pennsylvania Department of Education.

Plowman, L., & Stephen, C. (2005). Children, play, and computers in pre-school education. *British Journal of Educational Technology, 36*(2), 145-157.

Poveda, D. (2003). Literature socialization in a kindergarten classroom. *Journal of Folklore Research, 40*(3), 233-272.

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon, 9*(5).

Public Broadcasting Service (PBS), & Parent Teacher Association (PTA). (2006, August 10). Parents start preparing their children very young and emphasize value of new media technologies as key to children's success in school and life according to new roper survey.

Ravitz, J. L., Becker, H. J., Wong, Y. T. (2000). *Constructivist compatible beliefs and practices among U.S. teachers* (Teaching, Learning & Computing: 1998 National Survey Report No. 4). Center for Research on Information Technology and Organizations, University of California, Irvine and the University of Minnesota. Retrieved December 15, 2007, from htttp://www.crito.uci.edu/TLC/findings/report4/

Reiser, R. A. (2001). A history of instructional design and technology. Part i: A history of instructional media. *Educational Technology, Research and Development, 49*(1), 53-64.

Rideout, V. J., Vandewater, E. A., & Wartella, E. A. (2003). Electronic media in the lives of infants, toddlers and preschoolers. Austin, TX: Henry J. Kaiser Family Foundation and the Children’s Digital Media Centers.

Roblyer, M. D., & Knezek, G. A. (2003). New millennium research for educational technology: A call for a national research agenda. *Journal of Research on Technology in Education, 361*(1), 60-71.

Roper Public Affairs & Media. (2006, July). *Pbs parents poll (404941)*. Conducted for PBS and PTA. New York: Gfk NOP.

Samuelsson, I. P., & Kaga, Y. (Eds.). (2008). *The contribution of early childhood education to a sustainable society*. Paris, France: United Nations Educational, Scientific and Cultural Organization (UNESCO). Retrieved June 20, 2008, from http://unesdoc.unesco.org/images/0015/001593/159355E.pdf

Schrum, L. (2005). A proactive approach to a research agenda for educational technology. *Journal of Research on Technology in Education, 37*(3), 217-220.

Schwandt, T. (2000). Three epistemological stances for qualitative inquiry. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed., pp. 189–213). Thousand Oaks, CA: SAGE Publications, Inc.

Smith, R., Clark, T., & Blomeyer, R. L. (2005). A synthesis of new research on k–12 online learning. Naperville, IL: Naperville, IL: Learning Point Associates.

Stahl, G. (2003). Meaning and interpretation in collaboration. In B. Wasson, S. Ludvigsen & U. Hoppe (Eds.), *Designing for change in networked learning environments. International Conference on Computer Support for Collaborative Learning 2003,* (pp. 523-532). Dordrecht, the Netherlands: Kluwer Academic Publishers.

Stahl, G., Koschmann, T., & Suthers, D. (2006). Computer-supported collaborative learning: An historical perspective. In R. K. Sawyer (Ed.), *Cambridge handbook* *of the learning sciences* (pp. 409-426). Cambridge, UK: Cambridge University Press.

Stake, R. E. (2000). Case studies. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed., pp. 435-454). Thousand Oaks, CA: SAGE Publications.

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research* (2nd ed.). Thousand Oaks, CA: SAGE Publications.

Suthers, D. D. (2006). Technology affordances for intersubjective meaning making: A research agenda for cscl. *International Journal of Computer-Supported Collaborative Learning, 1*(3), 315-337. Retrieved March 322, 2008, from http://lilt.ics.hawaii.edu/lilt/papers/2006/Suthers-ijCSCL-2006.pdf.

Sweeney, M. A. (2007). The use of videoconferencing techniques which support constructivism in k-12 education. *Dissertation Abstracts International, 68*(04), DAI-A (UMI 3257352).

Takayama, S. (2007). *The musubi man: Hawaii's gingerbread man*. Honolulu, HI: Bess Press.

Taylor, P. C., & Fraser, B. (1991). *An instrument for assessing constructivist learning environments.* Paper presented at the annual meeting of the National Association for Research in Science Teaching, Fontane, WI.

The Pennsylvania State University. (2008). Deos-l. *The American Center for the Study of Distance Education (ACSDE).* Retrieved June 1, 2008, from http://www.ed.psu.edu/acsde/deos/deos-l/deosl.asp

Thorpe, R. (1998). The use of personal video conferencing with special needs pupils from three schools serving rural areas: A case of successful adoption of new technology. *Technology, Pedagogy and Education, 7*(3), 395-412.

Thurston, A. (2006). Promoting multicultural education in the primary classroom: Broadband videoconferencing facilities and digital video. *Computers & Education, 43*, 165-177.

Turbill, J. (2001). A researcher goes to school: Using technology in the kindergarten literacy curriculum. *Journal of Early Childhood Literacy, 1*(3), 255-279.

Turvey, K. (2006). Towards deeper learning through creativity within communities in primary education. *Computers & Education*, 309–321.

U.S. Department of Education. (2004). National technology education plan 2004. A new golden age in American education: How the internet, the law and today's students are revolutionizing expectations, *U.S. Department of Education, Office of Elementary and secondary Education. (2002). No Child Left Behind: A desktop reference. Retrieved October 9, 2005, from http://www. ed.gov/admins/lead/account/nclbreference/page.html*: Washington, DC: U.S. Department of Education, Office of Educational Technology.

U.S. Department of Education. (2006). Preparing tomorrow's teachers to use technology program. Retrieved June 15, 2008, from http://www.ed.gov/programs/teachtech/index.html

Van Scoter, J., & Boss, S. (2002). *Learners, language, and technology: Making connections that support literacy*. Portland, OR: Northwest Regional Educational Laboratory.

Vásquez, A. (2006). Chapter 2: Cross-national explorations of sociocultural research on learning. *Review of Research in Education, 30*(1), 33-64.

Volk, D., & De Acosta, M. (2001). 'many differing ladders, many ways to climb.' Literacy events in the bilingual classroom, homes, and community of three Puerto Rican kindergartners. *Journal Of Early Childhood Literacy, 1*(2), 193-224.

Vygotsky, L. S. (1981). The instrumental method in psychology. In J. V. Wertsch, (Ed.), *The concept of activity in Soviet psychology*. Armonk, NY: Sharpe, pp. 134-143.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. M. Cole, V. John-Steiner, S. Scribner, & E. Souberman. (Eds.) Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1986). *Thought and language: The development of higher psychological processes*. A. Kozulin (Ed.). Cambridge, MA: MIT Press.

Wartella, E., O'Keefe, B., & Scantlin, R. (2000). *Children and interactive media: A compendium of current research and directions for the future*. Menlo Park, CA: Markle Foundation.

Wartella, E. A., Lee, J. H., & Caplovitz, A. G. (2002). *Children and interactive media: Research compendium update*. Austin, TX: Markle Foundation.

Watkins, D. C., Green, B. L., Goodson, P., Guidry, J., & Stanley, C. (2007). Using focus groups to explore the stressful life events of black college men. *Journal of College Student Development, 48*(1), 105-118.

Wegerif, R., & Mercer, N. (1996). Computers and reasoning through talk in the classroom. *Language and Education, 10*(1), 47-64.

Wyeth, P. (2006, April 24-27). *Ethnography in the kindergarten: Examining children's play experiences.* Paper presented at the CHI2006, Montréal, CA.

Yelland, N. (2005). The future is now: A review of the literature on the use of computers in early childhood education (1994–2004). *AACE Journal, 13*(3), 201-232.

Yoo, S., Johnson, C. C., Rice, J., & Manuel, P. (2004). A qualitative evaluation of the students of service (sos) program for sexual abstinence in Louisiana. *The Journal of School Health, 74*(8), 329-334.

Yost, N. (2001). Lights, camera, action: Videoconferencing in kindergarten. In C. Crawford, D. A. Willis, R. Carlsen, I. Gibson, K. McFerrin, J. Price & R. Weber (Eds.), *Proceedings of society for information technology and teacher education international conference 2001* (pp. 3173-3175). Chesapeake, VA: AACE.

APPENDICES

APPENDIX A: GLOSSARY

Communicate: "To make common to many, share, impart, divide" (Simpson, 2007).

Communication: "The action of communicating or imparting" (Simpson, 2007, "communication" 1). Or, "the imparting, conveying, or exchange of ideas, knowledge, information, etc. (whether by speech, writing, or signs). Hence (often plural), the science or process of conveying information, especially by means of electronic or mechanical techniques" (Simpson, 2007, "communication" 2)

Community of Learners: A place where "shaping the learning experience becomes a shared process as adults and students work together through negotiation" (Harada et al., 2002, p. 66).

Distance education: Encompasses the definition of e-learning but also addresses the roles of the students and teacher Distance education is an organized, instructional program characterized by physical separation of the teacher and learner, utilization of technology mediums, and two-way communication (ASTD, 2008)

Distance learning: Refers to student outcomes associated with distance education. Distance learning is defined as "the acquisition of knowledge and skills through mediated information and instruction, encompassing all technologies and other forms of learning at a distance."

E-Learning: Educational content delivered by electronic means such as the Internet, local and wide area networks, audio and digital technologies, satellite broadcast, interactive TV, CD-ROMs, DVDs, and more.

Listserv: A listserv is an e-mail, subscription based service that sends information to all members who sign up for the service. Often, a supervisory role is given to the listserv's administrator to filter out inappropriate material.

Literacy: At a 2003 meeting of international experts at UNESCO, they constructed the following definition of literacy.

> Literacy is the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts. Literacy involves a continuum of learning enabling an individual to achieve his or her goals, develop his or her knowledge and potentials, and to participate fully in the community and wider society. (Literacy Assessment and Monitoring Programme [LAMP], 2004, p. 2, as cited in Nordtveit, 2005, p. 4)

Meaning making: Students learning how "to recognize and solve problems, comprehend new phenomena, construct mental models of those phenomena, and given a new situation, set goals and regulate their own learning (learn how to learn)" (Jonassen, Howland, Moore, & Marra, 2003, p. 6). Furthermore, based on that premise, the use of technology to support meaningful learning and enhance teaching instruction is viewed as a medium to "engage students in active, constructive, intentional, authentic, and cooperative learning" (p. 6).

Zone of proximal development: "The distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers." (Vygotsky, 1978, p. 86)

APPENDIX B: NAEYC POSITION STATEMENT ABOUT TECHNOLOGY AND YOUNG CHILDREN

Technology and Young Children—Ages 3 through 8

A position statement of the
National Association for the Education of Young Children

Adopted April 1996

In this position statement, we use the word technology *to refer primarily to computer technology, but this can be extended to include related technologies, such as telecommunications and multimedia, which are becoming integrated with computer technology.*

Technology plays a significant role in all aspects of American life today, and this role will only increase in the future. The potential benefits of technology for young children's learning and development are well documented (Wright & Shade 1994). As technology becomes easier to use and early childhood software proliferates, young children's use of technology becomes more widespread. Therefore, early childhood educators have a responsibility to critically examine the impact of technology on children and be prepared to use technology to benefit children.

Market researchers tracking software trends have identified that the largest software growth recently has been in new titles and companies serving the early childhood educational market. Of the people who own home computers and have young children, 70% have purchased educational software for their children to use (*SPA Consumer Market Report* 1996). While many new titles are good contributions to the field, an even larger number are not (Haugland & Shade 1994).

Early childhood educators must take responsibility to influence events that are transforming the daily lives of children and families. This statement addresses several issues related to technology's use with young children: (1) the essential role of the teacher in evaluating appropriate uses of technology; (2) the potential benefits of appropriate use of technology in early childhood programs; (3) the integration of technology into the typical learning environment; (4) equitable access to technology, including children with special needs; (5) stereotyping and violence in software; (6) the role of teachers and parents as advocates; and (7) the implications of technology for professional development.

NAEYC's position

Although now there is considerable research that points to the positive effects of technology on children's learning and development (Clements 1994), the research indicates that, in practice, computers supplement and do not replace highly valued early childhood activities and materials, such as art, blocks, sand, water, books, exploration with writing materials, and dramatic play. Research indicates that computers can be used in developmentally appropriate ways beneficial to children and also can be misused, just as any tool can (Shade & Watson 1990). Developmentally appropriate software offers opportunities for collaborative play, learning, and creation. Educators must use professional judgment in evaluating and using this learning tool appropriately, applying the same criteria they would to any other learning tool or experience. They must also weigh the costs of technology with the costs of other learning materials and program resources to arrive at an appropriate balance for their classrooms.

1. In evaluating the appropriate use of technology, NAEYC applies principles of developmentally appropriate practice (Bredekamp 1987) and appropriate curriculum and assessment (NAEYC & NAECS/SDE 1992.) In short, NAEYC believes that in any given situation, a professional judgment by the teacher is required to determine if a specific use of technology is age appropriate, individually appropriate, and culturally appropriate.

The teacher's role is critical in making certain that good decisions are made about which technology to use and in supporting children in their use of technology to ensure that potential benefits are achieved. Teachers must take time to evaluate and choose software in light of principles of development and learning and must carefully observe children using the software to identify both opportunities and problems and make appropriate adaptations. Choosing appropriate software is similar to choosing appropriate books for the classroom—teachers constantly make judgments about what is age appropriate, individually appropriate, and culturally appropriate. Teachers should look for ways to use computers to support the development and learning that occur in other parts of the classroom and the development and learning that happen with computers in complement with activities off the computer. Good teaching practices must always be the guiding goal when selecting and using new technologies.

2. Used appropriately, technology can enhance children's cognitive and social abilities.

Computers are intrinsically compelling for young children. The sounds and graphics gain children's attention. Increasingly, young children observe adults and older children working on computers, and they want to do it, too. Children get interested because they can make things happen with computers. Developmentally appropriate software engages children in creative play, mastery learning, problem solving, and conversation. The children control the pacing and the action. They can repeat a process or activity as often as they like and experiment with variations. They can collaborate in making decisions and share their discoveries and creations (Haugland & Shade 1990).

Well-designed early childhood software grows in dimension with the child, enabling her to find new challenges as she becomes more proficient. Appropriate visual and verbal prompts designed in the software expand play themes and opportunities while leaving the child in control. Vast collections of images, sounds, and information of all kinds are placed at the child's disposal. Software can be made age appropriate even for children as young as three or four.

When used appropriately, technology can support and extend traditional materials in valuable ways. Research points to the positive effects of technology in children's learning and development, both cognitive and social (Clements 1994; Haugland & Shade 1994). In addition to actually developing children's abilities, technology provides an opportunity for assessment. Observing the child at the computer offers teachers a "window" onto a child's thinking. Just as parents continue to read to children who can read themselves, parents and teachers should both participate with children in computer activities and encourage children to use computers on their own and with peers.

Research demonstrates that when working with a computer children prefer working with one or two partners over working alone (Lipinski et al. 1986; Rhee & Chavnagri 1991; Clements, Nastasi, & Swaminathan 1993). They seek help from one another and seem to prefer help from peers over help from the teacher (King & Alloway 1992; Nastasi & Clements 1993). Children engage in high levels of spoken communication and cooperation at the computer. They initiate interactions more frequently and in different ways than when engaged with traditional activities, such as puzzles or blocks. They engage in more turn taking at the computer and simultaneously show high levels of language and cooperative-play activity.

Technology extends benefits of collaboration beyond the immediate classroom environment for children in the primary grades who can already read and write. With the potential of access to the Internet or other on-line "user friendly" networks, young children can collaborate with children in other classrooms, cities, counties, states, and even countries. Through electronic field trips in real time or via diskette, children are able to share different cultural and environmental experiences. Electronic mail and telecommunications opportunities through the Internet facilitate direct communication and promote social interactions previously limited by the physical location of participating learners.

3. Appropriate technology is integrated into the regular learning environment and used as one of many options to support children's learning.

Every classroom has its own guiding philosophies, values, schedules, themes, and activities. As part of the teacher's overall classroom plan, computers should be used in ways that support these existing classroom educational directions rather than distort or replace them. Computers should be integrated into early childhood practice physically, functionally, and philosophically. Teachers can accommodate integration in at least five ways:

• Locate computers in the classroom, rather than in a separate computer lab (Davis & Shade 1994).

• Integrate technology into the daily routine of classroom activity. For example, a teacher might introduce musical rhythm with actions, recordings, and a computer used as an electronic rhythm-matching game. The children then would work in small groups with the computer program serving as one of several learning centers.

• Choose software to enrich curriculum content, other classroom activities, or concepts. For example, the program in the computer learning center might allow children to invent their own rhythms that they could simultaneously hear played back and see displayed graphically. They could edit these rhythms on the computer, hearing and seeing the changes.

• Use technology to integrate curriculum across subject-matter areas. For example, one group of children used the computer to make signs for a restaurant in their dramatic-play area (Apple Computer Inc. 1993). The rhythm program helps children connect mathematical patterns to musical patterns.

• Extend the curriculum, with technology offering new avenues and perspectives. For example, exploring shapes on the computer provides opportunities to stretch, shrink, bend, and combine shapes into new forms. Such activities enrich and extend children's activities with physical manipulatives.

4. Early childhood educators should promote equitable access to technology for all children and their families. Children with special needs should have increased access when this is helpful.

Educators using technology need to be especially sensitive to issues of equity.

A decade of research on the educational use of computers in schools reveals that computers maintain and exaggerate inequalities (Sutton 1991). Sutton found gender, race, and social-class inequalities in the educational uses of computers, which Thouvenelle, Borunda, and McDowell summarize below.

• Girls used computers in and out of school less often than did boys.

• African American students had less access to computers than did White students.

• Presence of computers in a school did not ensure access.

• Teachers, while concerned about equity, held attitudes that hindered access—they believed that better behaved students deserved more computer time and that the primary benefit of computers for low-achieving students was mastery of basic skills (i.e., drill-and-practice software).

• Richer schools bought more equipment and more expensive equipment. (1994, 153–54)

These findings identify trends that, unchecked, will almost certainly lead to increased inequity in the future. Early childhood educators must find ways to incorporate technology into their classrooms that preserve equity of access and minimize or even reverse the current trends. For example, anecdotal reports indicate that preschool-age boys and girls show equal interest in computers, but as they grow older girls begin to spend less time with computers than do boys. There are a number of ways educators can proactively work to maintain girls' interest in computers and technology: (1) consider girls' interests and interaction styles when selecting and evaluating software for classroom use; (2) model the use of the computer as a learning and productivity tool and invite children, especially girls, to observe and assist them in the work; and (3) promote equity by offering special times for "girls only" use of computers, which permits girls to explore the computer without having to directly compete with boys (Thouvenelle, Borunda, & McDowell 1994).

Considerations of equity in curriculum content require qualitative judgments. For example, research evidence indicates that children who are economically disadvantaged have less access to computers at home and at-home access is related to attitudes and competence (Martinez & Mead 1988). If schools wish to provide equity to children of low-income families, with respect to their confidence and competence concerning computer learning, these children need to be provided more in-school computer access (Sutton 1991). And that access must be meaningful, moving beyond rote drill-and-practice usage.

Preschool-age children spend time in a variety of diverse settings (e.g., homes, child care centers, family child care), which further complicates the issues of equity and access. Some of these settings have considerable access to technology while others lack the very basics. The more early childhood educators believe in the benefits of appropriate use of technology at the preschool age, the more responsibility we bear in ensuring equity and access to this important learning tool.

Efforts should be made to ensure access to appropriate technology for children with special needs, for whom assistive technologies may be essential for successful inclusion.

For children with special needs, technology has many potential benefits. Technology can be a powerful compensatory tool—it can augment sensory input or reduce distractions; it can provide support for cognitive processing or enhance memory and recall; it can serve as a personal "on-demand" tutor and as an enabling device that supports independent functioning.

The variety of assistive-technology products ranges from low-tech toys with simple switches to expansive high-tech systems capable of managing complex environments. These technologies empower young children, increasing their independence and supporting their inclusion in classes with their peers. With adapted materials, young children with disabilities no longer have to be excluded from activities. Using appropriately designed and supported computer applications, the ability to learn, move, communicate, and recreate are within the reach of all learners.

Yet, with all these enhanced capabilities, this technology requires thoughtful integration into the early childhood curriculum, or it may fall far short of its promise. Educators must match the technology to each child's unique special needs, learning styles, and individual preferences.

5. The power of technology to influence children's learning and development requires that attention be paid to eliminating stereotyping of any group and eliminating exposure to violence, especially as a problem-solving strategy.

Technology can be used to affirm children's diversity.

Early childhood educators must devote extra effort to ensure that the software in classrooms reflects and affirms children's diverse cultures, languages, and ethnic heritages. Like all educational materials, software should reflect the world children live in: It should come in multiple languages, reflect gender equity, contain people of color and of differing ages and abilities, and portray diverse families and experiences (Derman-Sparks & A.B.C. Task Force 1989; Haugland & Shade 1994).

Teachers should actively select software that promotes positive social values.

Just like movies and television today, children's software is often violent and much of it explicit and brutally graphic, as in most of the bestselling titles for the popular game machines. But, often, violence is presented in ways that are less obvious. In all of its forms, violence in software threatens young children's development and challenges early childhood educators, who must take active steps to keep it out of their classrooms (see the *NAEYC Position Statement on Violence in the Lives of Children* 1994).

