Learning Constellations:

A Multimedia Ethnographic Research Environment
Using Video Technology for
Exploring Children's Thinking

by

Ricki Goldman Segall

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A MULTIMEDIA ETHNOGRAPHIC RESEARCH ENVIRONMENT USING VIDEO TECHNOLOGY FOR EXPLORING CHILDREN'S THINKING

by

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Bachelor of Arts, University of British Columbia, Canada, 1969
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Abstract

This dissertation is an examination of five years of research which includes: an ethnography of children's epistemologies—in-depth case studies of three children from the Logo constructionist culture called Project Headlight, at the Hennigan School in Boston; a theoretical discussion of the epistemological and ethnographic perspectives underlying the work; and, a description of the multimedia video methodology and design process.

Three preferred thinking styles emerge from this study—the empirical, the narrative and the social/interpersonal. The success or failure of each child's appropriation relates to her/his preferred style of thinking. Preferred styles are shown to be pervasive throughout many diverse domains. The video data from which I drew my conclusions about their thinking were generated by engaging in personal relationships with these children over a two-and-a-half year period. I investigated, by recording these conversations on video, what we learn about children's thinking when we listen carefully to how they link the their experiences together in coherent ways.

In the discussion of the video ethnographic perspective, I propose that Clifford Geertz's notion of *thick descriptions* can provide a conceptual framework for reflecting upon how the researcher can trust her/his conclusions from video-based research data. A detailed description of the multimedia video ethnography research methodology is also given. I elucidate how the extensive video and text data were organized by designing and using *Learning Constellations*—first, to break down and analyze the data, and, then, to reconstruct case studies. More specifically, I explain how my observations about the growing Logo culture were communicated to other researchers and users, on a regular basis, to enable them to become part of the discovery process. By using tools for annotating and clustering video and text data, a layering or *thickening* of the description about these children's epistemologies occurred.

The five phases of the research project described are:
•Phase I: Collecting data by observing and videotaping my interactions with the children called, **"Researcher as Participant Recorder."**
•Phase II: Editing linear 'movies' and non-linear chunks from the video data called, **"Editing for Linear and Non-linear Presentation."**
•Phase III: Identifying, selecting, classifying, and categorizing the video segments for videodiscs, called **"Selecting Video Data for the Videodiscs."**
•Phase IV: Building the interface for *Learning Constellations,* called **"Designing *Learning Constellations.*"**
•Phase V: Using *Learning Constellations* to analyses data and to build theories about the children's styles of thinking, called **"Analyzing Data in an Videodisc Environment."**

The results of my research are four case studies—one is the overall school culture within Project Headlight, and the other three are in-depth case studies of one girl and two boys, who chose to tell their stories to me. What this study yields is very fine-grained descriptions of how children speak about themselves. Each child represents a preferred style of thinking: empirical, narrative and interpersonal.

My conclusions indicate that, given choice, children's thinking in each of these styles is fundamentally pervasive in many domains. My conclusions about using *Learning Constellations* as a research tool indicate that integrated and coherent theories about children's thinking can be formed which may not have arisen without the tool.

The contribution of this dissertation to the field of epistemology are two-fold. The first is to deepen the existing theoretical work on the thinking styles of children. The second is to highlight the difficulties encountered by children whose preferred thinking style is either narrative or social/interpersonal and to suggest specific changes within the existing educational system.

Description of *Learning Constellations*

Learning Constellations is the name I have given to the set of six videodiscs and a specifically designed HyperCard application which I designed with my development team to provide non-linear access to: 1) documentary style video observations; 2) the transcripts of the video; 3) textual annotations; 4) video annotations; and 5) this dissertation. Integral to the system are tools for navigating through the units of video and text, or *stars;* tools for searching through the different domains or *galaxies;* tools for clustering stars and building learning *constellations;* and tools for building theories. The general objective underlying the creation of the multimedia tool, *Learning Constellations,* was to design a research environment for making theoretical connections among discrete elements of video and text data selected for videodisc as being representative of these children in the emerging Logo culture of Project Headlight at the Hennigan School in Boston.

Dissertation Supervisor:

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Dedication

to

Silvia McFadyen-Jones,
Friend and Educator,

for her commitment to the freedom of the human spirit,
and for her everlasting friendship;

and to

Ivan Illich, Alice Miller and Mary Catherine Bateson,
Kindred Spirits,

who have inspired my thinking about learning.

[L]earning is the human activity which least needs manipulation by others. Most learning is not the result of instruction. It is rather the result of unhampered participation in a meaningful setting.

Deschooling Society — by Ivan Illich

I can imagine that someday we will regard our children not as creatures to manipulate or to change but rather as messengers from a world we once deeply knew, but which we have long since forgotten who can reveal to us more about the true secrets of life, and also our own lives, than our parents were ever able to.

For Your Own Good — by Alice Miller

Composing a life through memory as well as through day-to-day choices...seems to be the most essential to creative living. The past empowers the present, and the groping footsteps leading to this present mark the pathways to the future.

Composing A Life — by Mary Catherine Bateson

Acknowledgments

Six years ago, I sat with William Higginson eating lunch on a small strip of grass beside a pizza truck at MIT. Bill is an Associate Professor in the Faculty of Education at Queen's University. At that time, he was a visiting professor here. We spoke of many things that day; mostly we discussed academic life within the Learning and Epistemology Group. If my acknowledgments begin anywhere, they begin with Bill who encouraged me to become part of the Seymour Papert's group and to continue my long-standing commitment to alternative educational philosophies and practices. Bill was present on my first day, and, he was there the day of my defense—as a member of my dissertation committee. I thank Bill for setting an example of how to be both a conscientious scholar and a devoted family and community member.

Another significant event occurred within my first month at MIT. The Media Laboratory had just opened its doors, and, as a result, there was much to celebrate. At one of those celebrations, Glorianna Davenport—now Assistant Professor of the Interactive Cinema Group—introduced herself to me. She spoke enthusiastically about her ideas, her films, and her collaboration with filmmaker, Richard Leacock. I was flooded with my previous memories of producing videos in the early 1970's. This discussion instigated my thinking about how art, science and epistemology could contribute to each other by using video as a research tool.