Some software programs offer children the opportunity to get rid of mistakes by "blowing up" their creations—complete with sound effects—instead of simply erasing or starting over. As a metaphor for solving problems or getting rid of mistakes, "blowing up" is problematic. In the context of a computer software experience, it is more troubling than in the context of television or video. Children control the computer software, and, instead of being passive viewers of what appears on the screen, with the computer they become active decisionmakers about what takes place on the screen. Software programs that empower children to freely blow up or destroy without thought of the actual consequences of their actions can further the disconnection between personal responsibility and violent outcomes.

Identifying and eliminating software containing violence is only one of the challenges facing early childhood educators. A related, opposite challenge is discovering software programs that promote positive social actions. For example, software has the potential to offer children opportunities to develop sensitivities to children from other cultures or to children with disabilities. Much could be done to help children develop positive responses to cultural and racial diversity by offering software programs that enable children to explore the richness within their own and different cultures.

6. Teachers, in collaboration with parents, should advocate for more appropriate technology applications for all children.

The appropriate and beneficial use of technology with young children is ultimately the responsibility of the early childhood educator, working in collaboration with parents. Parents and teachers together need to make better choices as consumers. As they become educated on the appropriate uses of technology, parents and teachers are more likely to make informed decisions and to make it known to developers of technology when they are unhappy with products. Working together, parents and teachers are a large consumer group wielding greater influence on the development of technology for young children. Following are specific recommendations for early childhood professionals as they advocate for more appropriate technology applications for all children.

- Provide information to parents on the benefits and use of appropriate software.
- Advocate for computer hardware that can be upgraded easily as new technology becomes available.
- Encourage software publishers to make previewing of software easier for parents and educators.
- Advocate for a system of software review by educators.
- Promote the development of software and technology applications that routinely incorporate features that cater to the needs of learners with different abilities.
- Advocate for software that promotes positive representation of gender, cultural and linguistic diversity, and abilities. Software publishers should create a balance of programs that appeal to both boys and girls.
- Encourage software publishers to create programs that support collaboration among learners rather than competition. Fostering cooperative learning enhances the acceptance of the abilities of all learners.
- Encourage software publishers to develop programs that reflect appropriate, nonviolent ways to solve problems and correct mistakes.
- Develop formal and informal information sharing and support for teachers, parents, and appropriate organizations

and community-based programs. Encourage free community access to technology through libraries, schools, and so forth.

- Support policies on federal, state, and local levels that encourage funding that supports equity in access to technology for young children and their families.

7. The appropriate use of technology has many implications for early childhood professional development.

As early childhood educators become active participants in a technological world, they need in-depth training and ongoing support to be adequately prepared to make decisions about technology and to support its effective use in learning environments for children.

To achieve the potential benefits of technology, both preservice and inservice training must provide early childhood educators with opportunities for basic information and awareness. These efforts must address the rapid proliferation and fast-paced change within the technology arena. Opportunities that emphasize evaluating the software in relation to children's development are essential.

Institutions of higher education and other organizations and groups that provide preservice and inservice education have a responsibility to

- incorporate experiences that permit educators to reflect on the principles of early childhood education and how technology can support and extend these principles;
- give teachers concentrated time to focus on how best to use educational technology and to develop a plan for the use of educational technology in a school or early childhood program;
- provide hands-on training with appropriate software programs to assist teachers in becoming familiar and comfortable with the operation and features of hardware and software; and
- provide on-site and school-based training on effectively integrating technology into the curriculum and assessment process.

At the classroom level, teachers need staff-development experiences (Kearsley & Lynch 1992) that permit them to

- use teaching techniques that fully use the technology;
- encourage parental involvement with technology;
- match technology applications to the learning needs of individual children;
- look for cross-curriculum/cross-cultural applications;
- facilitate cooperative interactions among children; and
- use technology to improve personal efficiency.

The potentials of technology are far-reaching and ever changing. The risk is for adults to become complacent, assuming that their current knowledge or experience is adequate. "Technology is an area of the curriculum, as well as a tool for learning, in which teachers must demonstrate their own capacity for learning" (Bredekamp & Rosegrant 1994, 61). As teachers try out their new knowledge in the classroom, there should be opportunities to share experiences and insights, problems and challenges with other educators. When teachers become comfortable and confident with the new technology, they can be offered additional challenges and stimulated to reach new levels of competence in using technology.

Early childhood educators should use technology as a tool for communication and collaboration among professionals as well as a tool for teaching children.

Technology can be a powerful tool for professional development. Software can provide accessible information and tools for classroom management, planning, and creation of materials. Telecommunications and the Internet can enable teachers to obtain information and new ideas from around the world and to interact with distant experts and peers. Early childhood educators can incorporate principles of cooperative learning as they assist distant peers in acquiring new skills; share curriculum ideas, resources, and promising practices; exchange advice; and collaborate on classroom and professional development projects. Providing training and support for access to services available via on-line networks and the Internet has the potential of opening the doors to worlds of additional classroom resources. With a responsive on-line system, mentors can assist novices in becoming more technology literate and more involved in actively using technology for professional benefits. As educators become competent users of technology for personal and professional growth, they can model appropriate use for young children.

References

Apple Computer Inc. 1993. *The adventure begins: Preschool and technology*. Videocassette. (Available from NAEYC.)
Bredekamp, S., ed. 1987. *Developmentally appropriate practice in early childhood programs serving children from birth through age 8*. Exp. ed. Washington, DC: NAEYC.
Bredekamp, S., & T. Rosegrant. 1994. Learning and teaching with technology. In *Young children: Active learners in a technological*

1509 16th Street, N.W., Washington, DC 20036-1426 ● 202-232-8777 ● 800-424-2460 ● FAX: 202-328-1846

age, eds. J.L. Wright & D.D. Shade, 53–61. Washington, DC: NAEYC.
Clements, D.H. 1994. The uniqueness of the computer as a learning tool: Insights from research and practice. In *Young children: Active learners in a technological age*, eds. J.L. Wright & D.D. Shade, 31–50. Washington, DC: NAEYC.
Clements, D.H., B.K. Nastasi, & S. Swaminathan. 1993. Young children and computers: Crossroads and directions from research. *Young Children* 48 (2): 56–64.
Davis, B.C., & D.D. Shade. 1994. Integrate, don't isolate!—Computers in the early childhood curriculum. *ERIC Digest* (December). No. EDO-PS-94-17.
Derman-Sparks, L., & the A.B.C. Task Force. 1989. *Anti-bias curriculum: Tools for empowering young children*. Washington, DC: NAEYC.
Haugland, S.W., & D.D. Shade. 1990. *Developmental evaluations of software for young children: 1990 edition*. New York: Delmar.
Haugland, S.W., & D.D. Shade. 1994. Software evaluation for young children. In *Young children: Active learners in a technological age*, eds. J.L. Wright & D.D. Shade, 63–76. Washington, DC: NAEYC.
Kearsley, G., & W. Lynch. 1992. Educational leadership in the age of technology: The new skills. *Journal of Research on Computing in Education* 25 (1): 50–60.
King, J.A., & N. Alloway. 1992. Preschooler's use of microcomputers and input devices. *Journal of Educational Computing Research* 8: 451–68.
Lipinski, J.A., R.E. Nida, D.D. Shade, & J.A. Watson. 1986. The effect of microcomputers on young children: An examination of free-play choices, sex differences, and social interactions. *Journal of Educational Computing Research* 2 (2): 147–68.
Martinez, M.E., & N.A. Mead. 1988. *Computer competence: The first national assessment*. Tech report no. 17-CC-01. Princeton, NJ: National Educational Progress and Educational Testing Service.
NAEYC position statement on violence in the lives of children. 1994. Washington, DC: NAEYC.
NAEYC, & NAECS/SDE (National Association of Early Childhood Specialists in State Departments of Education). 1992. Guidelines for appropriate curriculum content and assessment in programs serving children ages 3 through 8. In *Reaching potentials: Appropriate curriculum and assessment for young children, volume 1*, eds. S. Bredekamp & T. Rosegrant, 9–27. Washington, DC: NAEYC.
Nastasi, B.K., & D.H. Clements. 1993. Motivational and social outcomes of cooperative education environments. *Journal of Computing in Childhood Education* 4 (1): 15–43.
Rhee, M.C., & N. Chavnagri. 1991. *4 year old children's peer interactions when playing with a computer*. ERIC, ED 342466.
Shade, D.D., & J.A. Watson. 1990. Computers in early education: Issues put to rest, theoretical links to sound practice, and the potential contribution of microworlds. *Journal of Educational Computing Research* 6 (4): 375–92.
SPA consumer market report. 1996. Washington, DC: Software Publishers Association (SPA).
Sutton, R.E. 1991. Equity and computers in the schools: A decade of research. *Review of Educational Research* 61 (4): 475–503.
Thouvenelle, S., M. Borunda, & C. McDowell. 1994. Replicating inequities: Are we doing it again? In *Young children: Active learners in a technological age*, eds. J.L. Wright & D.D. Shade, 151–66. Washington, DC: NAEYC.
Wright, J.L., & D.D. Shade, eds. 1994. *Young children: Active learners in a technological age*. Washington, DC: NAEYC.

Copyright © 1996. All rights reserved. National Association for the Education of Young Children, 1509 16th Street, N.W., Washington, DC 20036-1426, 202-232-8777, 800-424-2460, FAX: 202-328-1846.

APPENDIX C: TECHNOLOGY FOUNDATION STANDARDS FOR ALL STUDENTS—FORMERLY NETS FOR STUDENTS (2000)

Technology Foundation Standards for All Students

The technology foundation standards for students are divided into six broad categories. Standards within each category are to be introduced, reinforced, and mastered by students. These categories provide a framework for linking performance indicators within the Profiles for Technology Literate Students to the standards. Teachers can use these standards and profiles as guidelines for planning technology-based activities in which students achieve success in learning, communication, and life skills.
Technology Foundation Standards for Students

1. Basic operations and concepts
    - Students demonstrate a sound understanding of the nature and operation of technology systems.
    - Students are proficient in the use of technology.

Social, ethical, and human issues
- Students understand the ethical, cultural, and societal issues related to technology.
- Students practice responsible use of technology systems, information, and software.
- Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.

Technology productivity tools
- Students use technology tools to enhance learning, increase productivity, and promote creativity.
- Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.

Technology communications tools
- Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
- Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

Technology research tools

- Students use technology to locate, evaluate, and collect information from a variety of sources.
- Students use technology tools to process data and report results.
- Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.

Technology problem-solving and decision-making tools

- Students use technology resources for solving problems and making informed decisions.
- Students employ technology in the development of strategies for solving problems in the real world.

APPENDIX D: NATIONAL EDUCATIONAL TECHNOLOGY STANDARDS FOR STUDENTS: THE NEXT GENERATION

National Educational Technology Standards for Students: The Next Generation

"What students should know and be able to do to learn effectively and live productively in an increasingly digital world …"

1. Creativity and Innovation

   Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students:
   a. apply existing knowledge to generate new ideas, products, or processes.
   b. create original works as a means of personal or group expression.
   c. use models and simulations to explore complex systems and issues.
   d. identify trends and forecast possibilities.

2. Communication and Collaboration

   Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. Students:
   a. interact, collaborate, and publish with peers, experts or others employing a variety of digital environments and media.
   b. communicate information and ideas effectively to multiple audiences using a variety of media and formats.
   c. develop cultural understanding and global awareness by engaging with learners of other cultures.
   d. contribute to project teams to produce original works or solve problems.

1. Research and Information Fluency

   Students apply digital tools to gather, evaluate, and use information. Students:
   a. plan strategies to guide inquiry.
   b. locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
   c. evaluate and select information sources and digital tools based on the appropriateness to specific tasks.
   d. process data and report results.

4. Critical Thinking, Problem-Solving & Decision-Making

   Students use critical thinking skills to plan and conduct research, manage projects, solve problems and make informed decisions using appropriate digital tools and resources. Students:

a. identify and define authentic problems and significant questions for investigation.
b. plan and manage activities to develop a solution or complete a project.
c. collect and analyze data to identify solutions and/or make informed decisions.
d. use multiple processes and diverse perspectives to explore alternative solutions.

5. Digital Citizenship

Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. Students:

a. advocate and practice safe, legal, and responsible use of information and technology.
b. exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.
c. demonstrate personal responsibility for lifelong learning.
d. exhibit leadership for digital citizenship.

6. Technology Operations and Concepts

Students demonstrate a sound understanding of technology concepts, systems and operations. Students:

a. understand and use technology systems.
b. select and use applications effectively and productively.
c. troubleshoot systems and applications.
d. transfer current knowledge to learning of new technologies.

APPENDIX E: PROFILE FOR TECHNOLOGY (ICT) LITERATE STUDENTSGRADES PK–2 (AGES 4–8)

Profile

for Technology (ICT) Literate Students Grades PK–2 (Ages 4–8)

The following experiences with technology and digital resources are examples of learning activities in which students might engage during PK–Grade 2 (ages 4–8):

1. Illustrate and communicate original ideas and stories using digital tools and media-rich resources. (1, 2)
2. Identify, research, and collect data on an environmental issue using digital resources and propose a developmentally appropriate solution. (1, 3, 4)
3. Engage in learning activities with learners from multiple cultures through e-mail and other electronic means. (2, 6)
4. In a collaborative work group, use a variety of technologies to produce a digital presentation or product in a curriculum area. (1, 2, 6)
5. Find and evaluate information related to a current or historical person or event using digital resources. (3)
6. Use simulations and graphical organizers to explore and depict patterns of growth such as the life cycles of plants and animals. (1, 3, 4)
7. Demonstrate the safe and cooperative use of technology. (5)
8. Independently apply digital tools and resources to address a variety of tasks and problems. (4, 6)
9. Communicate about technology using developmentally appropriate and accurate terminology. (6)
10. Demonstrate the ability to navigate in virtual environments such as electronic books, simulation software, and Web sites. (6)

The numbers in parentheses after each item identify the standards (1–6) most closely linked to the activity described. Each activity may relate to one indicator, to multiple indicators, or to the overall standards referenced.

The categories are:

1. Creativity and Innovation
2. Communication and Collaboration
3. Research and Information Fluency
4. Critical Thinking, Problem Solving, and Decision Making
5. Digital Citizenship
6. Technology Operations and Concepts

National Educational Technology Standards for Students

Excerpted from NETS for Students Booklet

APPENDIX F: PERFORMANCE INDICATORS FOR TECHNOLOGY - LITERATE STUDENTS. GRADES PREK-2 (2000)

Profiles for Technology Literate Students

PERFORMANCE INDICATORS FOR TECHNOLOGY—LITERATE STUDENTS

GRADES PreK-2

All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 2, students will:

1. Use input devices (e.g., mouse, keyboard, remote control) and output devices (e.g., monitor, printer) to successfully operate computers, VCRs, audiotapes, and other technologies. (1)

2. Use a variety of media and technology resources for directed and independent learning activities. (1, 3)

3. Communicate about technology using developmentally appropriate and accurate terminology. (1)

4. Use developmentally appropriate multimedia resources (e.g., interactive books, educational software, elementary multimedia encyclopedias) to support learning. (1)

5. Work cooperatively and collaboratively with peers, family members, and others when using technology in the classroom. (2)

6. Demonstrate positive social and ethical behaviors when using technology. (2)

7. Practice responsible use of technology systems and software. (2)

8. Create developmentally appropriate multimedia products with support from teachers, family members, or student partners. (3)

9. Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)

10. Gather information and communicate with others using telecommunications, with support from teachers, family members, or student partners. (4)

Numbers in parentheses following each performance indicator refer to the standards category to which the performance is linked. The categories are:

1. Basic operations and concepts
2. Social, ethical, and human issues
3. Technology productivity tools
4. Technology communications tools
5. Technology research tools
6. Technology problem-solving and decision-making tools

APPENDIX G: COMPARISON OF GRADE LEVELS AND STUDENT AGES IN THE U.K., U.S., AND AUSTRALIA

	Country				
	U. K.			U.S. and Australia	
Age	Schooling level known as	Key stage	Year	Schooling or grade level known as	Year
0-4	Preschool				
4-5	Preschool	Reception	-	PreK or nursery school	PreK
5-6	Primary School	KS1	1	Elementary or Primary	Kinder-garten
6-7	Primary School	KS1	2	Elementary or Primary	1
7-8	Junior School	KS2	3	Elementary or Primary	2
8-9	Junior School	KS2	4	Elementary or Intermediate	3
9-10	Junior School	KS2	5	Elementary or Intermediate	4
10-11	Junior School	KS2	6	Elementary or Intermediate 5	5
11-12	Secondary School	KS3	7	Elementary or Middle School	6

Note: Adapted from (Australian Government, 2008) and (British Council, 2008).

APPENDIX H: PRESCHOOL THROUGH ELEMENTARY VIDEOCONFERENCING EXAMPLES ON THE BECTA WEB SITE

Case Study #	Description of Schools and Topic	English	Math	Science	History	Geography	MFL	Art & Design	Design & Tech	RE	Citizen.	Music	Other
1.	Tipton & Cockwood Primaries - Video conferencing in the early years classroom	KS1	KS1								KS1		CPD
2.	Chalvey Early Years Centre, Slough - Early Years storytelling	FC									FC		
3.	Branscombe and Farway KS1 - Collaboration between two small schools			KS1									CPD
4.	Branscombe and Farway KS2 - Collaboration between two small schools			KS2									CPD
5.	Lea Junior School, Slough - Narrative poetry writing	KS2											
6.	West Down Primary - Link with Montem Junior, Slough									KS2	KS2		
9.	East Lyme, USA - African-American history				US						US		
12.	Halfway Primary School, Llanelli - Sioux City Project	KS1-2	KS2	KS1-2							KS1-2		
24.	West Down Primary - Science lesson from Ilfracombe College			KS2									
25.	St Thomas Moore School, Blaydon, Newcastle - Distance manufacture (CAD/CAM)							KS2					
26.	Sawtry Community College - The planning and delivery of science			KS1-4									
27.	Athena EiCEAZ, Birmingham - Numeracy		KS2										
28.	Hato Paora College, Feilding, New Zealand - Theory of music and keyboard skills												
31.	Lent Rise School, Burnham, Bucks - Link with Science Museum			KS2									
32.	Davenies School, Beaconsfield - Science Museum			KS2									
33.	DeMontfort University - Science Museum			KS2									
35.	Great Ormond Street Children's Hospital School - General			KS2-3	KS2-3						KS2-3		
39.	Montgomery Combined School, Exeter - Link with NASA			KS2									

APPENDIX I: MAGPI MEMBER INSTITUTIONS

MAGPI MEMBER INSTITUTIONS

Aggregation Point Directly Connected Internet 2 Members Applications Only

May 22, 2007

Intermediate Unit 1

Arcadia University

Berks County Intermediate Unit — **Agg. Point Summary**

18 School districts
2 Career and Tech. Centers
1 Vocational Technical
1 Intermediate Unit

- Antietam School District
- Boyertown Area School District
- Brandywine Heights Area School District
- Conrad Weiser Area School District
- Daniel Boone Area School District
- Exeter Township School District
- Fleetwood Area School District\
- Governor Mifflin School District
- Hamburg Area School District
- Kutztown Area School District
- Muhlenberg School District
- Oley Valley School District
- Reading School District
- Schuylkill Valley School District
- Tulpehocken Area School District
- Twin Valley School District
- Wilson School District
- Wyomissing Area School District
- Berks Career and Technology Center (BCTC) - East
- Berks Career and Technology Center (BCTC) - West
- Reading/Muhlenberg Vocational Technical

Capital Area Intermediate Unit — **Agg. Point Summary**

30 School Districts
1 State Gov't Agency
2 Intermediate Units

- Big Spring School District
- Central Dauphin School District
- Dauphin County Technical School
- Derry Township School District
- Greenwood School District
- Halifax Area School District
- Harrisburg School District
- Lower Dauphin School District
- Millersburg Area School District
- Northern York County School District
- Shippensburg Area School District
- Steelton-Highspire School District
- Susquehanna Township School District

Susquenita School District
West Shore School District
Lincoln Intermediate Unit (25 School Districts)
Pennsylvania Department of Education

Carbon-Lehigh Intermediate Unit	Agg. Point Summary
Center for Advancing Partnerships in Education	26 School Districts
Colonial Intermediate Unit	1 Vocational-Technical
(14 School Districts)	3 Higher Education
The DaVinci Center	2 Intermediate Units
DeSales University	1 Museum
Lafayette University	1 Non-profit Ed. Org
Lehigh Carbon Communtiy College	
Lehigh Valley Hospital	
Catasauqua Area School District	
Delaware Valley School District	
East Penn School District	
Lehighton Area School District	
Northern Lehigh School District	
Northwestern Lehigh School District	
Panther Valley School District	
Parkland School District	
Salisbury Township School District	
Southern Lehigh School District	
Vocational/Technical Schools	
Weatherly Area School District	
Whitehall Coplay School District	

CERMUSA/ST. FRANCIS University	Agg. Point Summary
Admiral Peary Vo-Tech	1 Higher Education
Adelphoi Village School District	50 School Districts
Altoona Area CTC School District	1 Vocational Technical
Austin Area School District	3 Intermediate Units
Bald Eagle School District	
Bedford Area School District	
Blacklick Valley School District	
Bradford Area School District	
Bellefonte Area School District	
Bishop Carroll High School	
Bishop Guilfoyle High School	
Bishop McCort High School	
Cambria Heights School District	
Cameron County School District	
Central Cambria School District	
Central Penn IST School District	
Chestnut Ridge School District	
Conemaugh Township School District	
Conemaugh Valley School District	
Coudersport Area School District	
Curwensville Area School District	
Forest Hills School District	

Galeton Area School District
Glendale School District
Harmony School District
Johnsonburg School District
Keystone Central School District
Meyersdale School District
Moshannon Valley School District
Northern Bedford School District
Northern Cambria School District
Northern Potter School District
Oswayo Valley School District
Otto-Eldred School District
Penn Cambria School District
Penns Valley School District
Phillipsburg-Osceola School District
Port Allegany School District
Portage Area School District
Richland School District
Ridgway School District
Rockwood School District
Saint Marys Area School District
Seneca Highlands VoTech School District
Shade Central School District
Smethport Area School District
State College School District
Tussey Mountain School District
Tyrone Area School District
West Branch Area School District
Williamsburg Area School District
Appalachia Intermediate Unit
Seneca Highlands Intermediate Unit
Central Intermediate Unit

Chester County Intermediate Unit

Avon Grove School District
Coatesville Area School District
Downingtown Area School District
Great Valley School District
Kennett Consolidated School District
Octorara Area School District
Owen J. Roberts School District
Oxford Area School District
Phoenixville Area School District
Tredyffrin/Easttown School District
Unionville-Chadds Ford School District
West Chester Area School District
Ancillae Assumpta Academy
Collegium Charter School
Malvern Preparatory School
The Pathway School
Silver Springs - Martin Luther School

Agg. Point Summary

12 School Districts
7 Private Schools
2 Higher Education
18 Libraries
2 County Gov't Agencies
1 Intermediate Unit

Upland Country Day School
Villa Maria Academy
Delaware County Community College
Immaculata University
Chester County Government
Housing Authority of Chester County
Atglen Reading Center
Avon Grove Library
Bayard Taylor Library
Chester Springs Library
Chester County Library
Coatesville Library
Downingtown Library
Easttown Library
Henrietta Hankin Library
Honeybrook Community Library
Malvern Library
Oxford Library
Paoli Library
Parkesburg Free Library
Phoenixville Library
Spring City Library
Tredyffrin Library
West Chester Public Library

Children's Hospital of Philadelphia

Colonial Intermediate Unit
(via Carbon Lehigh Intermediate Unit)
Delaware Valley School District
Pocono Mountain School District
East Stroudsburg School District
Nazareth Area School District
Northampton Area School District
Pleasant Valley School District
Stroudsburg Area School District
Bethleham Area Vocational/Technical School
Career Instittue of Technology
Monroe Career and Technology School

Summary

7 School Districts
1 Intermediate Unit
1 Vocational School
2 Career and Tech Centers

The Daily Pennsylvanian

The Fox Chase Cancer Center

The Franklin Institute

The Inn at Penn

Lehigh University

Lincoln Intermediate Unit
(via Capital Area Intermediate Unit)

Summary

Central York	**25 School Districts**
Dallastown Area	**1 Intermediate Unit**
Dover Area	
Eastern York	
Hanover Public	
Northeastern	
Red Lion	
South Eastern	
South Western	
Southern York	
Spring Grove Area	
West York Area	
York City	
York County School of Technology	
York Suburban	
Bermudian Springs	
Conewago Valley	
Fairfield Area	
Gettysburg Area	
Littlestown Area	
Upper Adams	
Chambersburg Area	
Fannett-Metal	
Franklin County Career & Technology Center	
Greencastle-Antrim	
Tuscarora	
Waynesboro Area	

Montgomery County Community College	**Agg. Point Summary**
Montgomery County Intermediate Unit	**1 Higher Education**
Cheltenham School District	**9 School Districts**
Colonial School District	**1 Intermediate Unit**
Hatboro-Horsham School District	**1 Government Agency**
Lower Merion School District	
Methacton School District	
Montgomery County Courthouse	
Pottstown School District	
Springfield School District	
Spring-Ford School District	
Wissahickon School District	

National Constitution Center

NJEDGE – State Network	**Agg. Point Summary**
Atlantic Cape Community College	**1 SEGP**
Organization	
Bergen Community College	**46 Higher Ed**
Berkeley College	**4 School Districts**

Bloomfield College
Brookdale Community College
Burlington County College
Camden County College
Center
Caldwell College
Centenary College
College of Saint Elizabeth
County College of Morris
Cumberland County College
DeVry University
Drew University
Essex County College
Fairleigh Dickinson University
Georgian Court College
Gibbs College
Gloucester County College
Hudson County Community College
Kean University
Medical Missions for Children
Mercer County Community College
Middlesex County College
Monmouth University
Montclair Board of Education
Montclair State University
New Jersey City University
New Jersey Institute of Technology
New Jersey Performing Arts Center
Ocean County College
Passaic County Community College
Passaic Valley High School
Paterson Board of Education
Ramapo College of New Jersey
Raritan Valley Community College
Richard Stockton College of New Jersey
Rider University
Rosenet - Madison Public Library
Rowan University
Rutgers, The State University of New Jersey
Saint Peter's College
Salem Community College
Seton Hall University
Stevens Institute of Technology
Sussex County Community College
The College of New Jersey
Thomas Edison State College
Union County College
University of Medicine and Dentistry of New Jersey
Wayne Board of Education
Warren County College
William Paterson University

1 Library
1 Hospital
1 Non-profit org
1 Performing Arts

The Philadelphia Orchestra

Princeton University

The School District of Philadelphia

Souderton Area School District

Sheraton University City

Temple University

Thomas Jefferson University

Tuscarora Intermediate Unit	**Agg. Point Summary**
Central Fulton School District	10 School Districts
Forbes Road School District	1 Intermediate Unit
Huntingdon Area School District	
Juniata County School District	
Juniata Valley School District	
Mifflin County School District	
Mount Union School District	
Southern Fulton School District	
Southern Huntingdon County School District	
Tuscarora Blended Learning Charter School	

University of Delaware	**Agg. Point Summary**
Delaware State University	2 Higher Education
DELEARN State R&E Network	1 State Network
Delaware School for the Deaf	1 Schools

University of Pennsylvania

University of Scranton	**Summary**
(via Carbon-Lehigh Intermediate Unit)	
Wilkes University	2 Higher Education
Northeastern Educational Intermediate Unit	1 Intermediate Unit
(5 districts)	5 School Districts
North Pocono	
Western Wayne	
Wallenpaupack	
Riverside	
Valley View	

Villanova University

Widener University	**Agg. Point Summary**
Delaware County Intermediate Unit	12 School Districts
Chester-Upland School District	1 Intermediate Unit
Garnet Valley School District	1 Higher Education

Haverford School District
Interboro School District
Penn Delco School District
Radnor School District
Ridley School District
Rose Tree Media School District
Southeast Delco School District
Springfield School District
Upper Darby School District
William Penn School District

Total MAGPI Members:

PA Intermediate Units	**15**
School Districts, Charter Schools, Private Schools	**182**
Vocational-Technical Schools	**4**
Higher Education, including Community Colleges	**65**
Libraries	**19**
Hospitals, independent of universities	**4**
SEGP organizations (State Networks)	**2**
Commercial Organizations	**3**
Government Agencies	**4**
Non-Profit Educational/Cultural Organizations	**4**
	302

APPENDIX J: DISSERTATION STUDY IRB APPROVAL LETTER

DUQUESNE UNIVERSITY

INSTITUTIONAL REVIEW BOARD

424 RANGOS BUILDING ♦ PITTSBURGH, PA 15282-0202

Dr. Paul Richer
Chair, Institutional Review Board
Human Protections Administrator
Phone (412) 396-6326 Fax (412) 396-5176
e-mail: richer@duq.edu

July 26, 2007

Ms. Debra Burkey Piecka
2336 Aetna Drive
Pittsburgh PA 15241

Re: Show and tell: observations and learning in a kindergarten classroom using interactive videoconferencing (Protocol 07-74)

Dear Ms. Piecka:

Thank you for submitting your research proposal to the IRB.

Based upon the recommendation of IRB member, Dr. David Delmonico, along with my own review, I have determined that your research proposal is consistent with the requirements of the appropriate sections of the 45-Code of Federal Regulations-46, known as the federal Common Rule. The intended research poses no greater than minimal risk to human subjects. Consequently, the research is approved under 45CFR46.101 and 46.111 on an **expedited** basis under 45CFR46.110.

Enclosed are the parental permission and assent forms stamped with approval and expirations dates. You should use them as originals for signed copies that you and parents/guardians hold.

This approval must be renewed in one year as part of the IRB's continuing review. You will need to submit a progress report to the IRB in response to a questionnaire that we will send. In addition, if you are still utilizing your parental permission or assent form in one year, you will need to have them renewed. In correspondence please refer to the protocol number shown after the title above.

If, prior to the annual review, you propose any changes in your procedure or consent process, you must inform the IRB of those changes and wait for approval before implementing them. In addition, if any unanticipated problems or adverse effects on subjects are discovered before the annual review, they must be reported to the IRB Chair before proceeding with the study.

When the study is complete, please provide us with a summary, approximately one page. Often the completed study's Abstract suffices. You should retain a copy of your research records, other than those you have agreed to destroy for confidentiality, over a period of five years after the study's completion.

Thank you for contributing to Duquesne's research endeavors.

If you have any questions, feel free to contact me at any time.

Sincerely yours,

Paul Richer /mc

Paul Richer, Ph.D.

C: Dr. David Delmonico
Dr. James Schreiber
IRB Records

APPENDIX K: DISSERTATION STUDY IRB APPROVED CONSENT FORMS: PARENTAL/GUARDIAN

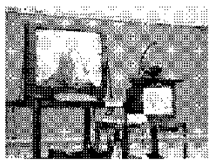
Permission for Child to Participate in a Research Study, Minor Assent Form, and Adult Consent to Participate in a Research Study

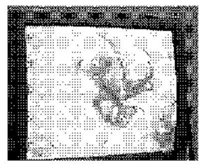
DUQUESNE UNIVERSITY

600 FORBES AVENUE ♦ PITTSBURGH, PA 15282

<<Date>>

Parental/Guardian Permission for Child to Participate in a Research Study: Show and Tell: Observations and Learning in a Kindergarten Classroom Using Interactive Videoconferencing





Dear Parents and Guardians,

<<Name of School>> is cooperating with Duquesne University in a research project and I would appreciate your child's participation. The purpose of this study is to investigate the impact of interactive videoconferencing in a kindergarten classroom. In the study, your child will participate in two interactive videoconferences with either another kindergarten classroom or a subject expert such as a weather man, zoo keeper, or marine biologist. All activities will take place at <<Name of School>> during school hours. Your child will be exposed to no risks greater than those encountered in everyday life. However, your child will benefit from interactions with educators in different parts of the country as well as multicultural events with distant kindergartners. Your child's participation will also help to contribute to a growing body of knowledge about how this technology impacts learning in young students.

Data will be collected in the form of field notes as well as videotape recordings of classroom activities that will be transcribed into text. All information collected will be kept confidential. The children will not be identifiable in any way. All videotapes, transcriptions, and field notes will be kept in a locked file cabinet in the researcher's home. All activities will take place at <<Name of School>> during school hours. The study will start <<Start Date of Study>> and end on <<End Date of Study>>. The study's procedures have been approved by the Institutional Review Board at Duquesne University. Questions may be directed to Dr. Paul Richer, Chair of the Duquesne University Institutional Review Board (412-396-6326).

Your child will be asked to sign a minor assent form indicating that they know that they will be part of a research study. The minor assent form is attached for your review. This form will be read to your child and they will be asked to affirm that they want to participate by signing their name or an "X" on the signature line.

Duquesne University
Institutional Review Board
Approval Date: July 27, 2007
Expiration Date: July 27, 2008

Please read the following statements. Indicate your permission for your child's participation by cutting off the bottom of the form. Return the bottom with the Consent to Videotape and Transcribe My Child's Classroom Activities form and return it to the school in the attached envelope.

- I understand there is no compensation for participating in this study.
- I understand that participation is voluntary.
- I understand I can withdraw at any time by informing Debra Piecka at (412) 370-555 or piecka941@duq.edu or Dr. James Schreiber at (412) 396-1081 or schreiberj@duq.edu.
- I understand that participation will NOT require my child to perform any class activities not also required of non-participants.
- I understand that I may request a summary of the results of this research at no cost to me.
- I understand that participation is confidential.
- I understand that any identifying information relating to my child and other participants in the class will be disguised in way that will not reveal their identity.
- I understand that there are no risks greater than those encountered in everyday life.
- I have read and understand the information contained in this consent form. I have had all my questions answered to my satisfaction, and I voluntarily agree to my child's participation in the study.

Yours truly,

Debra Piecka
Doctoral Student, School of Education, Instructional Technology

This research is supervised by Dr. James B. Schreiber, Associate Dean for Teacher Education, Associate Professor, Foundations and Leadership, Duquesne University, 321 Fisher Hall, Pittsburgh, PA 15282, email: schreiberj@duq.edu , phone: (412) 396-1081.

--------------✂--✂---------------------

I give permission for my child, ____, to participate in the study described above.

Child's Date of Birth (MM/DD/YYYY) ______________________________

I do not wish for my child, ____, to take part in this research project.

Parent or Guardian's Signature____

Date ________________________________

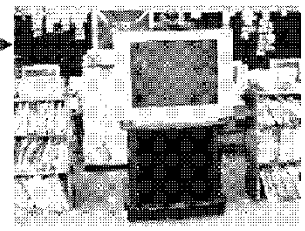
Duquesne University
Institutional Review Board
Approval Date: July 27, 2007
Expiration Date: July 27, 2008

Sample Copy - Minor Assent Form

Research Study: Interactive Videoconferencing Study at (Name of School and possibly picture of school)

Hello, (printed name of student entered here). It's nice to meet you. My name is Mrs. Piecka. I'm a student just like you. I go to school at Duquesne University in Pittsburgh, PA. My job is to learn about what happens in your class when you use the interactive videoconferencing equipment. I am going to write a story about it.

Here is a picture of the equipment.



An interactive videoconference lets your class see and talk with other people who aren't in your school. It's like telephone with a picture of the person that you are talking with.

During the next two weeks, I will be visiting your classroom. I will be taking notes and movies so that I can learn about what is happening in (NAME OF TEACHER)'s class when you use the videoconferencing set. Your (PARENT/GUARDIAN) said it OK was for me to take the notes and movies of you.

Do you have any questions? I will be writing a story about what happens in your classroom. If it's OK, I need you to let me know that it's OK for me to watch you. First, I will read the rules. If you like the rules and know what I mean, please put your name on the line. I will make a copy of this paper for you to keep.

Rules: I want to be in Mrs. Piecka's story. No one is making me. I know that I can talk with my (TEACHER) or another adult if I want to ask questions. I will let Mrs. Piecka know that I know the rules by putting my name on the line. I can also put an X on the line. I get to keep a copy of the paper.

(Signature of Minor or "X")__________________________________

Date

(Print Name of Witness) (Signature of Witness)______________________________

Date

(Signature of Researcher)__________________________________

Date

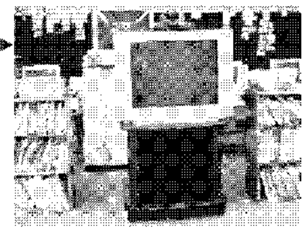
Duquesne University
Institutional Review Board
Approval Date: July 27, 2007
Expiration Date: July 27, 2008

Minor Assent Form

Research Study: Interactive Videoconferencing Study at (Name of School and possibly picture of school)

Hello, (printed name of student entered here). It's nice to meet you. My name is Mrs. Piecka. I'm a student just like you. I go to school at Duquesne University in Pittsburgh, PA. My job is to learn about what happens in your class when you use the interactive videoconferencing equipment. I am going to write a story about it.

Here is a picture of the equipment.



An interactive videoconference lets your class see and talk with other people who aren't in your school. It's like telephone with a picture of the person that you are talking with.

During the next two weeks, I will be visiting your classroom. I will be taking notes and movies so that I can learn about what is happening in (NAME OF TEACHER)'s class when you use the videoconferencing set. Your (PARENT/GUARDIAN) said it OK was for me to take the notes and movies of you.

Do you have any questions? I will be writing a story about what happens in your classroom. If it's OK, I need you to let me know that it's OK for me to watch you. First, I will read the rules. If you like the rules and know what I mean, please put your name on the line. I will make a copy of this paper for you to keep.

Rules: I want to be in Mrs. Piecka's story. No one is making me. I know that I can talk with my (TEACHER) or another adult if I want to ask questions. I will let Mrs. Piecka know that I know the rules by putting my name on the line. I can also put an X on the line. I get to keep a copy of the paper.

(Signature of Minor or "X") ______________________________

Date

(Print Name of Witness) ____ (Signature of Witness) ______________________________

Date

(Signature of Researcher) ______________________________

Date

Duquesne University
Institutional Review Board
Approval Date: July 27, 2007
Expiration Date: July 27, 2008

DUQUESNE UNIVERSITY

600 FORBES AVENUE ♦ PITTSBURGH, PA 15282

ADULT CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE:	Show and Tell: Observations and Learning in a Kindergarten Classroom Using Interactive Videoconferencing
INVESTIGATOR:	Debra C. Burkey Piecka 2336 Aetna Drive, Pittsburgh, PA 15241 (412) 833-9555 piecka941@duq.edu
ADVISOR:	Dr. James B. Schreiber Associate Dean for Teacher Education, Associate Professor, Foundations and Leadership Duquesne University 321 Fisher Hall, Pittsburgh, PA 15282 schreiberj@duq.edu (412) 396-1081
SOURCE OF SUPPORT:	This study is being performed as partial fulfillment of the requirements for the doctoral degree in Instructional Technology Duquesne University.
PURPOSE:	You are being asked to participate in a research project that seeks to investigate the impact of interactive videoconferencing in a kindergarten class including interactions and types of learning involving students, teachers, and distance participants. Classroom activities will be recorded in the form of field notes. Videotapes will help record classroom events and will be transcribed. The study will occur over two consecutive weeks. The study is not intended to add or to change the teaching experiences related to a normal day in the kindergarten classroom but will provide opportunities for two interactive videoconferences during the duration of the study. These are the only requests that will be made of you.
RISKS AND BENEFITS:	There are no risks greater than those encountered in everyday life. However, participation benefits will include interaction with educators in different parts of the country as well as multicultural events with distant kindergartners. In addition, your participation will help to contribute to a growing body of knowledge about how this technology impacts learning in young students.
COMPENSATION:	Participants will not be compensated in any way. However, participation in the project will require no monetary cost to you. An envelope is provided for return of your response to the investigator.

Duquesne University
Institutional Review Board
Approval Date: July 27, 2007
Expiration Date: July 27, 2008

CONFIDENTIALITY: Your name will never appear on any survey or research instruments. Data will be collected in the form of field notes as well as videotape recordings of classroom activities. The videotapes will be transcribed into textual documents and portions used in research presentations and reports. All transcripts will be stripped of any identification to you and other participants. Transcripts of classroom activities may be reproduced in whole or in part for use in presentations or written products that result from this study. All videotapes, transcriptions, and field notes will be kept secure in a locked file cabinet in the researcher's home. Your response(s) will only appear in statistical data summaries. After five years, all videotapes, transcribed data, and field notes will be destroyed.

RIGHT TO WITHDRAW: You are under no obligation to participate in this study. You are free to withdraw your consent to participate at any time.

SUMMARY OF RESULTS: A summary of the results of this research will be supplied to you, at no cost, upon request.

VOLUNTARY CONSENT: I have read the above statements and understand what is being requested of me. I also understand that my participation is voluntary and that I am free to withdraw my consent at any time, for any reason. On these terms, I certify that I am willing to participate in this research project.

I understand that should I have any further questions about my participation in this study, I may call Dr. Paul Richer, Chair of the Duquesne University Institutional Review Board (412-396-6326).

____
Participant's Name

Participant's Signature Date

________________________________ ________________
Researcher's Signature

Duquesne University
Institutional Review Board
Approval Date: July 27, 2007
Expiration Date: July 27, 2008

APPENDIX L: KINDERGARTEN DAILY SCHEDULE

– Kindergarten Schedule 2007-2008

	Monday	Tuesday	Wednesday	Thursday	Friday
8:00 - 8:10	Lunch count, attendance, getting ready, Morning Prayer				
8:10 - 8:50	Computer ------------------ Small Group Reading	Gym	Math/Calendar	Religion ~~Math/Calendar~~ Snack	Computer ------------------ Small Group Reading
8:50 - 9:30	Math/Calendar	Language Arts	Computer ------------------ Small Group Reading	~~Snack~~ ------------------ ~~Religion~~ GYM	DASH Science
9:30 - 10:10	Snack ------------------ Religion	Snack ------------------ Spanish	Snack ------------------ Religion	Computer ~~Gym~~ Sm. Grp Rdg.	Snack ------------------ Special Projects
10:10 - 10:40	Language Arts	Math/Calendar	Language Arts	Calendar ~~Computer~~ ------------------ Math ~~Small Group Reading~~	Math/Calendar
10:40 - 10:50	Story or songs – followed by dismissal for AM class				
10:50 - 11:00	Bathroom Break, Prepare for Lunch				
11:00 - 12:25	Lunch, Recess, Clean-up				
12:25 - 12:50	Rest Period				
12:50 - 2:00	Learning Centers	Learning Centers	Learning Centers	Learning Centers	Learning Centers
2:00 - 2:15	Story				
2:15 - 2:25	Prepare for Dismissal See you tomorrow !				