The foundations of my thinking about using video for my research at the Hennigan School and using videodisc technology for working with my data were established in conversations with Glorianna which occurred almost daily for over two years. There were times (during that phase) when our ideas seemed to come from the same source. We invented together by moving in and around each other's thoughts. We played. When I think back on those days, I recognize Glorianna as always "being there"—in the editing room, at the school, on excursions, and at every major event of my life at the Media Lab. Hundreds of encounters—culminating in her participation as a member of my dissertation committee. I thank her for her constant support, her belief that I was making a significant contribution, and, above all, for her friendship.

I also thank Glorianna for sharing with me her love of Ricky Leacock (and Dianne Bohl). Ricky was the ultimate storyteller; listening to his stories was a great honor. I thank him.

Seymour Papert. I chose to study at the Media Lab because of Seymour. I believed then and still believe today, that if fundamental changes can occur in schools, assumptions need to be challenged. Seymour challenges assumptions. After five years, it is impossible to capture Seymour's contribution to this work in a few words; his ideas appear everywhere in the following

pages. Seymour also challenges people; at every stage, he asked me to articulate what I was finding as I explored a new methodological approach. Today, as I look at this body of work, I have a deep understanding of why he asked so many questions and wanted so many illustrations of "what it would look like." I thank Seymour for teaching me the meaning of the word *rigor*. As Taro Yashima, an author/illustrator of children's literature, once wrote: "The other side of the soul is rigor."

To Seymour Papert, Glorianna Davenport, and William Higginson, I give my thanks for the opportunity to enter the next phase of my life, a time of giving to others what I have learned from them and my previous mentors.

I have often reflected upon the two most important gifts I have been given in my life. The first gift is the devotion of enlightened mentors. The second is the gift of friendship. Often the two have merged in diverse ways. There are three persons who have been instrumental in the development of my thinking. My friendship with Silvia McFadyen-Jones is rooted in what I learned from her in Early Childhood Education classes in Vancouver, Canada. For twenty-two years, Silvia and I have been conducting a conversation about freeing childhood from bondage. I am quite certain that not one sentence was written in this work without our telepathic communication. I only hope that she will recognize herself as the silent co-author. It is her magnanimous spirit I thank.

On a day close to my Master of Arts graduation from the Hebrew University of Jerusalem, Zvi Lamm, my advisor and mentor, once told me that within six months I would miss academic life. Within four, I was thinking about a doctoral program. The following year, Zvi returned from Cambridge with the news that he had found the person with whom I should study—Seymour Papert. I thank Zvi for his guidance and his teachings. Zvi's greatness as a thinker did not end in the classroom, but it did begin there. Watching him weave philosophical ideas together was a fascination I indulged in for five years! I will always be grateful to Zvi for sharing his thinking with me and for inviting me to be friends with his wife, Dafna, and their dear son, Udi.

Another Seymour in my life was a professor of English Literature at the University of British Columbia named Seymour Levitan. Seymour showed me the meaning of sensitivity to the subject being investigated. I believe that much of my writing about the children I studied was made possible by the example set by Seymour. His careful and considerate way of analyzing a poem taught me that when you break something into its parts, you must remember to put it back together again. It is the whole which we cherish. The family of Seymour, Alberta, and their daughter, Rachel, culturally and intellectually nurtured me. I thank them.

Children have always been the people who have inspired me the most. Children carry a wisdom which they sometimes lose in adulthood. My work with children of all ages has been to help them keep the glow of curiosity and wonderment. It is ironic that the time in my life which

has been without the closeness with friends' children or my niece and nephews has resulted in a in-depth study about children. I have often questioned this situation along the way. How can I help many children if I am not intimately involved with the challenges facing Melanie, Jared, Nathan, and Jeffrey? Should I have found more time for them?

I do know that the love and concern I feel for the three children in my study—Josh, Mindy and Andrew—comforts most of my misgivings. They showed me how relationships are not conditional and *being close to* can mean many things. Josh, Andrew and Mindy gave me so much of themselves and asked only for respect in return. For the countless hours of joy, while either being with them in person or working with the video data, I thank them and all the children of Project Headlight with all my heart. May they each find many people who welcome who they are and how they think. To the children's parents and teachers, I send my gratitude for giving me the permission to enter through doors which are usually locked. Many of them welcomed me (and my camera) into spaces without setting rules. This took courage and confidence. This work would not have been possible without their search for new solutions. I hope even more doors will open for them in the future.

Most doctoral students speak of the loneliness of their years of research. The deeper they immerse themselves, the fewer the people with whom they can enter into intelligible dialogue. My work was quite the opposite. Working in video and designing a computer interface for accessing video data meant that I would need to collaborate. What I could not have foreseen was that the two central people I would work with, Vivian Orni Mester, a filmmaker from Brazil, and David Greschler, a HyperCard designer and trainer, would *fall in love* with the project. Vivian worked on the project for eighteen months and David for more than half a year. Without them, *Learning Constellations* would not shine nearly so bright! Vivian's even-nature and David's dynamic tension were a perfect match. Working with them was one of the best project environments I have ever participated in. I thank them both as colleagues and friends.

In a similar way, the more I defined my research, the closer my relationships became with my colleagues in the Epistemology and Learning Group. When I reflect back over the five years, I understand how each of my colleagues has affected this final work. I would like to acknowledge their contribution by reflecting upon them individually for a moment. Conversations with Sarah Dickinson are like volcanoes! They erupt. Then we both go back to work. For five years, Sarah and I have discussed every topic imaginable. Life at MIT has been sweeter because Sarah was around most every evening. Aaron Falbel contributed in so many ways that I find it hard to know how to acknowledge his major contribution to this work. Aaron's scrupulous reading of my writing over the past five years is the least of his many contributions. (He was one of the major readers for this work.) He has shared with me a common love and respect for educational reformers and anarchists, and for authors of children's literature. Above all, Aaron has reminded me through

his actions that my love of the writings of Illich, Miller, and others requires more effort and sacrifice. Thank you, dear Aaron.

Idit Harel, Judy Sachter, Marlene Kliman, Susan Imholtz and Lise Motherwell were the women students from the first year of Project Headlight. I shared an office and many hours of conversation with Judy. (Judy's eyes were always a good resting place during any meeting or presentation.) I thank her for the power of her rootedness throughout the past five years. Susan was the first to try to encourage group collaboration and communication. I thank her for cutting through some difficult territory. Lise was the first to start videotaping in the school. I thank her for opening the way. Marlene showed me how important it is to define a topic and develop it. Her use of balancing scales encouraged me to look for a suitable way to frame my work.

Idit Harel has been a source of fascination to me for five years. The extent of her energy and dedication to making Project Headlight succeed has been boundless. However, what I thank Idit for today is not only for her comments on many drafts, but for encouraging me to complete this work so I can start others. In doctoral work, one always feels that a newer discovery is around the corner. Idit helped me to find a meaningful closure, and for that, I am most grateful. I also thank her for remembering special occasions and acknowledging them in her own unique way.

I would like to acknowledge my other colleagues throughout the years. To Nira Granott Farber—for her friendship and insightfulness about my work. Nira helped me to see the big picture whenever I got lost in the details of my data. To Mario Bourgoin—for many shared memories, personally and professionally. To Yasmin Kafai—for reading, for discussing, for finding the perfect reference at the right time, and for becoming a friend! To Mitch Resnick—for helping me to understand why Josh's making connections was significant to his style of thinking. To Carol Strohecker—whose multimedia work called *A Different Train of Thought* inspired me to find a workable metaphor for my project. Thank you for that and all the many discussions we have had throughout the years. To Fred Martin—for the many times I popped into his workspace needing a friend with whom to talk. To Steve Ocko—for his understanding why video documentation was important. To Alan Shaw—for reading and for helping me think about the challenges facing children in the inner-schools. To Greg Gargarian—for welcoming diverse ideas as he welcomes guests into his home, with love. To Hillel Weintraub—for showing concern and sensitivity towards teachers' needs. To Uri Wilensky—for our walks in many of the same parts of the world—even if they were at different times! To Aaron Brandeis, Paula Hooper, and Alan Ruttenberg—for asking me to participate in a video they produced on Augmentation. This exercise helped me express many of the ideas found in this dissertation. I also thank them for their comforting smiles during this last phase. To Kevin McGee—for challenging established rituals. To Isaac Jackson—for asking me to come closer to the traditions within ethnography while being supportive of my innovations. To John Bennett—for being my colleague and friend.

To Joseph Weizenbaum—for asking me to maintain my humanity in doing research while setting the perfect example. To Sherry Turkle—for writing a book which kindled many ideas. To Edith Ackermann—for asking me the same question throughout the past three years. It was a very good question! To Sylvia Weir—for being the first to ask the important questions. I hope I answered them well, Sylvia. To Marilyn Schaffer—for her constant encouragement. To Carol Sperry—for demonstrating that co-operation is are the most important theme in education today.

There are many others at the Media Lab whom I would like to thank. Jacqueline Karaaslanian for constantly reminding me that everything will turn out well. I thank Mai Cleary, Philip Pardi, and the many support staff we have been so fortunate to have with us. To Linda Peterson and to Ellen Liao— for helping me in all the administrative stages of my work. To Stuart Cody—for helping me understand the nature of hundreds of technical problems. Students, faculty, and staff from many groups, especially those from the former Film/Video group, were available when I needed help. Lino shared his food and his insights about human nature with me. Gabriel Cerullo helped to make MIT a friendly and warm place for me. Peter Jenny reminded me that I could both make my professional contribution and maintain my personal integrity.

I would also like to acknowledge persons and agencies who supported my research from outside the Media Lab: Sarah Little Turnbull of Stanford University, Howard Gardner of Harvard University; Art and Claire Neilson, patrons; David Parry, filmmaker; Jim Smith at the Cambridge Centre for Adult Education; Robert McLean, Associate Professor at the Ontario Institute of Studies in Education; Andrew Molnar of the National Science Foundation; The **MIT Council of the Arts**; and the **National Science Foundation**: grant #851031-0195, #MDR-8751190, #TPE-8850449; **The McArthur Foundation**: grant #874304; **IBM Corporation**: grant # SP95952; **LEGO Systems A/S, Apple Computer Inc.**, and **Fukatake**. Although the ideas expressed in this work do not necessarily reflect the positions of the supporting agencies or individuals, I am very grateful for their support.

In closing, I would like to take a last moment to reflect upon the support given to me by my family and those who are like family to me. I thank my family and my husband's family for their encouragement. Silvia McFadyen-Jones, Ben Linder, Ruth and Avrum Biran, Joshua and Gella Fishman, Rachel and Larry Kaplan, Ilana Shoham, Sharon Kessler, Ruth, Shoshanna, and Meir Brayer, Aviva and Shlomo Sternberg, Susan Scott, Kathy Wienhold, and Uri Feldman have been part of this process for a long time. I thank them for their gift of friendship and hope this work reflects the kind of relationship we share—intimate, affectionate and immediate.

My husband Avner is often more than modest in his analysis of the personal and professional contribution he has made to this work. His devotion to our marriage has been a humbling experience for me. I pray that I will be able to contribute to helping him attain his aspirations in our next phase of life. Thank you, dearest Avner, for all you have sacrificed.

CONTENTS

Introduction

An Ethnography of Children's Epistemologies 15
Multimedia Video Ethnography for Discovery and Communication 16
A Study in Two Domains 17
Rationale for Study 17
The Research Site 18
Project Headlight at the Hennigan School 18
Research Process 20
Phase I and Phase II – Videotaping and Editing 21
Phase III and Phase IV – Designing the Videodiscs and Interface 22
Phase V – Analyzing the Data to Build Portraits of Each Child 24
Issues In Video Ethnographic Research 27
How the Video Researcher Becomes a *Participant Recorder* 27
How the Point of View Can Enrich the Meaning 27
How a "Culture" is created by the Researcher Using Video Technology 29
How Events are Described, *Thickly* 31
How to Reach Conclusions from Selected Video Data 33

PART I THEORETICAL OVERVIEW

1 Video Ethnography Perspective

1.1 *Thick Descriptions* for Articulating and Building an Ethnographic Research Environment 37
1.1.1 The Problem of Reaching Conclusions in Multimedia Ethnography 38
1.1.2 The Video Ethnographer Recording the Video Data, *Thickly* 38
1.1.3 The Video Ethnographer Editing the Video Data, *Thickly* 42
1.1.4 The Video Ethnographer Assessing the Video Data, *Thickly* 43
1.1.5 Thick Descriptions to Uncover *Universal Signifiers* 44