APPENDIX M: NOTES ABOUT MICROPHONE CONFIGURATIONS AND USE FOR VIDEO RECORDING

Various configurations of capturing the audio were explored during the pilot study including: dropping an omni-directional microphone from the ceiling, using a boom microphone from a peripheral part of the room that would hang over the center of the classroom, relying on the built-in microphone of the video camera recorder, and supplementing the standard microphone of the camera recorder. Costs and weight of the microphones played a part in the final configuration choice. Hanging microphones necessitated long microphone cables and the pushing of ceiling tiles to accommodate the pulling of cables from the video camera recorder. Boom microphones were heavy; therefore, the safety of the kindergartners was an important consideration. An accident with the heavy boom microphone stand could result in an injury. Therefore, before the option of using boom microphones was tested, the capabilities of the video cameras built in microphones and auxiliary microphones was explored.

The audio clarity of the built-in microphones of the cameras was good, but clearness of the audio was extremely important for transcription. In addition, some unknowns remained. Until the actual day of the videoconferences, it was difficult to anticipate the volume of the far end participants. Ancillary microphones were tested to learn whether these devices would boost audio clearness. These trials proved to be very consistent and a determination was made to use ancillary microphones on video cameras.

Backup Plans for Videotaping

To ensure that videotapes of the videoconferencing sessions were recorded, two different video cameras were positioned in the room. Thus, if one video camera malfunctioned, another backup recording would be available from the alternate camera. The researcher used a Sony personal camcorder and supplemented the taping with a JVC loaned video camera from the Instructional Technology department of the Duquesne University School of Education. The Sony camera recorded to a mini DVD while the JVC unit recorded to a 30 GB hard drive. Both cameras were tested in the kindergarten classroom prior to the actual videoconferences. This provided the researcher with an opportunity to practice the set-up and placement of the cameras as well as to learn the ins and outs of their functionality.

Microphone Considerations

The Sony camera only used a proprietary microphone. There were no jacks on the equipment to allow for hookup of a generic microphone such as an omni-directional boundary type. The Sony ECM-HGZ1 shotgun microphone attached to the interface shoe at the top of the camcorder. This shotgun microphone synchronizes the audio to the camcorder. While in telephoto mode, the microphone focuses the audio straight ahead of the camcorder so that it is isolated to the subject matter. This is called a super-cardioid pattern. In wide-angle mode, the microphone range is broadened to a wider scope directly in front of the camcorder. This is referred to as a cardioid pattern. Figure M1 depicts the range of audio capture for the Sony ECM-HGZ1 when connected to the Sony camcorder. The audio capture pattern expands to the left and the right of the camcorder with the attached microphone and moves forward. During the videotaping, the camcorder was left in the wide-angle mode to allow for maximum capture of dialogue.

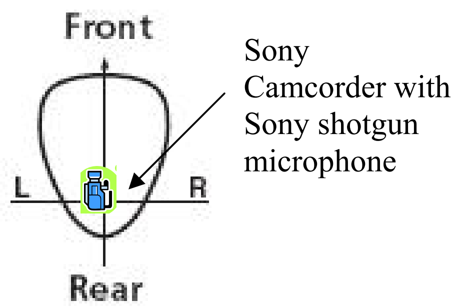


Figure M1. Directivity diagram of audio pattern (cardioid) when using the Sony ECM-HGZ1 shotgun microphone and the Sony Camcorder

The second JVC video camera permitted the connection of a nonproprietary microphone. To gain the widest audio range with this camcorder, an Optimus brand omni-directional microphone or sometimes referred to as boundary microphone was connected to the JVC camera. Figure M2 depicts the sound capture pattern for this configuration. The microphone features a long cord and weighted bottom that enabled easy placement in the center of the room to capture a circular pattern of sound.

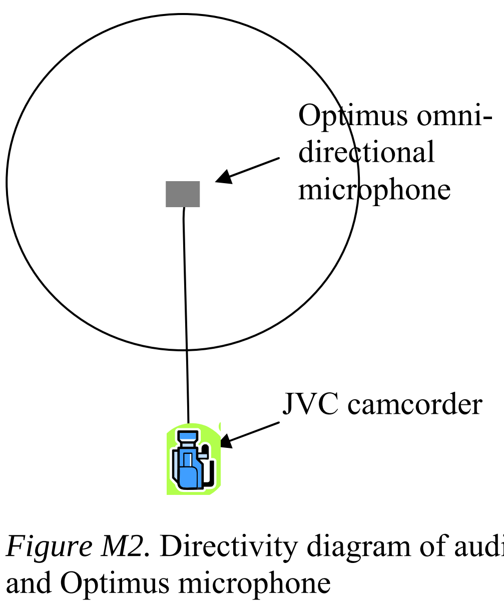


Figure M2. Directivity diagram of audio pattern (omni-directional) for JVC camcorder and Optimus microphone

APPENDIX N: EQUIPMENT LIST

Sony PCS-1

The Sony PCS-1 videoconferencing unit (Figure N1) was a compact, H.323 based system that permitted videoconferencing over the Internet or other telecommunication lines. Components included the camera, the microphone, remote control, and codec (compresses video for more efficient transmission). Attached to the Sony PCS-1 videoconferencing unit was a NEC 42 inch plasma monitor, Optimus 330-2022 boundary microphone, and cable modem. The PCS-1 sat on top of a filing cabinet in the library.

Figure N1. Sony PCS-1 videoconferencing unit

NEC Flat Panel Monitor

The NEC 42 Inch Plasma Model PX-42VM5HA (Figure N2) provided a beautiful picture when videoconferencing with the Sony PCS-1 videoconferencing unit. The unit came with a remote control and two metal feet that were anchored to a generic, black multimedia cart approximately 40 inches high. The monitor was stabilized through four long screws that protruded through the top of the cart. On the inside of the cart, the screws were fastened with wing nuts for a tight fit. The cart rolled on castors so that the monitor could be positioned in the most advantageous part of the library depending on the room layout. The cart housed the NEC monitor and Sony PCS-1 remote controls along with extra batteries and instructional manuals. Two, small Sony speakers flanked the monitor. They speakers were positioned several yards away from the monitor and apart from the microphone during videoconferences to eliminate echoes and sound disturbances.

Figure N2. NEC Monitor 42 Inch Plasma Model PX-42VM5HA

JVC Camcorder

The JVC Everio GZMG155 1MP 30GB Hard Disk Drive Camcorder with 32x Optical Zoom (Figure N3) is a lightweight, digital video recorder that records movies to the internal hard drive. The video camera used the Cyberlink Suite of software to create DVDs of the movie files. The camera featured a hinged viewing screen. The screen image depicted the actual scene being captured for the movie. This camcorder was setup in the classroom to run on battery power so that no one tripped on the power cord. This camcorder belonged to the researcher’s university and was used on loan for each videoconferencing session. An auxiliary microphone assisted in boosting the sound recording capabilities of the JVC camcorder.

Figure N3. JVC Everio GXMG155 camcorder

JVC Microphone

The Optimus 330-2022 (Figure N4) boundary microphone was used with the JVC camcorder. The microphone had an off and off switch; the unit was powered by a small flat battery. Spare batteries were kept on hand to ensure excellent sound recordings. The Optimus microphone plugged into the microphone jack of the camcorder and had a durable, rubber base. The long cord of the microphone allowed the researcher to place the microphone adjacent to the student on either a table or the floor.

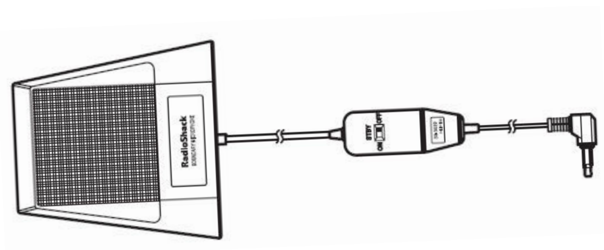


Figure N4. Optimus 330-2022 diagram

Sony Camcorder

The Sony DVD Handycam Camcorder HDR-UX7 (Figure N5) belonged to the researcher. This video camera recorded to mini-DVD disks that needed to be loaded into a compartment on the side of the camcorder. It recorded for approximately 30 minutes before another disk needed to be loaded into the unit. The camcorder also took still pictures that were stored on a memory stick. Like the JVC camcorder, the Sony unit had a hinged viewing screen that showed the actual picture that was being recorded. The camera was used on battery power so that no one tripped on the power cords. The camera had a proprietary interface for microphones. To boost the audio recording capabilities of the Sony, the researcher used a proprietary Sony gun microphone.

Figure N5. Sony Handycam Camcorder HDR-UX7

Sony Microphone

The Sony Gun Zoom Microphone ECM-HGZ1 (Figure N6) was a proprietary microphone owned by the researcher that was used to enhance the capture of the sound during the videoconferencing taping. It was used with the Sony camcorder and fit snugly on the top of the Sony HDR-UX7 in its "shoe".

Figure N6. Sony Gun Zoom Microphone ECM-HGZ1

Software

- The Cyberlink PowerProducer software (Figure N7) that accompanied the JVC Everio Camcorder was used to produce DVDs from the video files captured on this video camera. It ran on a Windows-based PC.

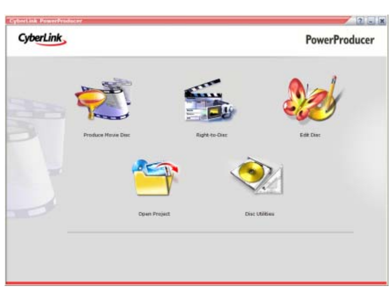


Figure N7. Cyberlink PowerProducer screenshot

- The iSofter DVD Ripper Platinum software (Figure N8) by iSofter Inc. was used to make MP3 files from the video files for further transcription services. The researcher used this software on her personal computer and it was owned prior to the start of the study.

Figure N8. iSofter DVD software screenshot

- FTP (file transfer protocol) software was used to upload the MP3 audio files to the transcription service. This software was provided through the provider's Web browser. No additional software was downloaded or purchased for this function.
- Microsoft Office Word was used for word processing. It was also used to review transcription text files.
- A student copy of the ATLAS.ti qualitative data analysis software was purchased for data analysis.

Supplies and Other Hardware

- Mini-DVDs are smaller that standard sized DVDs and allow 30 minutes of recording time. These were used in the Sony camcorder.
- Movies were backed up to recording DVDs for subsequent viewing and analysis on computers or DVD players.

- The researcher owned two 3 foot tripods. One was used to mount each video camcorder, Sony and JVC, for recording the videoconferencing session. The stationary tripod platforms provided hands-free recording once they were turned on.
- The researcher used her personal Windows-based PC for document preparation, movie viewing, and data analysis.

APPENDIX O. VIDEOCONFERENCING CALENDAR

October 2007

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
1	2	3	4 Inquiry with English University about inclusion of their astronomy IVCs in the study.	5	6	7
8	9 Email confirma-tion of interest for participation in research study from Lovand Catholic School received.	10 Lovand Catholic School selected as the sample site of participation for study.	11 First meeting with Lovand to discuss research study and drop off consent. permission. and assent forms.	12	13	14
15	16	17	18	19	20	21
22 First day of participant observation at Lovand Catholic School.	23 Set up IVC with marine laboratory for 1/30/08. Researched content programs about birds.	24	25 Booked ginger-bread and puppet VC. Mrs. Hartman received related materials via email.	26	27	28
29	30	31				

November 2007

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
			1 Mrs. Hartman confirmed interest in the astronomy videoconference. Sought lesson plan preparation ideas.	2	3	4
5	6 .	7	8	9	10	11
12	13	14	15 **VC I** Backyard bird videoconference with St. Rose Catholic School @ 10:10AM.	16	17	18
19	20	21	22 Scheduled dates for astronomy videoconferences via email.	23	24	25
26	27	28	29	30		

December 2007

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
					1	2
3	4	5	6 **VC II** Gingerbread and puppetry VC @ 9:30 AM.	7	8	9
10	11	12	13 **VC III** Birdfeeder and holiday IVC with St. Rose Catholic School @ 10:10 AM.	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

January 2008

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15 **VC IV** Astronomy I @ 9 AM.	16	17	18	19	20
21	22 Astronomy I makeup @ 9 AM. Not needed	23	24	25	26	27
28	29	30 Marine labora-tory IVC scheduled for 9 AM- 9:20 AM. Cancelled due to snow delay at school. Make-up 5/1./08.	31			

February 2008

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
				1	2	3
4	5 **VC V** Polar World VC with St. Rose @ 10:10 AM.	6	7	8	9	10
11	12 Astronomy II VC @ 9 AM. Snow day – no VC.	13	14 **VC VI** Astronomy VC II makeup @ 9 AM. Actual date due to school closure 2/14. Valentine's Day	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29 Final day of participant observation in the classroom.		

No activity in months March – April 2008.

May 2008

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
			1 Marine Laboratory IVC, 9:00 AM.	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30 Final day of school. Piecka attended year end picnic. Gave class photos to participants.	31	

APPENDIX P: VIDEOCONFERENCING CODE LIST

Gingerbread	Astronomy	Code Name	Soc. Context	Sign & Tool	Role Language	ZPD	Code Description
	X	Ast1LearningAct2	X	X	X	X	This code represents the second learning activity of the first astronomy IVC. During this learning activity, Lovand School had to estimate the size of Mercury and Jupiter in relation to the Sun using balls. Smith School had to estimate the size of Venus and Saturn in relation to the Sun. Then, each school had to present their estimations to one another over IVC. Each school had 5 minutes to ready their presentations.
	X	Astronomy		X	X	X	Astronomy is a broad code that describes concepts related to astronomy.
X		China - The Runaway Ricecake	X	X	X	X	This code reflects dialogue in the gingerbread IVC when the students were learning about China and the book The Runaway Ricecake.
X		ChineseSP	X	X	X	X	ChineseSP refers to dialogue about the history and images of Chinese shadow puppets.
X		Cinnamon		X	X	X	Code refers to the cinnamon spice ingredient in gingerbread.
	X	Coloring Book		X	X	X	This code represents Lovand's astronomy coloring book project.
X		comes to life and runs away	X	X	X	X	This code relates to a way that Miss Peterson described gingerbread boy-like stories. She stated that the character comes to life and runs away.
	X	Constellations		X	X	X	Code refers to learning about constellations. Elizabeth casually defined constellations as patterns of stars used to help us know the relationship of stars to one another or as a cluster of stars.
X	X	CulturalContext	X		X	X	This code refers to dialogue relating to the notation of cultural differences between Smith School and Lovand School.
	X	DayNight		X	X	X	DayNight is a concept that the Lovand students first learned about during their science curriculum when investigating moon phases. Later, these concepts were reinforced by Elizabeth in her discussions about day and night.
	X	Do you ever see the moon when …	X	X	X	X	Do you ever see the moon when …
	X	Earth	X	X	X	X	Earth refers to learning about the earth.
X		Egg		X	X	X	Code refers to the egg ingredient in gingerbread.
	X	England	X	X	X	X	The England code relates to the sociocultural nature of the Astronomy videoconferences. It may be used to indicate that the Lovand kindergarten classroom is receiving information

Gingerbread	Astronomy	Code Name	Soc. Context	Sign & Tool	Role Language	ZPD	Code Description
							about England such as the geographical location. It may also be used in the context of the participants' observations about how the remote classroom is different from themselves or just notes about how the English classroom is different from the Lovand classroom.
	X	English What do you see?		X	X	X	Description of the English night sky by Smith students.
	X	EnglishLAct2	X	X	X	X	Smith School's presentation of the estimation of planet sizes in relation to the Sun.
	X	EnglishSEMLAct	X	X	X	X	EnglishSEMLAct is Smith School's presentation of the Sun, Earth, and moon learning activity.
X		Flour		X	X	X	Code refers to the flour ingredient in gingerbread.
	X	Flying Saucer		X	X	X	Refers to a song the Smith children sang during the Astronomy IVC.
	X	Followup	X	X	X	X	The code followup refers to follow-up activities to the IVC.
	X	Galaxy		X	X	X	Galaxy is an astronomy concept code that refers to learning about the galaxies. Elizabeth defined a galaxy as a collection of thousands of millions of stars.
	X	Game	X	X	X	X	Dialogue surrounding learning activities in a game format.
X		Gbaby	X	X	X	X	Code refers to an example of a story featuring a gingerbread boy-like character that "comes to life and runs away" in the form of a gingerbread baby.
X		GbreadNYC	X	X	X	X	Code refers to an example of a story featuring the gingerbread boy in the cultural context of New York City.
X		GbreadSP		X	X	X	GBreadSP refers to the shadow puppet performance of The Gingerbread boy. This code included the entire script of the performance.
X		GbreadSPQ&A			X	X	This code refers to Miss Peterson's question and answer session at the end of The Gingerbread Man shadow puppet performance.
X		Ginger		X	X	X	Code refers to the ginger spice ingredient in gingerbread.
X		Gingerbread Boy	X	X	X	X	Code used for opening dialogue of the Gingerbread Boy and Puppets. Includes dialogue that asks questions about what the children already know about the tale of the gingerbread boy.
X		Gingerbread Puppets		X	X	X	Refers to dialogue surrounding the construction of gingerbread puppets.
	X	Greetings	X		X	X	Greetings is a free code used to indicate who participated in the astronomy videoconferences.
X		HandSP	X	X	X	X	HandsP refers to a passage of dialogue where

Gingerbread	Astronomy	Code Name	Soc. Context	Sign & Tool	Role Language	ZPD	Code Description
							Miss Peterson used her hands to make a shadow puppet. Then, she asked the children to make shadow puppets using their hands. They created birds and butterfly hand shadow puppets.
		Inclusion					This code is used to reinforce the inclusive planning involved in the IVC.
X		Ingredients		X	X	X	Code refers to the ingredients in gingerbread.
	X	LearningAct4-planet,constel,galaxy	X	X	X	X	This is the 4th learning activity in the first astronomy videoconference. The students needed to name a picture as a planet, group of stars or galaxy.
X		Meaning making from Gingerbread & Puppets					Free code about meaning making during the puppet videoconference.
	X	Meeting and Greeting	X	X	X	X	Code for a portion of the Astronomy I videoconference.
	X	Moon		X	X	X	Moon refers to learning about the moon
	X	Mural		X	X	X	Code for the mural project.
X		Na, na, na, I won't come back		X	X	X	In vivo code. This is the song the gingerbread sang as her ran away from people who were trying to eat him.
	X	Orbit		X	X	X	Orbit refers to learning about orbit patterns of the Sun, Earth, other planets, and the moon.
	X	Planet		X	X	X	The planet code represents learning about the planets, especially those other than Earth.
	X	Postcard		X	X	X	Refers to a type of Smith astronomy project - a postcard.
	X	Q&A	X	X	X	X	Q&A stands for question and answer. Q&A covers a few different kinds of question and answer sessions. One type of session is an open ended one where students may ask questions of the other students or astronomer. Another type of Q&A is when the astronomer asks the students in-depth questions that require them to consider their knowledge in order to answer the question. Yet another type of Q&A is a circular process between the teacher or facilitator in order to clarify answers to questions or just to serve as a way to bring out the learning of the students. All of these methods are common in classrooms.
	X	Q&AAstron_to_Lovand	X	X	X	X	Questions and answers directed to Lovand by Elizabeth and Laura about their projects.
	X	Q&AColoringBook	X	X	X	X	Questions and answers directed to Lovand about their coloring book project.
	X	Q&AMural	X	X	X	X	Questions and answers directed to Lovand about

Gingerbread	Astronomy	Code Name	Soc. Context	Sign & Tool	Role Language	ZPD	Code Description
							the mural artifact.
	X	Q&ASmithtoLovand_Projects	X	X	X	X	Questions and answers direct to Lovand by Smith students after the presentation of their artifacts.
	X	Rocket ship		X	X	X	Rocket ship is an in vivo code referring to the children's questions and answers about the Smith artifacts & project that related to rocket ships.
	X	SEMLearningAct		X	X	X	SEMLearningAct stands for the Sun, Earth, and moon learning activity where Elizabeth, the astronomer, instructed participants that she wanted the students to form a human model of their interrelated orbit.
X		Shadow Puppet	X	X	X	X	Code refers to types of shadow puppets.
X	X	SignTool		X			SignTool is a code that describes the use of signs and tools according to Vygotskian learning theory.
	X	Smith Poster Topics		X	X	X	Code refers to the many types of Smith project posters.
	X	SolarSystem		X	X	X	SolarSystem is a code that provides the definition of the solar system for the astronomy videoconferences. For this code, the astronomer's (Elizabeth's) definition of the solar system is used..."The earth, the moon, and all the planets that go around the Sun.
	X	Star		X	X	X	This code refers to astronomy concepts relating to stars.
X		START HERE and read CLOCKWISE					Free code used for directions for reading the concept map.
X		Sugar		X	X	X	Code refers to the sugar ingredient in gingerbread.
	X	TechLiteracy			X	X	TechLiteracy refers to statements demonstrating that the students are receiving information about IVC. This code may also refer to student statements that demonstrate their understanding of the capabilities of the equipment, questioning about why the IVC appears in a certain way, or just general quips that indicate their expectations about being in an IVC session.
X		That's where I am from.	X		X		In vivo code. Sophie's remark about her heritage.
X		The Musubi Man	X	X	X	X	Code refers to an example of a story featuring a gingerbread boy-like character that "comes to life and runs away." The Musubi Man is a Hawaiian representation of the gingerbread boy and is made of rice and seaweed.
	X	UKUniv	X	X	X	X	The UKUniv code refers to Laura, the university

Gingerbread	Astronomy	Code Name	Soc. Context	Sign & Tool	Role Language	ZPD	Code Description
							professor, and Elizabeth, the astronomer. They both worked for a major University in England.
	X	Us	X	X	X	X	Us is a code used to describe the local classroom as far as the student and teacher composition as well as the location and description of the kindergarten class.
	X	We are shrinking.		X	X	X	This is an in vivo code used by a student when the picture in picture feature of the videoconferencing equipment was shut off. Thus, the students at Lovand could no longer see themselves on the monitor.
	X	What do you see?		X	X	X	This refers to learning activity three that featured a time for the students to describe what they "see" when they look into the night's sky above their home. For the Lovand learners, this was also a time to display their knowledge about the moon phases.
X	X	ZPD				X	This code stands for the ZPD.