1.2 *Thick Descriptions and Conviviality* for Multimedia Video Ethnography
1.2.1 Illich's *Conviviality* in *Learning Constellations* 45
1.2.2 Instructional vs Descriptive Multimedia Environments 47
Concluding Remarks 50

2 Epistemological Perspective

2.1 Stages and Styles 52
2.1.1 The Empirical Roots of Stages Theory: A Developmental Model of Thinking 53
2.1.1.1 Patriarchal Influences 53
2.1.2 The Narrative Mind 54
2.1.3 The Pluralistic Mind 56
2.1.4 The Interpersonal as the Starting Point for Thinking about Science 59
2.2 Epistemological Concerns of Research Methodology
2.2.1 Influence of a Conceptual Framework 59
2.2.2 Influence of Postpositivist Holistic Ethnography 61

PART II METHODOLOGY

3 Method of Multimedia Video Ethnography

Introduction 65
3.1 Phase I: Researcher as Participant Recorder (1985-1987) 66
3.1.1 Early Problems and Solutions 67
3.1.1.1 Step 1: Limitations of Original Hypothesis 68
3.1.1.2 Step 2: Appropriate Conceptual Tools 69
3.1.1.3 Step 3: The Videocamera and VideoMaking 70
3.1.1.4 Step 4: Responding to the Children 71
3.1.1.5 Step 5: Constraints of Research Tools 75
3.1.1.6 Step 6: Documentary-Style Video 76
3.1.1.7 Step 7: Caring about the Culture 77
3.1.1.8 Step 8: Transparent and Non-invasive Tools 78
3.1.1.9 Step 9: Developing an "Affectionate" Style of Shooting 79
3.2 Phase II: Editing for Linear and Non-Linear Presentation(1986–1989) 80
3.2.1 Step 1: Editing for Linear Presentations 80
3.2.1.1 Presenting the Footage to Filmmakers and Researchers 81
3.2.1.2 Letting the Story Tell itself without Narration 82
3.2.2 Step 2: Editing for Videodisc 83
3.2.2.1 Arranging Chunks for Linear and for Non-linear Delivery 83
3.2.2.2 Integrating the Artistic and the Scientific 84
3.3 Phase III: Selecting Video Data for the Videodiscs (1988-1989) 85
3.3.1 From "Video Intervals" to "Video Chunks" for Videodisc 85
3.3.1.1 Step 1: Re-viewing the Relevant Video Data 86
3.3.1.2 Step 2: Selecting and Recording the Video Chunks onto 1" Videotapes 86
3.3.1.3 Step 3: Logging the Scenes/intervals onto *Star Notes* 86
3.3.1.4 Step 4: Entering the Text Data 88
3.3.1.5 Step 5: Assigning Keywords/Themes 88
3.4.1.6 Step 6: Building Stacks from Keywords to Compare and Contrast Data 88
3.4.1.7 Step 7: Selecting Video Chunks and Editing for Videodisc 90
3.3.2 From Videodisc Chunks to Videodisc Chapters 90
3.3.2.1 Establishing the Overview of the Six Videodiscs 91

3.4 Phase IV Designing *Learning Constellations* (1989–1990) 93
3.4.1 Building the Interface for *Learning Constellations* 93
3.4.2 Overview of the Tool, Learning Constellations 93
3.4.2.1 Description of the System and its Use 93
3.5 Phase V Analyzing Data in an Videodisc Environment (1990–present) 100
3.5.1 Reconstructing from the Deconstructed Video Data 100
3.5.1.1 Step 1: Searching through the Data Making New Connections 101
3.5.1.2 Step 2: Annotating and Reading Annotations 102
3.5.1.3 Step 3: Using "Videonote" to Isolate Segments within Chunks and Make New Connections 103
Closing Remarks 104

PART III CASE STUDIES

4 The Logo Culture at the Hennigan School: Changes within defined boundaries

4.1 Introducing Project Headlight 108
4.2 Denizens in the School Structure 109
4.2.1 Outdoor Recess: A Time for Separation 109
4.2.2 The Computer Pods: Circles for Collaboration 110
4.2.3 The Lunch Room: The Receiving of *Stuff* 111
4.2.4 Teachers and Children Apart 113
4.3 Making Changes within the Structure of the School 116
4.3.1 A Teacher in Transition: Linda Moriarty 116
4.3.2 Teacher as Listener 118
4.2.3 Teacher and Child Growing Together 119
4.3.4 Building Children's Autonomy 123
4.3.5 The First Case Study: Shannon 124
4.4 Introducing the Children in the Video Research Study 129
4.4.1 Josh, Andrew and Mindy 129
4.4.2 The Child in a Changing Culture 130

5 The Empirical Mind of Josh

5.1 Meeting Josh 133
5.2 Playing vs Building a Game 136
5.2.1 Josh and Joe: The Discussion 136
5.3 Cars, Gears, and Moving Things 140
5.3.1 Objects "to Think With" 140
5.3.2 Thinking about Gears 141
5.4 Movement and Thinking about Movement 145
5.4.1 Josh's Inventions 145
5.4.2 Thinking about Moving Things 147

INTRODUCTION

An Ethnography of Children's Epistemologies

This dissertation is a video–based research of how three children, two boys and one girl, from different ethnic backgrounds dealt with the introduction of a computer–rich Logo–based learning environment in the context of their personal style of learning. It includes in-depth case studies of their attempts to appropriate these changes. An underlying premise is that the *constructionist*[1] atmosphere created by adults and children working together in the Logo culture at the Hennigan School promotes children's thinking about how to put ideas together in ways which lead towards appropriation.[2]

The purpose of this study is to contribute to the ways of thinking about the empirical, narrative and interpersonal styles of children's thinking. Portraits or case studies of Mindy, Josh, and Andrew illustrate my hypothesis that children's thinking in each of the styles is fundamentally pervasive in diverse domains. When a child is thinking deeply about a certain subject within her/his style, s/he does so in a variety of contexts. For example, if Josh is thinking deeply about moving things, then he thinks about moving things in many situations within his empirical style. Andrew, a narrative thinker, tries to make sense of the difference between reality and fantasy whether he is programming or telling me stories. Similarly, Mindy's social and interpersonal style of thinking focuses on girl–boy relationships when she is thinking about a party, preparing for a dance presentation, or programming girls in dresses using Logo. While other theorists and researchers[3] have addressed the issue of styles in their writing, I built case studies of these styles based on random–access analysis of recorded moments of video data and deepened the understanding of the significance of these styles.

The three children I studied had their own unique concerns and set up situations to work out ways of understanding what was on their minds.

7 The Social Mind of Mindy

7.1 "Making" Girls 208
7.1.1 Introducing Mindy 208
7.1.2 Wanting a Space of Her Own 209
7.1.3 Wanting Advice from an Older Sister 211
7.2 Girls and Boys 213
7.2.1 The Meaning of Mindy's *Winks* 215
7.2.2 Overcoming Being Put-Down by Her Classmates 215
7.2.3 Mindy's Teasing Josh 216
7.3 "New Inventions" 218
7.3.1 Dolls and Girls as *People to Think With* 218
7.3.2 Mindy's Making Girls on the Computer 219
7.3.4 Mindy's Story about Girls: *Princess Alice and the Unknown Rabbit* 220
7.4 Being "Kept Back": From the Advanced Work Class to Failing 221
7.5 Telling the Truth or Lying 223
Closing Comments 225

PART IV CONCLUSIONS

8.1 Integrating Epistemology and Multimedia Ethnography 230
8.1.1 Pervasiveness of Thinking Styles and the School Curriculum 230
8.2 Contributions of Video-Based Research 231
8.2.1 Style of Child Affecting the Reporting of the Data 232
8.2.2 Communication and Discovery as Less Distinct Research Pursuits 233
8.3 Unexpected Findings 234
8.3.1 *Learning Constellations* to Support Research Activities 234
8.3.2 The Rights of Students with Diverse Thinking Styles 235
8.3.3 Girls Don't *Have* to Think like Boys 236
8.4 Closing Statement 237
Opening Subjects within the Curriculum to Diverse Styles of Thinkers 237
Post Scripts 239

Notes 240

Bibliography 249

7 The Social Mind of Mindy

7.1 "Making" Girls 208
7.1.1 Introducing Mindy 208
7.1.2 Wanting a Space of Her Own 209
7.1.3 Wanting Advice from an Older Sister 211
7.2 Girls and Boys 213
7.2.1 The Meaning of Mindy's *Winks* 215
7.2.2 Overcoming Being Put-Down by Her Classmates 215
7.2.3 Mindy's Teasing Josh 216
7.3 "New Inventions" 218
7.3.1 Dolls and Girls as *People to Think With* 218
7.3.2 Mindy's Making Girls on the Computer 219
7.3.4 Mindy's Story about Girls: *Princess Alice and the Unknown Rabbit* 220
7.4 Being "Kept Back": From the Advanced Work Class to Failing 221
7.5 Telling the Truth or Lying 223
Closing Comments 225

PART IV CONCLUSIONS

8.1 Integrating Epistemology and Multimedia Ethnography 230
8.1.1 Pervasiveness of Thinking Styles and the School Curriculum 230
8.2 Contributions of Video-Based Research 231
8.2.1 Style of Child Affecting the Reporting of the Data 232
8.2.2 Communication and Discovery as Less Distinct Research Pursuits 233
8.3 Unexpected Findings 234
8.3.1 *Learning Constellations* to Support Research Activities 234
8.3.2 The Rights of Students with Diverse Thinking Styles 235
8.3.3 Girls Don't *Have* to Think like Boys 236
8.4 Closing Statement 237
Opening Subjects within the Curriculum to Diverse Styles of Thinkers 237
Post Scripts 239

Notes 240

Bibliography 249

The content areas—Mindy's ever–constant interest in gender-based roles in society, Josh's fascination with the source of energy, and Andrew's preoccupation with the distinction between reality and fantasy—were examined to the extent that they illustrated how each of the children delved into their concerns, and either made what they experienced their own or did not. They either linked bits and pieces of experience, integrated them into the web which is their life, and appropriated them as their own, or, they did not appropriate. For example, Josh was able to pull together the discrete and build a unified whole which was an integration of both what he was learning and how he was learning. Andrew was left with undigested pieces of information with which he could not build a solid foundation upon. Mindy was able to appropriate, but what she appropriated is not valued by educators. In short, this study will examine that process of successful or unsuccessful appropriation within a preferred learning style.

Multimedia Video Ethnography for Discovery and Communication

Multimedia video ethnography is what I term using video and videodisc technology in conjunction with computer–linked interfaces for studying cultural growth and change. This medium contributed to this study in two ways.

First, it enabled me to segment the pieces or chunks of video data, to organize them into meaningful categories, and then to reconstruct the chunks into fine-grained case studies of children. In those processes of working with my video data, discoveries about the children's thinking were made which would not have been possible using conventional research tools. Second, it enabled me to communicate with my viewers and readers in a manner which gave them the opportunity to build their own meanings. By using this medium, I established different relationships with my viewers and readers; they became part of the research effort of understanding the children.

Having made the distinction between using multimedia video ethnography for research and for communication, I would like to add that my ultimate goal is that discovery and communication become less distinct pursuits.

Two products have resulted from this process. The set of six videodiscs and the interface called *Learning Constellations*, and this dissertation. My own preference is *Learning Constellations*.

A Study in Two Domains

In this dissertation, two separate yet overlapping bodies of knowledge are discussed separately and then integrated: multimedia video ethnography as a research tool and children's epistemologies.

The questions most relevant to the area of multimedia video ethnography are: how do researchers use what they see on video to make serious generalizations; and, how does the content—the meaning of what happened—remain intact. In other words, how can we rely on our video data? As in other approaches, the issue is one of rigor in one's method of extraction.

There are two sets of questions most relevant in describing children's epistemologies.

The first has to do with what we learn about children's thinking in this particular Logo culture. How is their appropriation related to their style of thinking? Is their preferred style pervasive throughout diverse domains or dependent upon the subject at hand? My conclusions contribute to understanding how preferred learning styles fundamentally affect the way in which we appropriate what we experience.

The second set of questions has to do with learning. What do we learn about children's thinking when we listen carefully to their stories and the way they link pieces of their experiences together? What does this say about a tradition of schooling based upon instruction of a set curriculum? My conclusions indicate that educators should understand how their students think in order to provide them with the experiences they need to develop their personal theories into tools which help them build foundations of knowledge.