APPENDIX Q: THE RESEARCHER'S JOURNAL ENTRIES ABOUT DATA REDUCTION

Premise or background of Vygotskian theory. Blue lines are answers to my own questions. Red is summary.

Colored text is represented by different fonts in this section so that there is a discernable difference in the text. Black text remains the same. Blue text is denoted with the **Arial font**. Red text is denoted with the **Courier New font.**

> Vygotsky's theory places a child's learning before their development. While Piaget stressed development phases for children and the necessity to go through one before the next, Vygotsky placed emphasis on the fact that a child can learn whether or not they are of a specific age. Learning can precede development. Likewise, a child's learning is a result of their culture—the social context and a child's interaction with people, objects, and the environment. Vygotsky pronounced that children construct their own knowledge—first outwardly, and then inwardly.
>
> > Every function in the child's cultural development appears twice: first, between people (interpsychological) and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of ideas. All the higher functions originate as actual relationships between individuals (Vygotsky, 1978, p.57).
>
> Here, Vygotsky emphasized the importance of language in the learning process. So as children are voices their thoughts at the kindergarten level, they are sorting out abstract ideas and trying to problem solve while they trying to come to some consensus as a group. Building on one another's knowledge until they feel comfortable with it in their minds.
>
> Another key feature of Vygotsky's sociocultural theory is his concept of the ZPD—a child accomplishes/learns new things that they could not do in an isolated fashion. Instead, they are assisted in their problem-solving ability by being able to do more with the assistance of adult/teacher guidance and facilitation and the collaboration of their peers. Through this process, children become more socialized in the culture of their peers/school/world. These scaffolded opportunities induce cognitive development.
>
> Rather than looking at the multicultural, I believe in this situation of changing cultures that it is important to look at what happens when the local and remote cultures vary for a group of kindergarteners. How do the kindergartners make sense of visiting another classroom via interactive videoconferencing? Well, they observe one another and comment on things in the classroom. They want to know if they have a play center, blocks, computers and so forth. They keep asking questions until they are either stopped by a teacher or have many questions answered. They

explore and probe. They find similarities and dissimilarities. They note them and move on. They deal with the differences in culture by asking questions and finding answers to their unknowns. They don't think it is a big deal. They think it is sometimes hysterically funny. Other times, they don't like what they hear. But they deal with these diversity issues as new knowledge…they just want to learn more about it. They don't think of in terms of multicultural. Adults do. Kids just want to find out what makes you tick—basic stuff. Do you like cereal? Do you have gym? Do you work on computers? What do you play with? So rather than isolating multicultural events, they should be looked at as a change from the "normal" classroom culture, but not as a multicultural event.

Translation:

Look for sections of the dialogue that show evidence of Vygotskian theory.

Where is their evidence of children asking questions to obtain answers and build their knowledge?
Where is their evidence of children starting to internalize the answers? How is this apparent? In their dialogue, possibly their facial expressions, nodding or leaning over and explaining things to one another?
Where can we see that learning precedes development? - Children talking about migrating birds, children talking about gaseous vs. nongaseous planets, moon phases, penguins, polar bears, …

So maybe I just look for those components of the dialogue that show evidence of Vygotskian theory based on the simplified premise/background above. Right?

Other questions…
Explanation about why there were so many science videoconferences.
What types of classroom activities assisted in raising the developmental level of the children and prepare them for the videoconferences? Maybe.

Vygotsky's method

Vygotsky was an educator, a lawyer, and a psychologist. He was a psychologist last. He saw major holes in the way that Piaget and others were investigating children in a "scientific" way.

He went against the common ideas of researching children in lab environments where there was no influence of culture. In his own research, he sought classroom environments—like Erickson.

Vygotsky didn't just question learning theory, he also challenged the way in which human learning was studied and advanced. He challenged the laboratory environment or “ecological validity,” the intersection of one’s life space and their social interaction with their environment, contextual or cultural, and sampling methods used in labs.

So, here, when examining the entire method of the study, not only do we look at the methodological framework. The Vygotskian lens doesn’t just inform the literature review in terms of what studies I look at, or how learning is formed, or how the data is to be analyzed, but it also comes into how I am actually looking at the methodological framework of the study – it too comes from a Vygotskian perspective.

According to Vygotsky,
The search for method becomes one of the most important problems in the entire enterprise of understanding the unique forms of psychological activity. In this case, the method is simultaneously prerequisite and product, the tool and the results of the study (1978, p. 65).

I need to find the right words to tie in the notion that Vygotsky was greatly concerned about the method of study; therefore, it is only befitting that a study based on his learning theory should be rightly concerned with the method chosen to interpret the meaning making of the children.

Vygotsky supports purposeful sampling, natural environments, prolonged investigation (still thinking about this)

Summary, page 463, (Nasir & Hand, 2006)

> As we have seen, sociocultural theory is characterized by its focus on (1) multiple intertwined levels of analysis, (2) cultural practices as a unit of analysis, (3) the role of artifacts and tools, and (4) social others in the learning process and learning as shifts in social relationships—all concerns grounded in the early work of Vygotsky. In general, this perspective holds that culture unfolds at multiple levels of development, which appear intertwined in activity. More specifically, it considers individual engagement in activity as being shaped by sociocultural processes acting simultaneously on different planes of development, by the cultural tools and forms that individuals employ to achieve their goals, and by their interactions with each other. Learning, then, as an aspect of cultural activity, is profoundly influenced by this joint social enterprise where transformation of activity occurs within the interplay of global and local processes.

So, rather than the emphasis on multicultural, instead focus on the global and local processes and how it affected the children’s learning.

Final answers for today: Dissect data according to emphasis of Vygotskian Theory. Probably define it this way, but in better terms:
Children construct knowledge
Learning occurs in social contexts
Learning precedes development
Language is a central tool in mental development and meaning making
ZPD from
  Peers
  Teachers.

Also include a note about the parallel to Vygotsky's concern not for just theory, but the qualitative method. (April 18, 2008)

APPENDIX R: THE RESEARCHER'S JOURNAL ENTRIES ABOUT IVC EXAMPLES THAT PORTRAY VYGOTSKIAN MEANING MAKING

Examples included:

Birds:

1. Make birdfeeders. Birdfeeders remind us of birds. Put stickers on birdfeeder of birds that we talked about in class: bluebird, cardinal, goldfinch and robin.

2. 2nd bird IVC was a review of the bird facts and included presentations about the birds. So, the children had the chance to use their language skills—the importance of language as a cognitive tool—to represent their knowledge as well as to display artifacts that were a symbol of it.

3. Made coloring books of birds that remind us of the birds. These are mediating activities that let the children compare a model to copy from and think about the colors of the birds…what they ate.

4. Overheard children in classroom talking about birds. Andrew was especially good at naming all of the birds. He just seemed to have great ability to recall all of the bird names—by their complete names. Andrew was also an accelerated reader.

5. ZPD: Kindergarten is all about ZPD, the role of a more knowledgeable other advancing the level of raising the developmental level of the learner. So, to make that argument, back it up with how in Bird IVC:
   a. Learning about migration
   b. Learning what they look like
   c. Learning about what they eat
   d. Learning about how they can help put food out for them in the winter
   e. Learning to tell others about birds through presentations
   f. Making their own coloring books.

6. Pictures of Birdfeeders and coloring books.

Gingerbread Man:

1. Content provider program…building on theme of holidays.
2. Content program incorporated into December theme and also involved the reading of books common to kindergarten—The Gingerbread Man.

3. Preparation included reading folktales—children's literacy, an occurring theme in kindergarten.

4. Compared and contrasted themes within the gingerbread tales—including gingerbread, women, and boys plus gingerbread people of different cultures in the IVC…extension classroom to IVC.

5. Cultural connotation—Sophie and the notation by her classmates that she is Chinese. The folktale told in many countries. The commonality of folktales and themes around the world. The gingerbread boy—The Runaway Rice Cake, The Runaway Masubi Man from Hawaii. This also represents internalization, making part of the outside social world, part of their own.

6. Reading folk tales in class…Classics tied into literacy. The Little Red Hen. The Tortoise and the Hare. One more need to check notes.

7. Stressing similarities and differences across stories for both theme and characters. Not a Venn diagram, but reading stories. Later, the children colored their favorite one and they graphed the results. Cross curricular emphasis.

8. ZPD—Sharing from the puppetry center. Tying in the arts, literacy, even a little bit of numeracy. Definitely cultural. On and offline activities. Building of artifact—the shadow puppet that was about 15 minutes to build.

9. My role in the puppets—cutting out 25 of them! Twisty straws, immersed in the culture of the classroom.

10. Pictures of puppets.

Polar world and penguins.

1. Surprise. Not anticipated but requested from the other local teacher who we videoconferenced with in the region. Wanted to reciprocate. Therefore, instead of Mrs. Hartman sharing curriculum, other teacher shared her penguin information and the children presented on different animals in the polar world. The kids liked this unit. They made a penguin colony—a symbol of their knowledge.

2. Importance of language in being able to present to the other classroom. Improvement in the class' ability to present to others and looking forward to seeing the culture of the other classroom again.

3. Demonstrated teaching sharing of curriculum.

Astronomy

1. ZPD, ZPD. An area of universal interest—SPACE. Children excited to learn from the outset. Teaching way above their ability. Teacher loved teaching science. Is it coincidental that there are so many articles about face to face science teaching as being examples of sociocultural theory…no, I don't think so. There are probably more example of science being collaborative than any other content area, although literacy studies are on the rise.

2. Mrs. Hartman teaching about the moon as part of the Bayer science curriculum was pulled into this lesson…out of time with the curriculum, but rearranged.

3. Hands on…light bulbs, moving around the classroom and making shadows on a Styrofoam ball. Learning that the moon orbited around the planet. ZPD. Talking about their knowledge and constructing the science worksheet about the phases of the moon. Hearing vocabulary way above their level.

4. IVC with UK. Children noticing different things about one another, the way they talked and dressed. The intervening roles of the Laura and the scientist acting as facilitators of knowledge, more ZPD. Lended so well to scaffolding. Learning to present and respond to questions. Also, the ability of time being put into the program to answer questions from the children and the ability on a small scale to direct Learner to Learner questions.

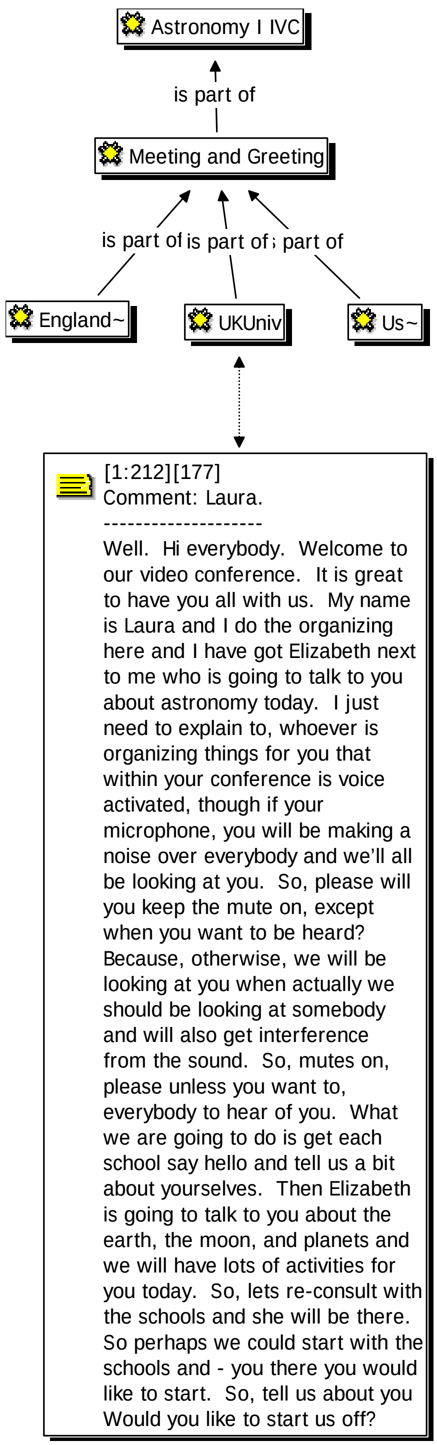
5. Spaceship as a cultural artifact.

6. Recognition of social plane of knowledge and exploratory talk. So much of it.

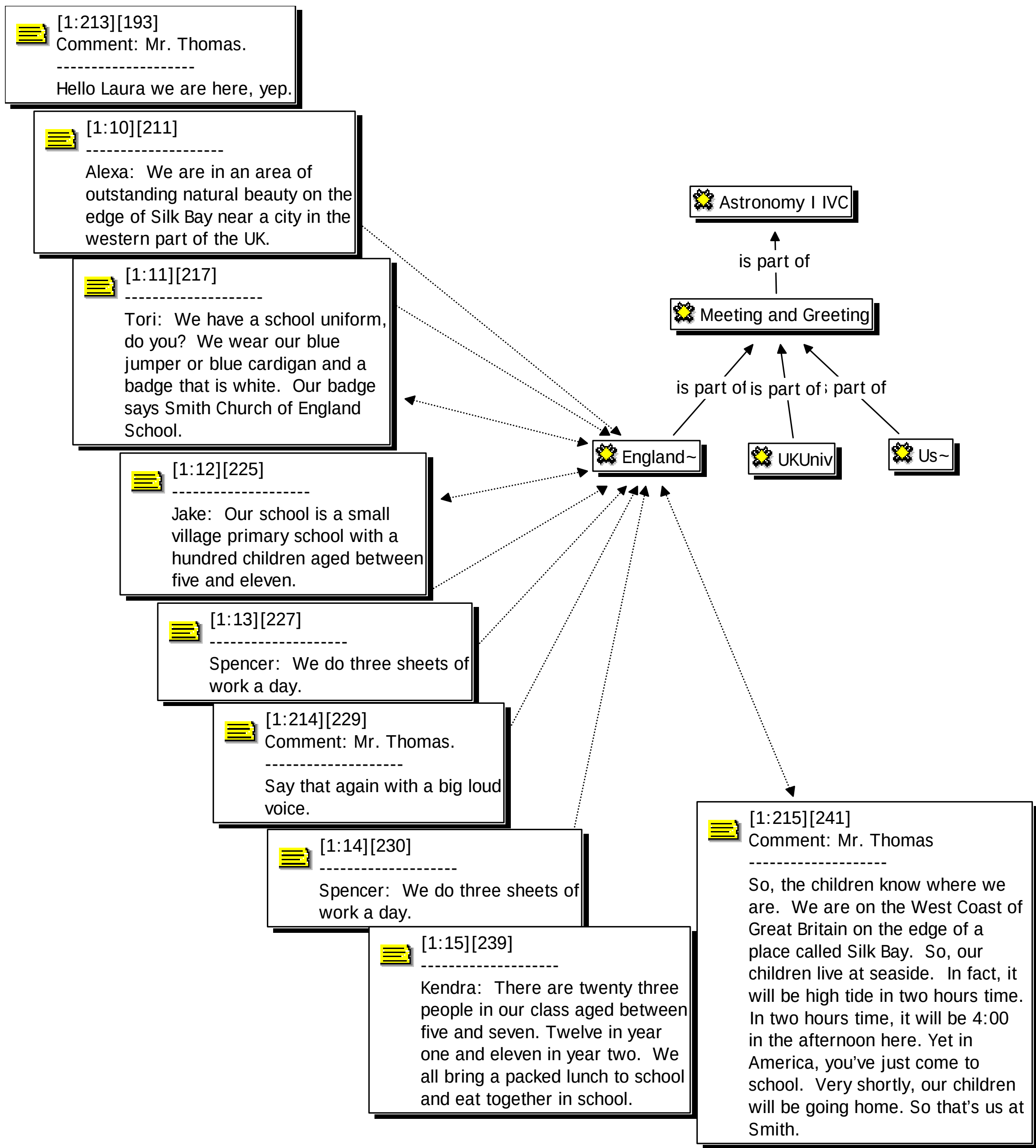
7. Cultural artifact of building projects that represented knowledge.

(July 4, 2008)

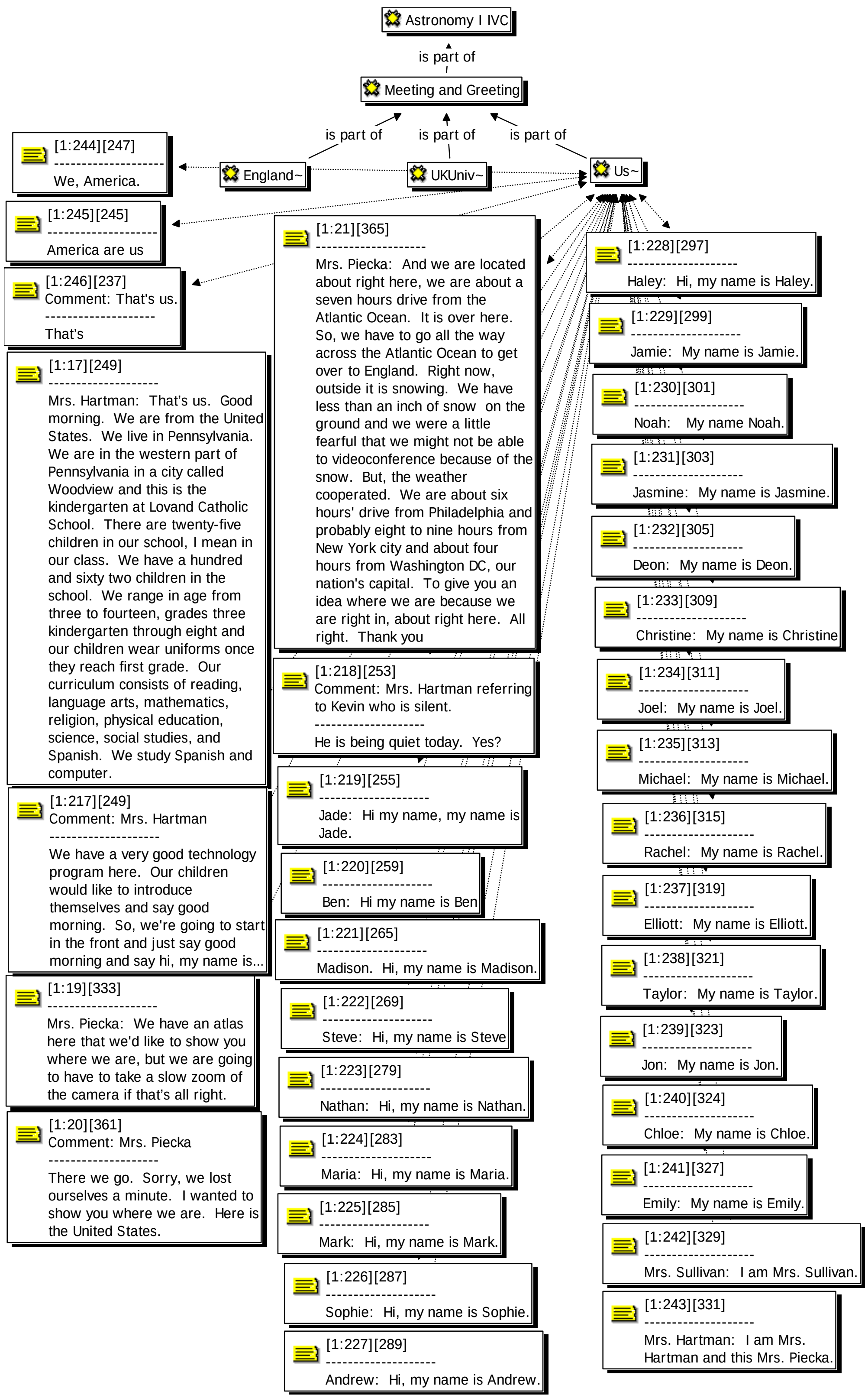
APPENDIX S: MEET AND GREET CONCEPT MAP FOR ASTRONOMY I



APPENDIX T: SMITH CHURCH OF ENGLAND'S GREETINGS



APPENDIX U: LOVAND SCHOOL'S HELLO DIALOGUE



APPENDIX V: ESTIMATING PLANET SIZED AGAINST A METER-SIZED SUN

Ast1LearningAct2~

[1:127][831]

Now this is the next little thing I want you to do so that the game, are you want to play?

[1:128][834]

Elizabeth: I am going to - I want you to imagine that we're shrinking the whole solar system then. I want you to imagine that the sun is shrinking down to be about a meter. So if we were able to take the sun and shrink it to a meter roughly in school I want you to - have an estimate as to how big you think mercury would be? And how big you think Jupiter would be? So if we could take the sun and shrink it down to a meter, how big you think Mercury - Mercury would be - and have about in a meter.

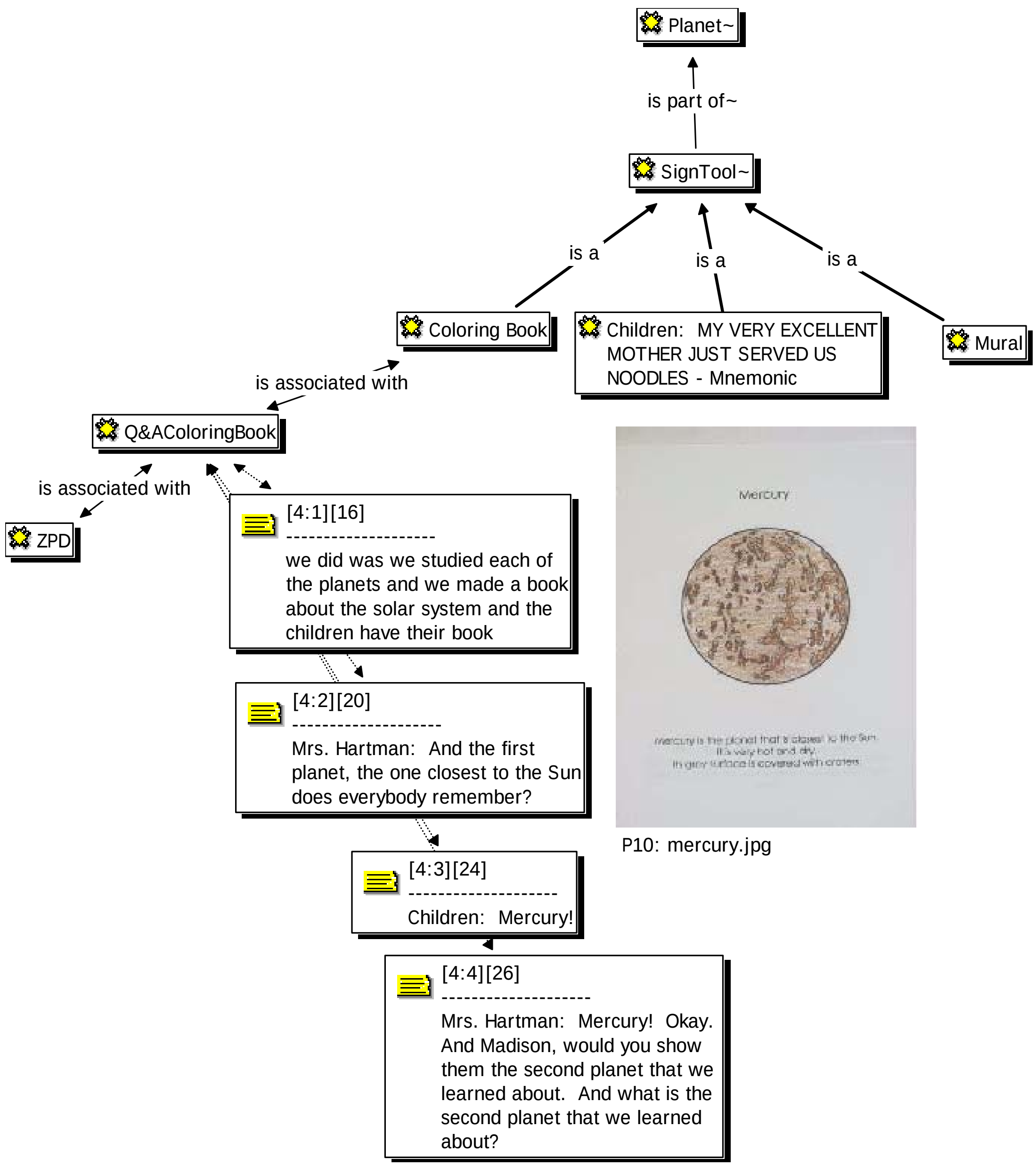
[1:130][857]

Mrs. Hartman: -is the Sun, which one - now sit down. Don't touch. If this is (child cough) the Sun, - now, do you remember when she showed us the planets? Which one was bigger - bigger? Mercury or Jupiter?

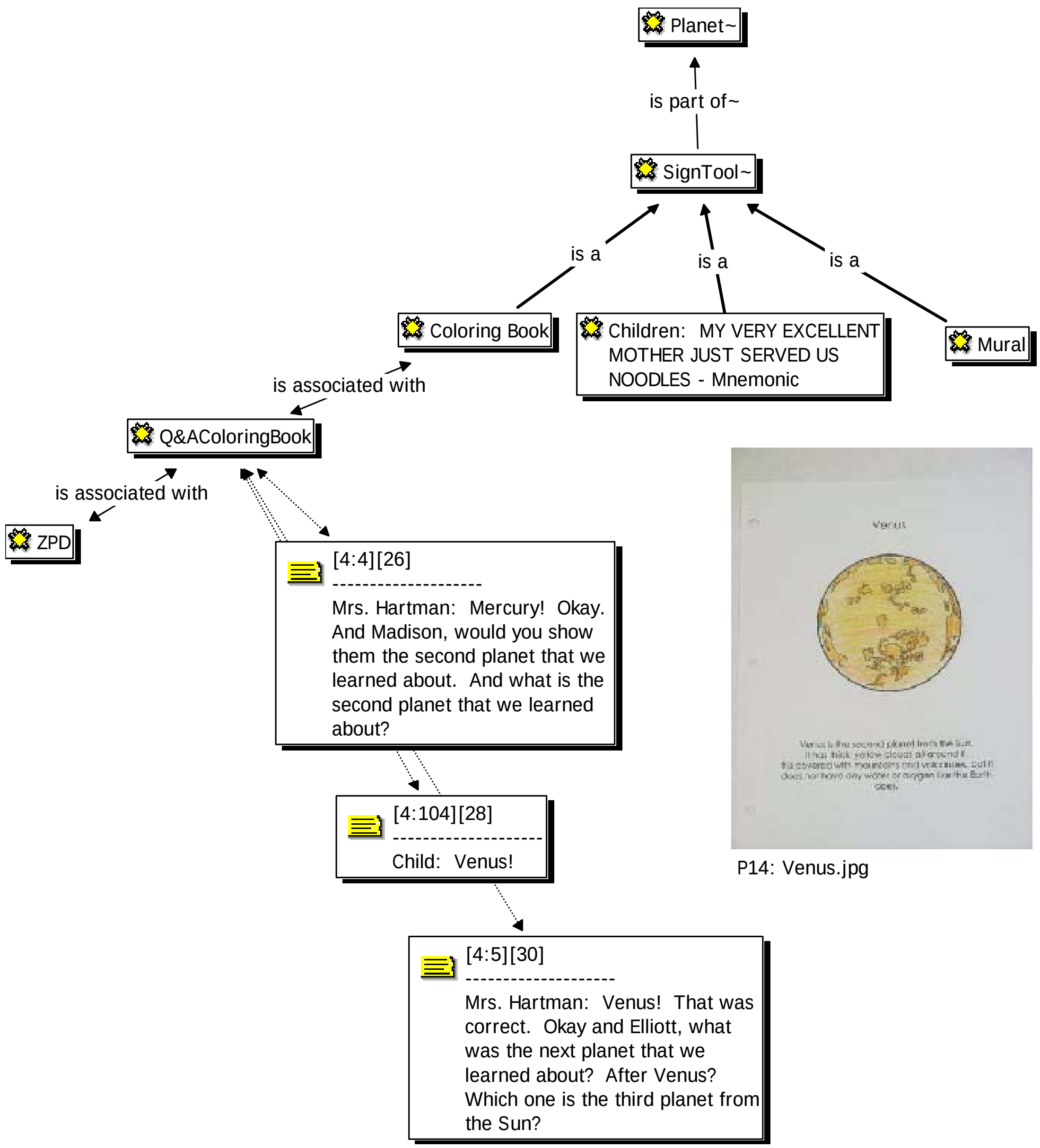
[1:131][859]

Children: Jupiter.
Mrs. Hartman: Jupiter was bigger. So - we need to have one of these balls be Mercury, one of these balls be Jupiter and that ball would be the Sun. So, which one do you think would be Mercury?
Child: The red smallest one.
Mrs. Hartman: The red one. And which one do you think would be Jupiter?
Children: The blue one. Blue.
Mrs. Hartman: Okay. Which one is bigger? Mercury or Jupiter?
Children: Jupiter.
Mrs. Hartman: Jupiter is bigger. So, the Mercury - Mercury has to be one of the smaller balls right?
Children: you don't touch it, Yellow.
Mrs. Hartman: So which one do you think-
Children: Yellow. The Yellow.
Mrs. Hartman: This one here?
Children: No.
Mrs. Hartman: This would be Mercury?
Children: No. No. No. The yellow.
Mrs. Hartman: Do you think this would be Mercury?
Children: Yes.
Mrs. Hartman: Or maybe, this one would be Mercury?
Children: That one.
Mrs. Hartman: Okay. So you want to say that this is Mercury. This is Jupiter and that is the Sun. Is that what you think?
Children: Yes.
Mrs. Hartman: Okay.
Child: Yes.

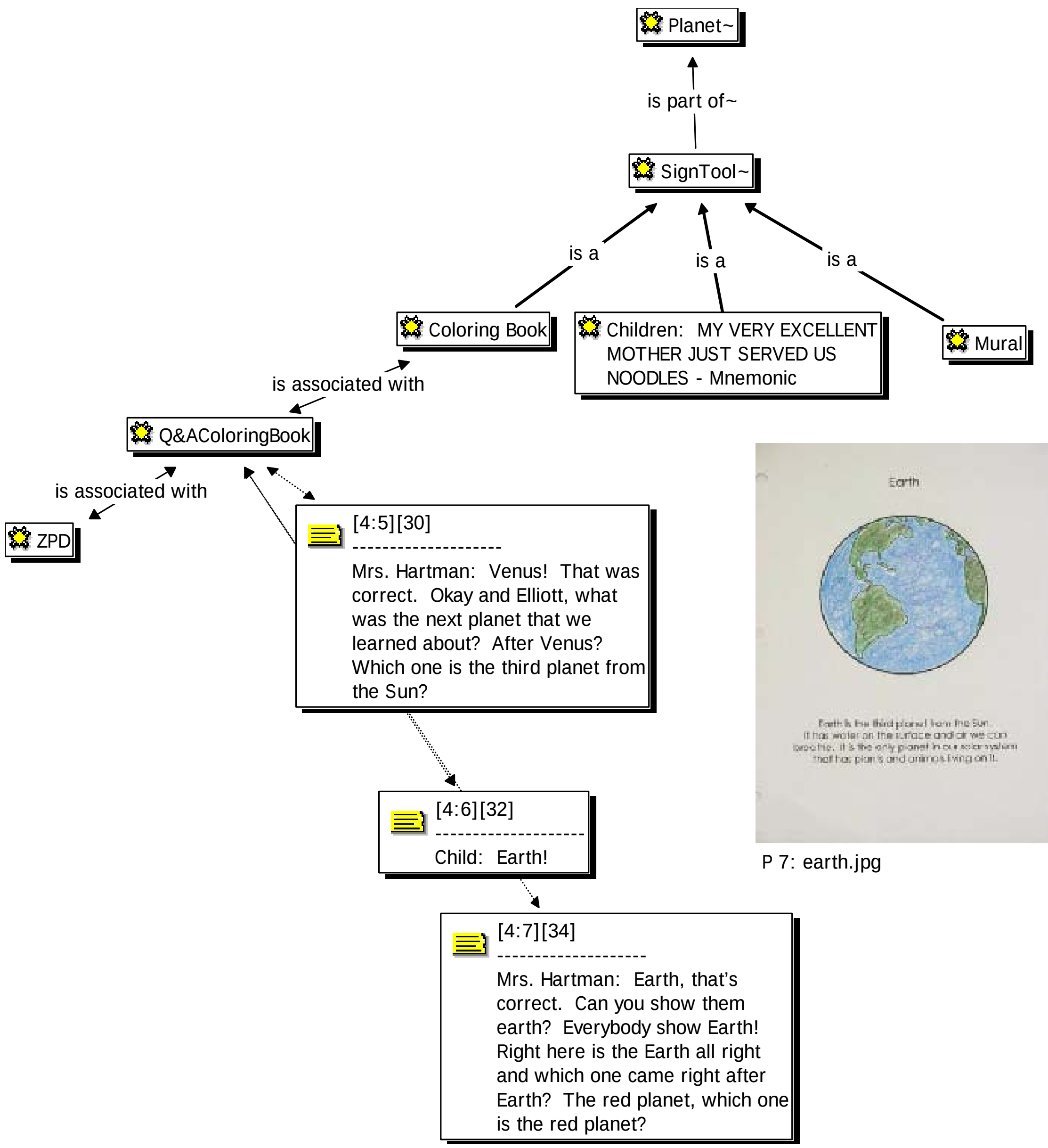
APPENDIX W: MERCURY COLORING PAGE AND DIALOGUE



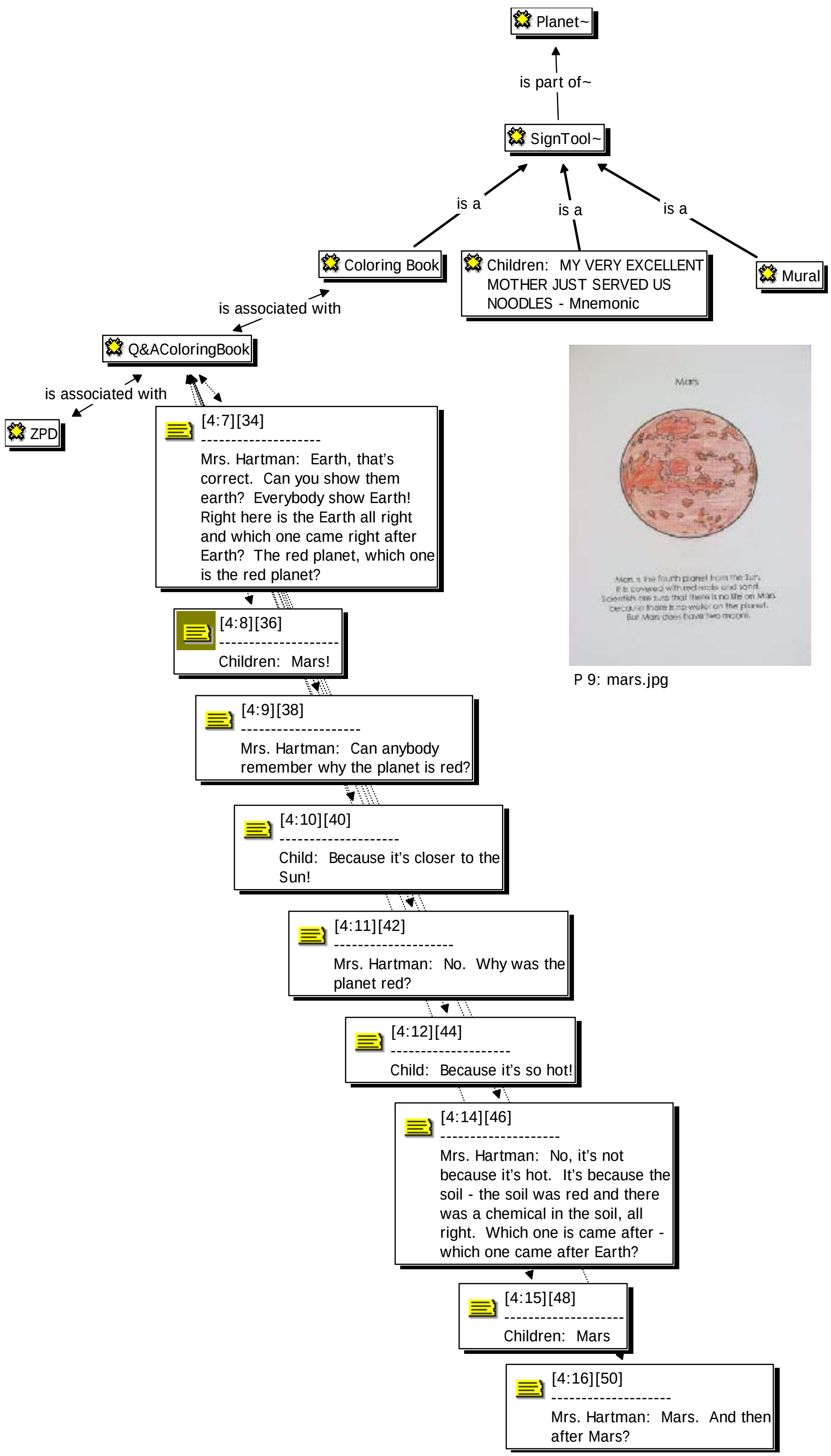
APPENDIX X: VENUS COLORING PAGE AND DIALOGUE



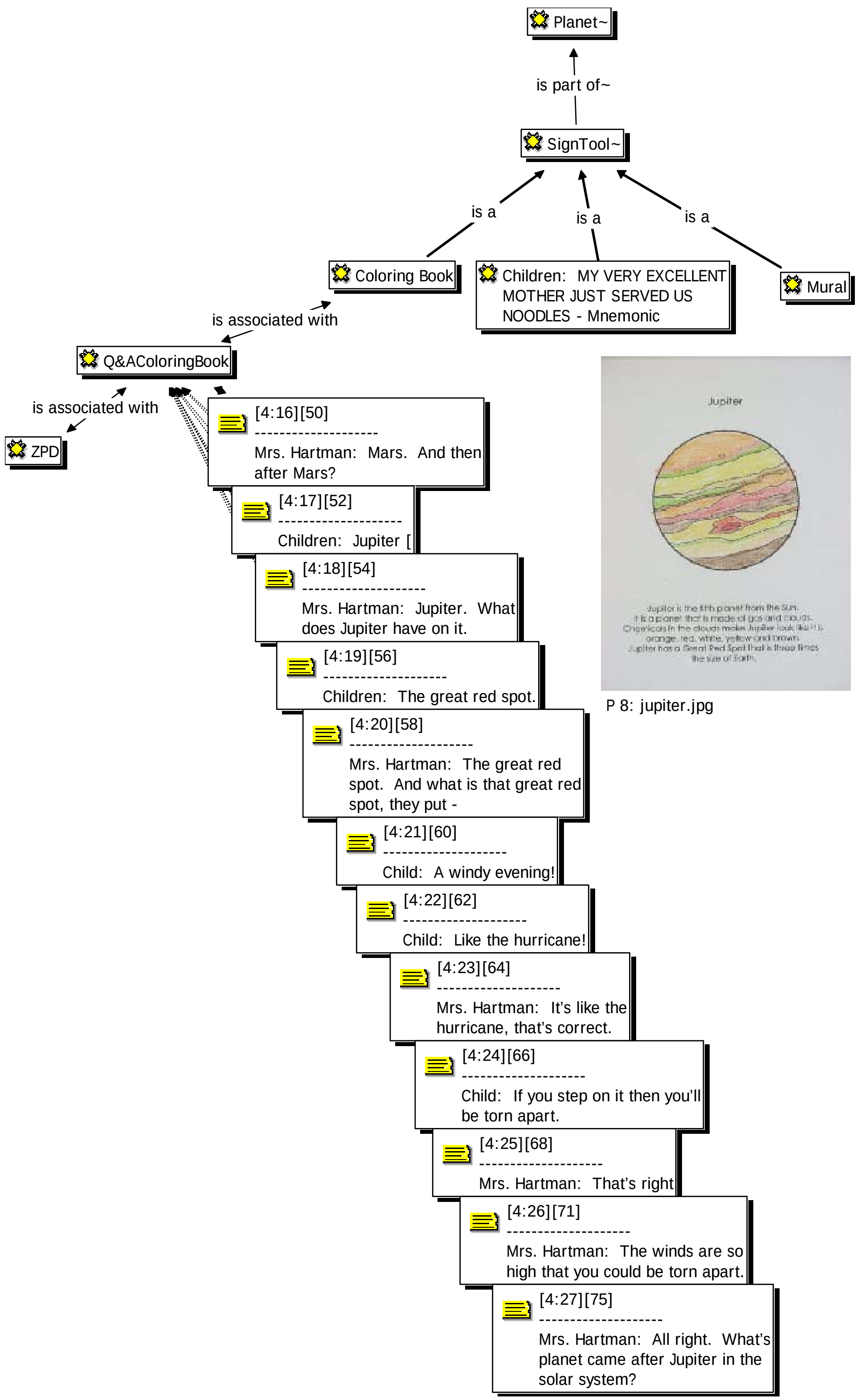
APPENDIX Y: EARTH COLORING PAGE AND DIALOGUE