Rationale for Study

The child's world is dramatically changing with the emergence of new technologies; we in the scientific community need to understand how children are making sense of the world in which they are still more recipient than

provider. By listening to the connections children make as they link separate ideas into the beginnings of theories about how things work, our questions about how to continue to develop learning environments for children to gain control over the enormous groupings of human knowledge can be addressed.

My hope for the future is that if we are truly committed to helping all children succeed in their lives, we must begin to look more closely at the neglected learning styles. We must examine our successes and failures with children. Josh is one of our successes. But, Andrew and Mindy may not be. What do we need to know about Andrew and Mindy, about how they think, and about how they appropriate or why they do not?

In order to find these questions to ask, I had to first find an alternative methodology, or to be more precise, a new way of interpreting current qualitative research methodologies.This study is not only a search for answers to questions, but more important, given the nature of new technologies in education, a search for the right questions. In other words, the research was not designed to provide only answers to questions, but rather, to change the nature of the questions asked about children's thinking in computer cultures.

It is also my hope that using video technology in order to build detailed descriptions of children's thinking about the things which concern them will be a contribution to both of my selected fields of study. Through my work, we researchers and educators may continue to examine why some children succeed and others do not. Perhaps we will find strengths in children where we previously saw weakness, and bias where we evaluated only strengths.

The Research Site

Project Headlight at the Hennigan School

Over a period of three years, from 1985 to 1988, I documented on video the implementation of Project Headlight in a culturally diverse inner-city elementary school, the Hennigan School, located in a section of Boston's Jamaica Plain known for urban problems of drug abuse, street violence, and housing project congestion. Under the guidance of Seymour Papert, a variety of studies have been conducted[4] with the teachers and the two hundred and fifty children who spend approximately one hour a day at the computers.

Papert, world–renowned for his theories about children learning from the mental manipulation of objects–to–think–with, started this experimental project using a computer language he and his team designed called Logo. (In Logo, a cursor in the shape of a turtle can easily be moved around the computer monitor by using simple commands such as RT 90, turn to the right 90 degrees, and FD 50, move forward 50 turtle steps.)

The idea of Papert, and his colleague, Turkle, which is most relevant to this study is their notion of appropriation. For Papert this means that children using the turtle cursor identify with the object they are manipulating to the extent that they appropriate the objects they construct as being products of their own learning. This ownership of their learning is what enables children to apply it to other related situations. It becomes part of their way of thinking about other things that interest them.

For example, in a conversation with Denise and Whitney, two grade four girls at the Hennigan School, they spoke about making angles and circles in Logo in the following manner:

> *Whitney:* You know, when you turn right 120, the turtle [cursor] is like that... *(She gestures up with her right arm)* and it turns like that, right like that...
> *Denise:* Everyone knows you now. *(She is referring to my filming them.)*
> *Whitney:* ...straight across like an X going back...
> *Denise:* Everybody knows you....
> *Whitney:* And then, you go any way you want. You can make it go FD, it (the turtle) will go forward, any way you want. And you can put LT (left), RT (right) and FD (forward) and stuff...
> *Ricki: to Denise:* Can you turn 360 degrees for me?
> *Whitney:* That's hard. *(Denise turns around making a big circle.)*
> **Denise: I did it in here, right here.** ***(She gestures to her chest.)***
> *Ricki:* Did you have to move anywhere or not?
> *Denise:* Yeah, I had to move 'cause I had to do a circle. *(She makes another big circle with her whole body.)*
> *Ricki:* You can't do a circle in one spot?
> *Denise:* Well....
> *Ricki:* Would that still be 360 degrees?
> *Denise:* Yeah, if you do a small circle....*(She gestures with her fingers little tiny circles.)*

When she said, "It's in here," she pointed to her chest as if the circle were inside her body.

Children not only identify with the turtle and their learning, but they also begin to reflect on their own thinking. They bring their whole selves into their learning activities. In fact, Papert's goal for using Logo is to provide a context within which a "thinking culture" can grow. To achieve this goal, Logo needs to be understood as a tool to create the cultural context within which children and adults can be engaged in a range of constructionist activities ranging from LEGO/Logo to music and theater.

As one of the founding members of the Project Headlight research team, I was interested in documenting how children appropriated their learning. What did identifying with a turtle cursor and making it her own really mean for the child during recess or at home? When Denise points inside of herself, what does the gesture mean for her? When she shows me how she makes a circle by physically walking along a made up circumference rather that standing in one spot and spinning, what does that mean about her thinking? How is the notion of a 360 degree spin of the body fundamentally different from thinking about the circle as a closure of a territory? Which is the product of schooling and which is the product of the Logo culture? How do the two ways of thinking about circles interact in ways which give the child a more personal relationship with their own learning? These were among the group of questions which led me to the research process described below.

The Research Process

The five phases of the research project were:

- Phase I: Collecting data by observing and videotaping my interactions with the children called, **"Researcher as Participant Recorder."**
- Phase II: Editing linear 'movies' and non-linear chunks from the video data called, **"Editing for Linear and Non-linear Presentation."**
- Phase III: Identifying, selecting, classifying, and categorizing the video segments for videodiscs, called **"Selecting Video Data for the Videodiscs."**

•Phase IV: Building the interface for *Learning Constellations*, called **"Designing *Learning Constellations*."**

•Phase V: Using *Learning Constellations* to analyze data and to build theories about the children's styles of thinking, called **"Reconstructing Case Studies of Children."**

Phase I and II: Videotaping and Editing

Why Video Research

The belief that all children are storytellers and creators of their own narratives guided my research project. My attention focused on the intentions or meanings of the stories and experiences the children shared with me. My overall approach was epistemological, although the psychological was of obvious interest. However, the approach most clearly influencing the initial phase of my documentary research was that of filmmaker, Richard Leacock, sometimes called the father of Direct Cinema, or Cinema Verité. Leacock's *Canary Bananas*, filmed and edited when he was still a teenager, convinced me that that observational eye of the filmmaker could contribute greatly to our understanding of children integrating new technologies into their lives. With the added influence of the films of John Marshall, especially one called *N'ai*, and the writings of ethnographer Clifford Geertz, video and multimedia ethnographic research emerged within Project Headlight.