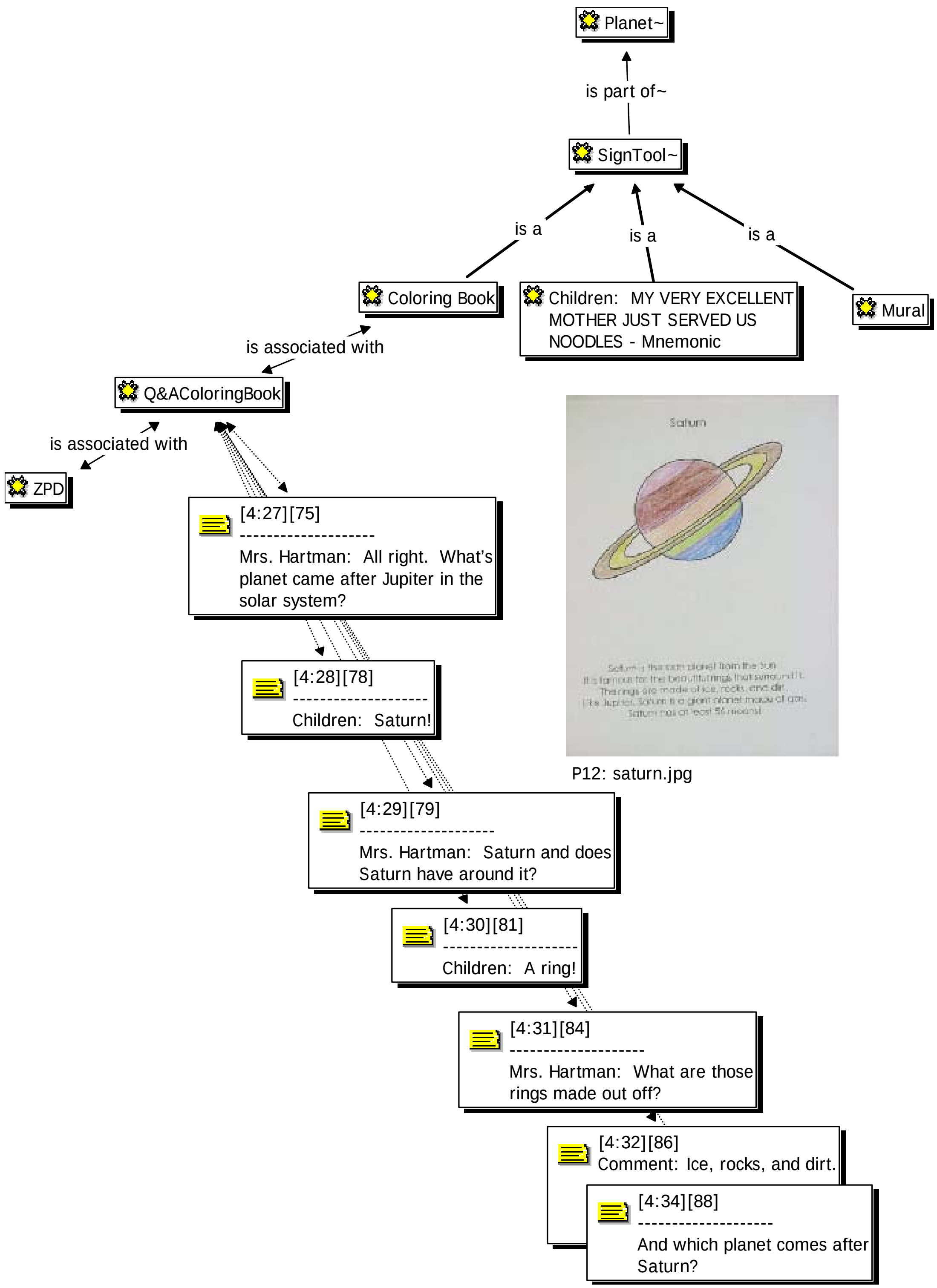
APPENDIX Z: MARS COLORING PAGE AND DIALOGUE



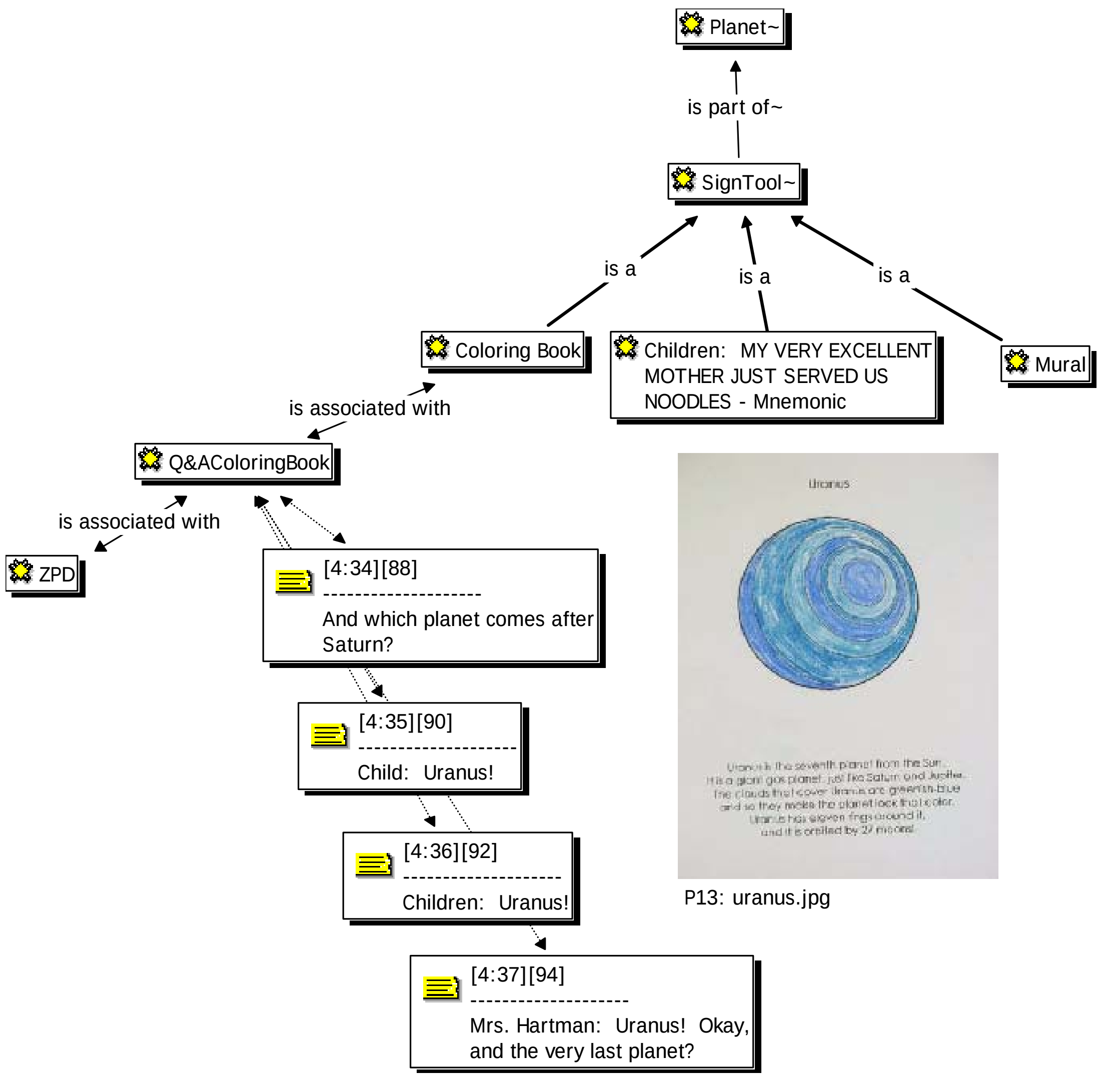
APPENDIX AA: JUPITER COLORING PAGE AND DIALOGUE



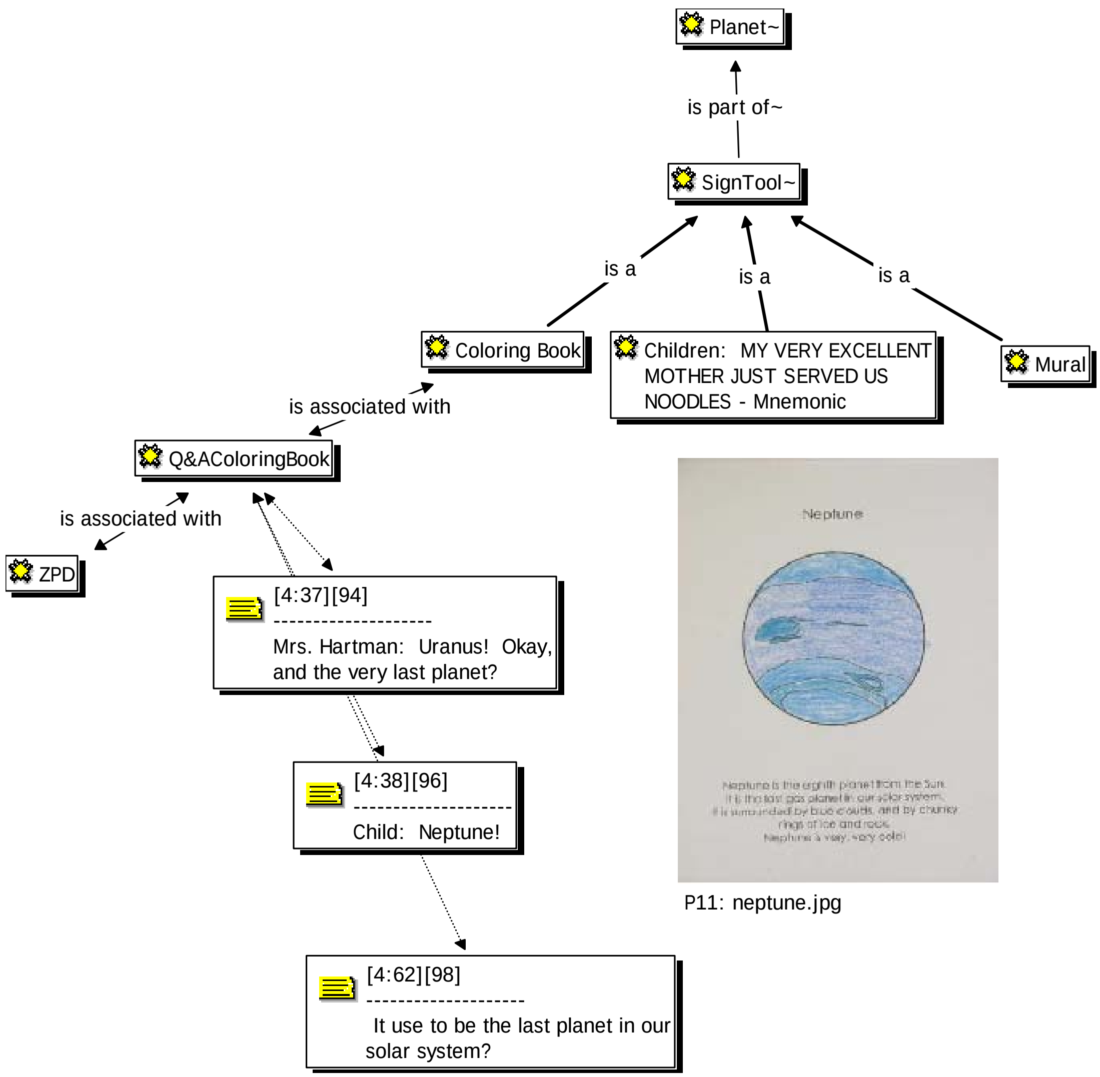
APPENDIX BB: SATURN COLORING PAGE AND DIALOGUE



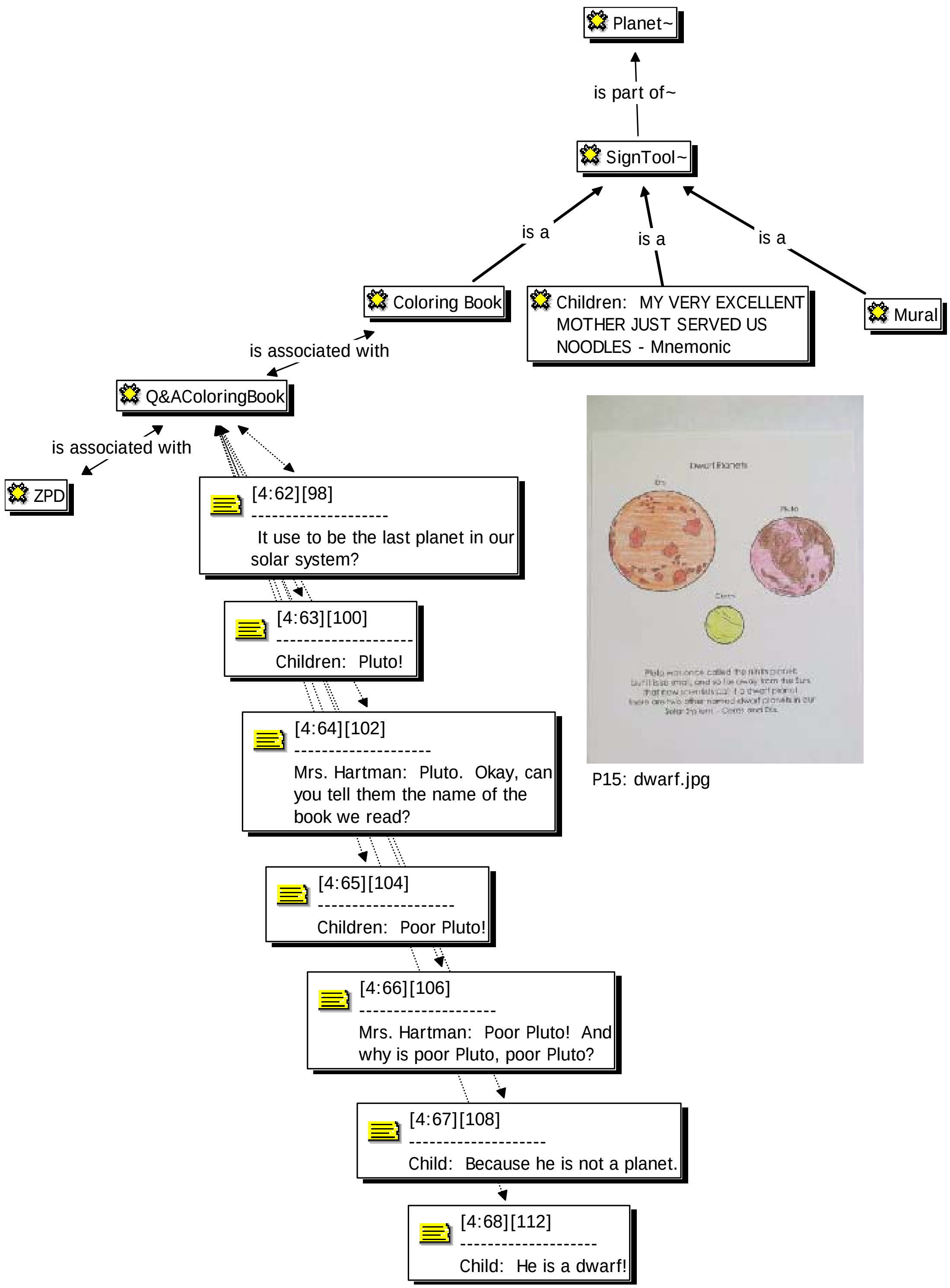
APPENDIX CC: URANUS COLORING PAGE AND DIALOGUE



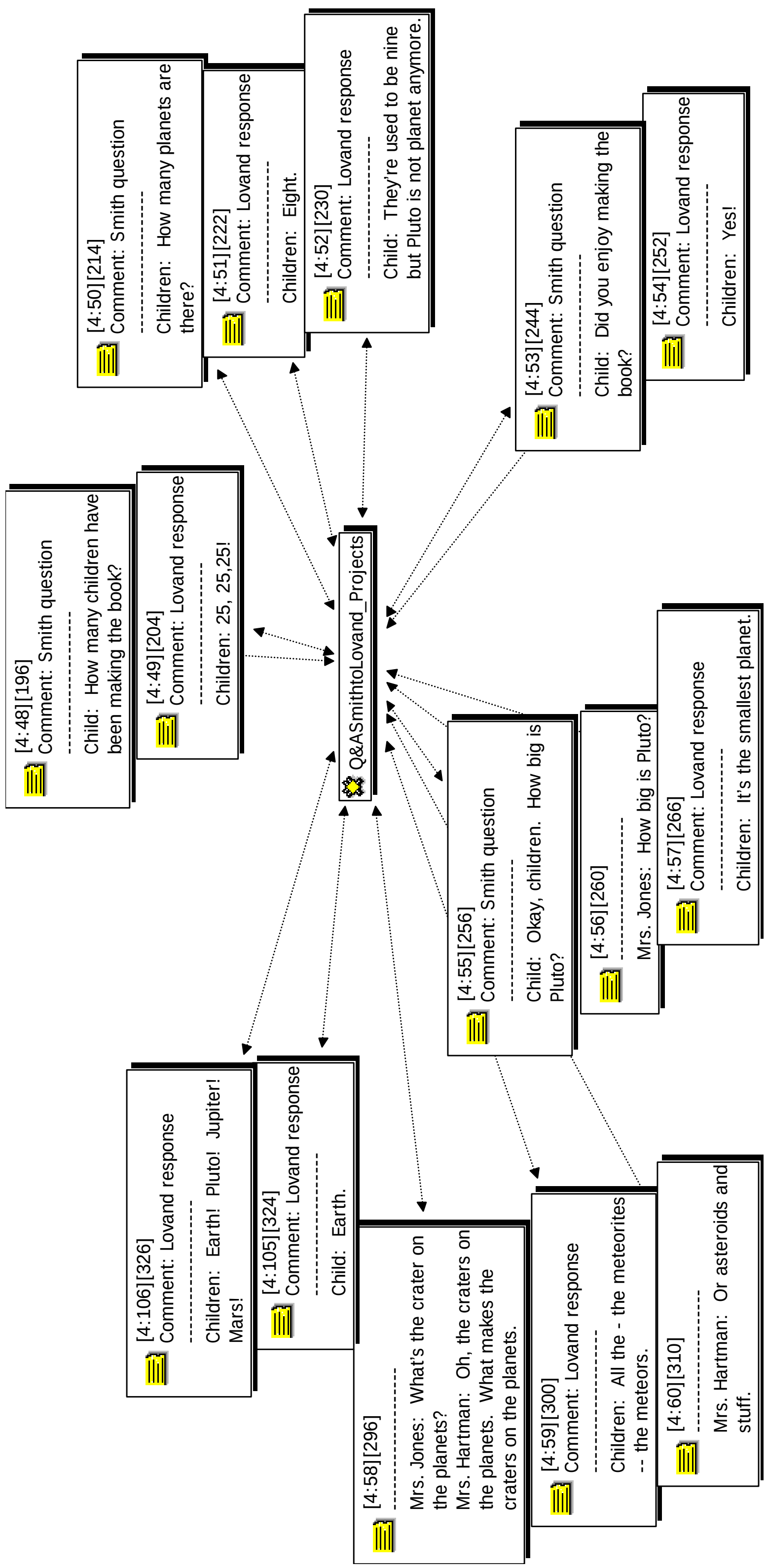
APPENDIX DD: NEPTUNE COLORING PAGE AND DIALOGUE



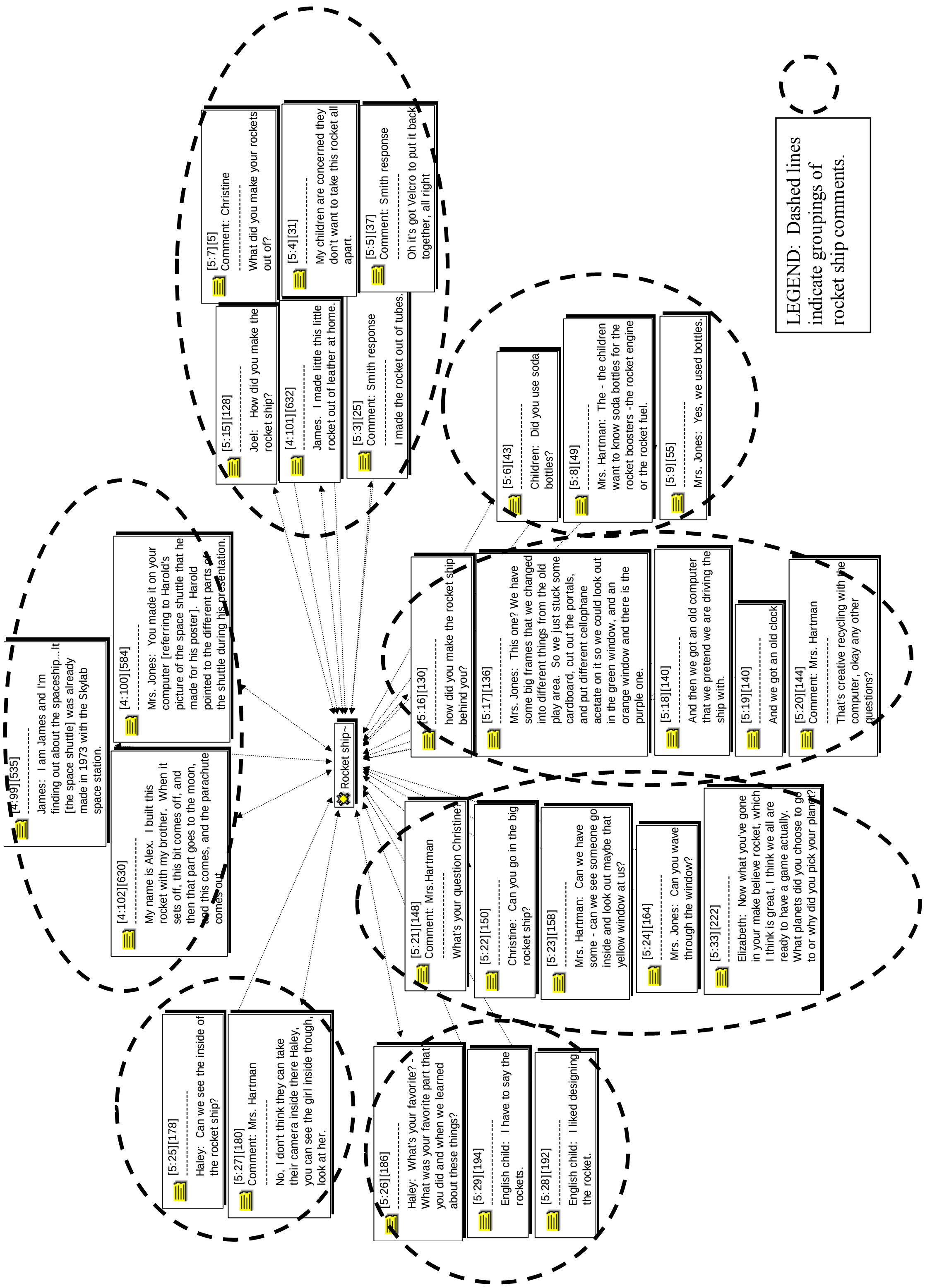
APPENDIX EE: DWARF PLANETS AND DIALOGUE



APPENDIX FF: PROJECT QUESTIONS POSED BY SMITH STUDENTS



APPENDIX GG: ROCKET SHIP DIALOGUE



APPENDIX HH. CATEGORY LIST

ATLAS.ti CODE	Results of the Interactive Videoconferences	Findings	Theory	Cumulative Theory
RQ1.1: Social Context	• The social setting for the gingerbread IVC included a remote content expert and the local classroom. Kindergartners in the gingerbread IVC o Discussed the application of puppetry and folktales to their lives. o Reviewed different cultures depicted in folktales and compared heritage of the gingerbread character. o Identified near and far locations on maps depicting the sites of the classrooms. o Exchanged information about what they wore to school, their school subjects, their classmates' ages, the classroom layouts, time, the Atlantic Ocean, and the weather. o The individual development environment was rooted within a social context that was both local and remote. • The social setting for the astronomy IVC included remote content experts, the local classroom, and a British primary level class. • For the astronomy videoconference, the meet and greet occupied a set period of time in order to build rapport amongst the participants. • Students and teachers recognized the language accent of the British students as well as their school uniform and their "wellies." • Students presented their projects well. They spoke loudly and clearly, although sometimes their teachers needed to remind them about these skills.	RQ1.1. The teachers and kindergartners formed a community of learners in a virtual learning environment with context experts, teachers, and peers over an IVC connection that afforded high levels of interaction. Students formed knowledge about the remote participants' culture as well as the content material to further their progress towards making them global learners while basing their understandings in the social context of their virtual learning environment. This outlook represented a more diverse point of view than that of just their local classroom.	Learning with interactive videoconferencing in kindergarten supports meaning making from a Vygotskian perspective based on the four tenets of the social origins of learning, mediated activity through symbol and tool use, the importance of language, and the support of the ZPD.	The four Vygotskian tenets used in this study are rarely evident in isolation when learning with interactive videoconferencing. Meaning making from a from a Vygotskian perspective involves the entwining of the origins of learning in a social context, sign and tool use in mediated activities to raise the children's psychological functioning, the importance and role of language, and assisted development of the learners as measured by the ZPD.

ATLAS.ti CODE	Results of the Interactive Videoconferences	Findings	Theory	Cumulative Theory
	• Teachers and students felt special about being the first class in the USA that the University joined for a conference.			

ATLAS.ti CODE	Results of the Interactive Videoconferences	Findings	Theory	Cumulative Theory
RQ1.2: Sign and Tool Use in Mediated Activity	• Students: experienced role of drama through puppetry; created shadow puppets using their own hands; pretended to make gingerbread by imitating the actions of the puppeteer in stirring the batter and cutting out gingerbread boys; and, created their own individual puppets. • During the astronomy videoconferences, there were many examples of activities where students used signs and tools during mediated activities in order to advance their knowledge about astronomy including: o Locating their city on a map. o Built a human model of the Sun and orbiting Earth and moon. o Observed the other school's model of the same. o Viewed pictures of the planets, stars, constellations, and galaxies while learning the terminology and differences between them. o Prepared moon phase worksheets to remind the class about why the moon looks different at night. o Used the mnemonic "My Very Excellent Mother Just Served Us Noodles" to recite the names of the planets in order from the Sun, o Built group and individual astronomy projects that they presented. These special artifacts featured: ▪ Mural showing relative planet distances from the sun. ▪ Planet coloring books. ▪ Postcards.	RQ1.2 The kindergartners and their teacher made use of signs and tools for mediated activities that led the children to higher levels of cognitive development during the interactive videoconferences.		

ATLAS.ti CODE	Results of the Interactive Videoconferences	Findings	Theory	Cumulative Theory
	▪ Songs. ▪ Sun posters. ▪ Moon posters. ▪ Space shuttle posters. ▪ Rocket posters. ▪ Space ships and rockets.			

ATLAS.ti CODE	Results of the Interactive Videoconferences	Findings	Theory	Cumulative Theory
RQ1.3. The importance and role of language.	• Students used language intensively in the gingerbread IVC to: o Hear and retell the story of the gingerbread man, o Compare and contrast folktale characters, o Discuss the cultural settings of the gingerbread boy; describe the ingredients in gingerbread, o Sing the "na, na" song, o Discuss the historical and cultural information about shadow puppets, o Answer open-ended questions about the stories, o Exclaim animal sounds, o Repeat puppet directions, o Talk amongst themselves as they constructed their gingerbread puppets, and o Count straws. • During the astronomy IVC, children voiced comments about how the videoconferencing equipment should be operated. They chastised the researcher when she accidently pushed a button and thereby changed the screen shot. They also commented about shrinking and the positioning of items on the monitor. Thus, their language demonstrated growing technological literacy. • During the astronomy videoconference, students used their language to: o Meet and greet one another, o Locate their schools on a map, o Name the correct planet, star, or	RQ1.3. The role of language was critical for the students as they made meaning of the interactive videoconferences through dialogue using their language to: demonstrate new vocabulary, ask and receive questions, compare and contrast various concepts, present and respond to others' work, critically reflect and explain their points of view, develop multicultural understanding, and reveal their technological literacy.		

ATLAS.ti CODE	Results of the Interactive Videoconferences	Findings	Theory	Cumulative Theory
	constellation, o Estimate the size of planets when compared to balls, o Play an open-ended question and answer game about astronomy objects, o Answered the question, “What do you see when you look up at the sky at 9 PM?” o Present the mural and coloring book pages in Mrs. Hartman’s room while Mr. Thomas’ room presented their student artifacts, o Recite the mnemonic “My Very Excellent Mother Just Served Us Noodles” to recite the names of the planets in order from the Sun, o Answer questions about the student-created projects, o Identify astronomy objects in the forfeit game, o Inquire about the play space ship that was built in Mr. Thomas’ room, o Respond to the forfeits in the game, o Sing songs, o Countdown by 10s from 100 and yell, “BLAST OFF!”			

ATLAS.ti CODE	Results of the Interactive Videoconferences	Findings	Theory	Cumulative Theory
RQ1.4. ZPD	Students during the gingerbread IVC: o Construct meaning from shadow puppet performance, o Understand context of performance in relation to their class work—make connections between puppetry and folktales, o Identify folktales that have characters who “come alive and run away,” o Recognize cultural differences in places such as China, Hawaii, and New York City, o Name ingredients found in gingerbread, o Understand the history of shadow puppets, o Partake in the retelling of *The Gingerbread Man,* and o Create and individual gingerbread puppet. Students: o Answer open-ended questions about the solar system in a game format, o Identify land, water, and cloud parts of the Earth, o Prepare astronomy research projects in small groups or as a class and present them to the remote site, o Demonstrate an understanding of the IVC equipment through their ability to stand up and talk into the microphone, speak slowly, hold up their projects for the camera to see, and wait for the camera to zoom, o Identify the 8 planets of the solar system using a mnemonic, o State facts about the 8 planets, o Reflect about their favorite planet, o Understand the terms: star, galaxy, solar	RQ.1.4 During the interactive videoconferences, students were able to complete more difficult problems or tasks with the assistance of content experts, teachers, and knowledgeable peers than if they were unassisted. These developmental gains show evidence of critical thinking, reflection, internalization, creativity, and language use by the students in the process of making meaning of their virtual learning experience. Furthermore, using the framework of the ZPD is useful in reviewing the developmental progress and meaning making of kindergartners while learning with interactive		

ATLAS.ti CODE	Results of the Interactive Videoconferences	Findings	Theory	Cumulative Theory
	system, planet, moon, constellation, and orbit, o Differentiate between a star, constellations, and galaxies, o Explain that the sun makes a shadow on the moon and that the moon has different phases, o Name some gaseous versus nongaseous planets, o Pretend to orbit as the moon around the Earth and the Earth around the Sun, o Identify the sun as a star, and o Name the former 9th planet and identify its reclassification.	videoconferencing.		

ATLAS.ti CODE	Results of the Interactive Videoconferences	Findings	Theory	Cumulative Theory
RQ2:Nature of Emerging Inquiries and Dialogue	• The nature of the emerging inquiries and dialogue surrounding the kindergartners' use of interactive videoconferencing is a subset of the Importance and Role of Language code in research question one. • In addition, analysis of the emerging inquiries and dialogue considers them in the context of Fisher's (1993) model of exploratory talk. • Examination also examines the purposefulness, reflexivity, and self-directedness of the dialogue.	RQ2.1. Children's conversations about the interactive videoconferencing equipment started and remained at the exploratory talk level for the gingerbread and astronomy videoconferences. RQ2.2. Children's inquiry and dialogue was purposeful, reflective, and self-directed.	During sustained interactive videoconferencing levels in kindergarten, children's inquiries and dialogue evidence exploratory talk that was purposeful, reflective and self-directed. Likewise, the dialogue indicates comfort with the technology.	

APPENDIX II. RESEARCH MATRIX INDICATING HOW THE RESEARCH PROCESS INFORMED THE OUTCOMES OF THE STUDY

RQ	Theoretical Frame	Literature Review	Methodology	Analysis and Findings	Implications
1	Four tenets of Vygotskian learning theory: 1) Individual development is rooted within a social context (Vygotsky, 1978, 1986), 2) Development represents a process whereby tools, signs, and mediated activity work together to advance psychological functioning to a “higher” (Vygotsky, 1978, p. 55) level of behavior, 3) Language plays an important role in cognitive development (1978) and contrary to Piagetian theory, precedes development for children (Vygotsky, 1978) and , 4) The ZPD (ZPD) (Vygotsky, 1978, 1986) distinguishes and describes the differences between	- Established the effectiveness of distance learning in K-12 environments as the basis for further investigation of IVC in kindergarten - Review of Vygotskian learning theory and four tenets (Vygotsky, 1978, 1986) - Investigation of current application of Vygotskian learning theory in light of digital society and globalization - Summary of anecdotal case studies of IVC in elementary school - Examination of concepts related to learning with IVC including interaction, community, and language in collaborations - Review of application of sociocultural theory	Research design informed by: 1) Pilot study in April 2007 2) Eight characteristics of qualitative research (Miles & Huberman, 1994a) • Extended field experience • The researcher’s quest to gain an interdependent picture of the situation. • Intent to capture data from an insider’s perspective (seeing the situation from the inside out). • Integrity in preserving the original form of the data despite the need to isolate or sift some information. • Explanation of how participants determine meaning in their situations (meaning-making). • Interpretation of the data based on grounds of internal consistency. • The researcher as the focal “measurement device” of the study. • Words portray the analysis. 3) Contemporary culture and data collection and analysis choices	1.1. The teachers and kindergartners formed a community of learners in a virtual learning environment with context experts, teachers, and peers over an IVC connection that afforded high levels of interaction. Students formed knowledge about the remote participants’ culture as well as the content material to further their progress towards making them global learners while basing their understandings in the social context of their virtual learning environment. This outlook represented a more diverse point of view than that of just their local classroom. 1.2. The kindergartners and their teacher made use of signs and tools for mediated activities that led the children to higher levels of cognitive development during the interactive videoconferences. 1.3. The role of language was critical for the students as they made meaning of the interactive videoconferences through dialogue using their language to: demonstrate new vocabulary, ask and receive questions, compare and contrast various concepts, present and respond to others’ work, critically reflect and explain their points of	Educational Technology and Distance Learning - Examines a new area of research not asked before - Applicability to the classroom and teachers - Examines distance learning in elementary school - CSCL - Community of learners Qualitative Research - Builds on ethnographic research in schools - Informed process of the research design based on the pilot study, Miles and Huberman’s 8 characteristics of qualitative research, and contemporary views about culture, data collection, and analysis. - Ethnographic, case-study methods of collecting data.

RQ	Theoretical Frame	Literature Review	Methodology	Analysis and Findings	Implications
	development and learning.	in qualitative studies about children learning with computers and the extension to another technology, IVC - Summary of qualitative elementary school videoconferences that include multicultural partnerships	• Participant observation and ethnographic approaches remain a qualitative mainstay (Eisenhart, 2001b) • Changing concepts about culture • "Funds of knowledge" (Nespor, 1997) examined the simultaneous existence of many cultural resources looking for intersections of activities and associations. • Ethnography must examine contemporary culture in new ways to track movement, symbolic forms, instantiations, and material forms (Eisenhart, 2001b). • Classroom as a case study (Stake, 2000) • "Methods are only a means, not an and" (Charmaz & Mitchell, 2001, p. 161) Data collection—ethnographic, case-study approach Data analysis—grounded theory approach using the ATLAS.ti computer assisted qualitative data analysis software	view, develop multicultural understanding, and reveal their technological literacy. 1.4. During the interactive videoconferences, students were able to complete more difficult problems or tasks with the assistance of content experts, teachers, and knowledgeable peers than if they were unassisted. These developmental gains show evidence of critical thinking, reflection, internalization, creativity, and language use by the students in the process of making meaning of their virtual learning experience. Furthermore, using the framework of the ZPD is useful in reviewing the developmental progress and meaning making of kindergartners while learning with interactive videoconferencing. Finding 3. The four Vygotskian tenets used in this study are rarely evident in isolation when learning with interactive videoconferencing. Instead, learning from a Vygotskian perspective involves the entwining of the origins of learning in a social context, sign and tool use in mediated activities to raise the children's psychological functioning, the importance and role of language, and assisted development of the learners as measured by the ZPD.	- Grounded theory analysis using the ATLAS.ti software. - Application of qualitative methodology to investigate learning with technology. - Emphasis on qualitative quality and rigor. Early Childhood Education - Integration of IVC into the curriculum. - Application of Vygotskian learning theory to learning with technology. - Classroom based study versus standardized testing outcomes. - Results of learning with IVC within the ZPD indicate developmental appropriateness. - Learning with IVC meets new definitions of literacy. Sociocultural-learning theory as a theoretical framework

RQ	Theoretical Frame	Literature Review	Methodology	Analysis and Findings	Implications
					- Continued investigations of learning with ICT. - Analysis of learning with technology from 4 Vygotskian tenets. - Increased attention to sign and tool use. - Pedagogy for considering differences in learners. - Values diversity. - Reconceptualization.

RQ	Theoretical Frame	Literature Review	Methodology	Analysis and Findings	Implications
2	3) Language plays an important role in cognitive development (1978) and precedes development for children (Vygotsky, 1978)	- Review of Vygotskian learning theory and four tenets (Vygotsky, 1978, 1986) - Investigation of current application of Vygotskian learning theory in light of digital society and globalization - Summary of anecdotal case studies of IVC in elementary school - Examination of concepts related to learning with IVC including interaction, community, and language in collaborations - Review of application of sociocultural theory in qualitative studies about children learning with computers and the extension to another technology, IVC Summary of qualitative elementary school videoconferences that	Research design informed by: 1)Pilot study in April 2007 2)Eight characteristics of qualitative research (Miles & Huberman, 1994a) • Extended field experience • The researcher's quest to gain an interdependent picture of the situation. • Intent to capture data from an insider's perspective (seeing the situation from the inside out). • Integrity in preserving the original form of the data despite the need to isolate or sift some information. • Explanation of how participants determine meaning in their situations (meaning-making). • Interpretation of the data based on grounds of internal consistency. • The researcher as the focal "measurement device" of the study. • Words portray the analysis. 3)Contemporary culture and data collection and analysis choices • Participant observation and	2.1. Children's conversations about the interactive videoconferencing equipment started and remained at the exploratory talk level for the gingerbread and astronomy videoconferences. RQ2.2. Children's inquiry and dialogue was purposeful, reflective, and self-directed.	Educational Technology and Distance Learning - Examines a new area of research not asked before - Applicability to the classroom and teachers - Examines distance learning in elementary school - CSCL - Community of learners Qualitative Research - Builds on ethnographic research in schools - Informed process of the research design based on the pilot study, Miles and Huberman's 8 characteristics of qualitative research, and contemporary views about culture, data collection, and analysis. - Ethnographic, case-study methods of collecting data. - Grounded theory analysis using the

RQ	Theoretical Frame	Literature Review	Methodology	Analysis and Findings	Implications
		include multicultural partnerships	ethnographic approaches remain a qualitative mainstay (Eisenhart, 2001b) • Changing concepts about culture • "Funds of knowledge" (Nespor, 1997) examined the simultaneous existence of many cultural resources looking for intersections of activities and associations. • Ethnography must examine contemporary culture in new ways to track movement, symbolic forms, instantiations, and material forms (Eisenhart, 2001b). • Classroom as a case study (Stake, 2000) • "Methods are only a means, not an and" (Charmaz & Mitchell, 2001, p. 161) Data collection—ethnographic, case-study approach Data analysis—grounded theory approach using the ATLAS.ti computer assisted qualitative data analysis software Research design informed by: 1)Pilot study in April 2007 2)Eight characteristics of		ATLAS.ti software. - Application of qualitative methodology to investigate learning with technology. - Emphasis on qualitative quality and rigor. Early Childhood Education - Integration of IVC into the curriculum. - Application of Vygotskian learning theory to learning with technology. - Classroom based study versus standardized testing outcomes. - Results of learning with IVC within the ZPD indicate developmental appropriateness. - Learning with IVC meets new definitions of literacy. Sociocultural-learning theory as a theoretical framework - Continued investigations of

RQ	Theoretical Frame	Literature Review	Methodology	Analysis and Findings	Implications
			qualitative research (Miles & Huberman, 1994a) • Extended field experience • The researcher's quest to gain an interdependent picture of the situation. • Intent to capture data from an insider's perspective (seeing the situation from the inside out). • Integrity in preserving the original form of the data despite the need to isolate or sift some information. • Explanation of how participants determine meaning in their situations (meaning-making). • Interpretation of the data based on grounds of internal consistency. • The researcher as the focal "measurement device" of the study. • Words portray the analysis. 3)Contemporary culture and data collection and analysis choices • Participant observation and ethnographic approaches remain a qualitative mainstay (Eisenhart, 2001b) • Changing concepts about		learning with ICT. - Analysis of learning with technology from 4 Vygotskian tenets. - Increased attention to sign and tool use. - Pedagogy for considering differences in learners. - Values diversity. - Reconceptualization.

RQ	Theoretical Frame	Literature Review	Methodology	Analysis and Findings	Implications
			culture • "Funds of knowledge" (Nespor, 1997) examined the simultaneous existence of many cultural resources looking for intersections of activities and associations. • Ethnography must examine contemporary culture in new ways to track movement, symbolic forms, instantiations, and material forms (Eisenhart, 2001b). • Classroom as a case study (Stake, 2000) • "Methods are only a means, not an and" (Charmaz & Mitchell, 2001, p. 161) Data collection—ethnographic, case-study approach Data analysis—grounded theory approach using the ATLAS.ti computer assisted qualitative data analysis software		