In the beginning of my video research, I videotaped what I understood to be significant to the theories I was interested in studying. As I became a participating member of this culture of children, my focus moved from testing out my hypotheses to finding out what theories children have. As Mary Catherine Bateson writes:

> [I]n anthropological fieldwork, even when you take with you certain questions you want answered or certain expectations about how a society functions, you must be willing to turn your attention from one focus to another, depending on what you are offered by events, looking for clues to pattern and not knowing what will prove to be important or how your own attentions and responsiveness have been shaped.[5]

Videotaping the Children and Editing the Footage

Twice a week, for two–and–a–half school years, (the camera and) I interacted with the children in ways that built non-pedagogic and thus, in most cases, non-judgmental relationships with them, by eliciting responses about their theory-making while I was recording our interactions with the camera placed on my hip or on my lap.

Throughout the filming phase, I edited many "slices" from the footage, short video works which demanded a close look at what it was that I was actually shooting. In fact, the editing phase started soon after the video recording did and lasted far into the fourth year of the project until the final videodisc was pressed. The shortest possible description of this phase is that, first, it entailed learning the language of the moving image to express an idea from the original rushes; and, second, it required a working knowledge of the mechanical or technical functioning of how the video from the source deck gets recorded on tape in the record deck.

By language of the moving image, I mean that I had to watch many films with a new camera eye. I no longer merely enjoyed a film; I scrutinized each edit, each move or direction of the camera, the timing between edits, the closeness of the shot, the transition to the next shot, the fades, the pans, the abrupt versus the gradual cut to the next scene. And with each observation, I asked myself, what message does each of these film gestures connote? Do they always mean the same thing? How does context affect the meaning of the gesture? And the question which kept astounding me was why I was learning more about observing children with the camera while editing the rushes than I did by repeated videotaping.

While editing[6] I learned what my observations communicated to me and to others. While editing, I "fell in love," as Richard Leacock often says, with my research. The magic of the art of editing and the wonder at the science of fine-tuned analysis struck some silent, familiar chord deep within me.

Phase III and IV: Designing the Videodiscs and the Interface

From video to videodisc – the design process

Phase III included selecting, collating, and categorizing of the video data for building the videodiscs, and Phase IV included the designing of the videodisc interface for users to access the video and text data.

Phase III was accomplished by designing and building a HyperCard logging tool called *Star Notes*[7] for filing each chunk of video.

Orni Mester, my assistant, and I defined a chunk of video as a segment rich enough in content that a viewer can understand its meaning if it were viewed in isolation. Each chunk of video can be thought of as a unit, a grain or an atom. *Granularity*,[8] used more commonly in the technical sense to describe a video signal, becomes *content-granularity* in this context. In other words, how do we know that a chunk of video is "enough and not too much" to retain the meaning of what was really going on at the time the video was taken? Obviously this question needs to be addressed if we are to use video data as a reliable source for informing ourselves about the meaning of people's actions.

Designing *Star Notes* enabled the identification and building of categories out of discrete video chunks. Using this system meant that searching through the vast data and building classifications, or, thematic groupings of cards which corresponded to the video sequences was a systematic process which took all the original video data into consideration. Each HyperCard *Star Note* contained a full description of the video chunk as well as Keywords. We defined a Keyword as a theme which emerged by viewing the material.

For example, after describing a chunk about Mindy saying Josh and Joe "have a big imagination, but I have a wild imagination," one obvious Keyword which emerged was "Imagination." Another was "Reflection."

Star Notes facilitated the composition of the videodiscs; once the central themes emerged from the Keyword searches, the design of each videodisc could follow a thematic integration of the material around that theme. Not only was the process of designing *Star Notes* an aid in selecting what video was most relevant from what was less relevant worth exploring in and of itself, but this process also led to the following phase of building a random-access videodisc environment.

From videodisc to "Learning Constellations"

The metaphor *Learning Constellations* seemed best to reflect my understanding of a multimedia research environment. A *star* is a chunk or a discrete unit of video or text. By linking stars together, we form *constellations*. Moreover, stars in constellations appear differently from different *galaxies* in the universe. Where one is situated at a given place determines how one clusters groups of discrete units.

The fact that we draw conclusions from what we are able to see and grasp from different perspectives is a good metaphor for thinking about how we think. It is also a helpful model for designing a multimedia ethnographic tool. Not only can researchers see a video chunk differently when grouped together in several possible constellations, but also they can share their perspectives, exploring a range of themes.

It was and still is my theory that the way we look at discrete chunks of video is influenced by the context in which we view these chunks. In other words, if the user first meets Josh in my linear video called *The Growth of a Culture,* she may construct a somewhat different point of view than if she first meets Josh while he is discussing horses during a class presentation. However, by linking them together in the same constellation with other related video chunks, one could begin to build a theory about why Josh is so lucid, "exceptional," and insightful when sitting on a hill outside the school and so "regular" when talking about horses in front of his teachers and classmates.

Phase V – Analyzing the Data to Build Portraits of Each Child

Discovery

Analyzing the video data began the moment I started viewing the footage. Another phase of analysis took place as we decided upon themes or Keywords about the video chunks and designed the placement of the video for the videodiscs. However, the analyses in those first four years were intuitions about what was happening rather than fine–grained examinations.

The fine–grained analysis began while using *Learning Constellations* with the selected video data. *Learning Constellations* enabled me to move from chunk to chunk, searching, finding, and linking related words, people, topics, and ideas. Often, a question would arise, such as: How did Josh change in relation to his being filmed over the two years? Within minutes, I could chunk within chunks and link snapshots of Josh together. Using the slow motion feature, I could view a small segment forward and backward; I often discovered connections I had never made even though I had been working with the same video data for four years. The slow motion feature was especially helpful in analyzing the reaction of a teacher to a child. By annotating and writing notes within *Learning Constellations,* I began to formulate my ideas around themes, topics, ideas and theories.

Nevertheless, an unexpected surprise occurred while writing the case studies, or portraits, as I prefer to call them. *Learning Constellations* provided me with access to the actual footage in an instance. Keeping several applications on, I could "jump" from my word processing application to *Learning Constellations* with a click of the "mouse" and view or read the data. Often, what I had remembered was not exactly what was said or done. Even when my memory was accurate, contextual details would be missing if I did not refer to my data as I was writing. As a result, the case studies of Mindy, Andrew and Josh were written with the video data, the annotations (by researchers, teachers, faculty, visitors and myself), and the transcripts of each chunk of video available to me while I wrote.

Communication

My case study analysis is also the result of a "dialogue" that went on for eight months with a varied audience. The occupations of persons who have been exposed to *Learning Constellations* include filmmakers; education and ethnography researchers and faculty; members of the National Science Foundation; computer company executives, designers and user–interface researchers; teachers; scientists; artists; cognitive scientists; psychologists; and pupils. Their varied questions brought me closer to understanding the children and why I chose to use this approach to investigate children's thinking.

This dialogue was not only between myself and those who watched the video data on *Learning Constellations*. It *is* also a "dialogue" between the user and her/himself while using the system—annotating, and following through on what s/he finds interesting. The dialogue is also on two other levels: between her/himself and the video of the children, and among themselves as a group of users. To illustrate a sample dialogue of a user with herself about how *Learning Constellations* could be used with others, let me cite Maureen Hansen, a teacher from California, who worked on *Learning Constellations* for two days and wrote:

> I want to relate how I see *Learning Constellations* as a teaching device and as a forum for dialogue on critical educational and social issues.
>
> First, as a teaching device. This amalgam of the computer and the camera transfers to the preparation of teachers at the colleges and universities, and could revitalize these curricula.

> There is much about children that can be learned from this medium. The proactive power of organizing the data not only gives the student of education some control over her/his learning, but could be used by professors as a component of evaluation. I hesitated when I wrote that because evaluation carries such a semantic yoke of oppression. Nevertheless, creating a personal "Constellation" might be more engaging and enlightening than the traditional term paper. I suspect strongly that it would. And further, I do not believe it would demand less effort, perception, or scholarship to do this well.
>
> The other potential use is as the instigator of controversial exchange about racial, economic, and gender issues. This might be the least obvious application, and, ultimately, the one that can make this tool an instrument of reform. (July, 1990)

One could ask what the input of others has to do with my analyses of the children. To answer this, I would like to point out two aspects of my method of analysis. The first is that my individual style of learning is negotiational and interpersonal. Forming meaningful relationships with people are my starting point for conceptual understanding. *Learning Constellations* was the medium through which I expanded my connections with people about the subject I am strongly committed to—the freedom of the human mind to explore her/his ideas for the benefit of humanity.

The second aspect about my method of analysis which answers this question of communication with others as an essential part of my analysis is that my educational philosophy is to reform traditional views about learning. Collaboration among learners is a means to this end. Therefore, writing the case studies was a pulling together of the many shared moments I had had with the children, teachers and with my many viewers.

The results of this phase of analysis are the three case studies of the children and the one of the Hennigan School.

Issues In Video Ethnographic Research

How the Video Researcher Becomes a *Participant Recorder*

Since the goal of my video research study at this school was to gain insight into the thinking of children, I set out to use a research tool, the video camera and videomaking, and implement a methodology, the ethnographic approach, to gather data by encouraging self-expression, communication and non-instructive learning.

This process included using video as an investigative tool for looking at how a culture could grow with the appropriation by children of computers to enable them to think about their thinking processes. This was accomplished by my asking questions which reflected their own work while programing or playing. The questions I asked were influenced by my previous experience as a teacher and teacher of teachers using Carl Roger's reflective listening techniques[9] for eliciting responses. The origin of the questions mostly stemmed from my genuine interest in what they were doing. Due to the invasiveness of videotaping, the first step was either to be invited by the child to see what she was doing or to ask permission to participate with the child while she was working. This does not mean that I did not regularly walk around recording many things in and around the open space—the computer pods—wherein the computers were arranged. However, when I sat down beside a child working, I asked whether or not she wanted to tell me (and the camera) what she was doing or thinking. And if the answer was "No," then I did not record. My questions tended to be open-ended and non-directive while provoking reflection. Therefore, I was able to use the recording capacity of video as a tool to record and elicit responses. Moreover, with the camera, I had to rethink the role of the individual researcher as not only being a participant observer of a culture, but rather, being a *participant recorder*.

How the *Point of View* Can Enrich the Meaning

To open this discussion, I will quote Bateson to provide a framework for thinking about *point of view* in doing ethnography:

> You learn to watch for both harmony and dissonance. In ethnography, you also watch the people around you to see what they regard as ordinary and what they regard as unusual, and then you review your own responses because you bring your own biases and expectations. Then, if you are doing ethnography or natural history, you record carefully what your attention has allowed you to see, knowing that you will not see everything and that others will see differently, but recording whatever you can so it will be part of the cumulative picture.[10]

A central concern of using video as a research tool is how does one know that what is being videotaped is research data, even if one tries to include as much as one can? Moreover, how does one know that the video one selects for either linear or non-linear usage is the most representative from the whole body of video data? Both of these concerns are concerns about point of view, or more pejoratively called bias, in research.

One way of looking at the issue is to ask oneself the question: what is the line between bias and interpretation. Is it as Davenport[11] suggests, based on whether or not we agree or disagree with the point of view of the author or filmmaker? If we do not agree, we tend to say that a given work misrepresented the issues; if we agree, we think that this was an interesting interpretation of the facts. The issue is yet more complicated. I can agree that a given point of view is biased and still enjoy its interpretation as humor or an interesting way of presenting what I know are not all the facts. The documentary *Roger and Me* by director Michael Moore[12] exemplifies this seeming contradiction well. The viewer has an opportunity to "journey with" Moore through Flint, Michigan trying while he attempts to get an interview with Roger Smith, Chairperson of General Motors. The movie was thought scandalous by those who expected this documentary to tell the whole "truth" about Flint. Those who agreed with the interpretation naturally liked the movie and thought it not to be biased. Others, who did not agree, did not like the movie and said it was a misrepresentation of what happened in Flint when General Motors closed down its factory there. But, some others, accepted the bias *and* the fact that is was not the whole truth, and also felt it contributed to their understanding of Flint. The latter were not interested in whether or not it told the whole story, but rather were interested in the fact that everyone in the movie—from the woman who sold the rabbits for food or pets, to the visiting wealthy party-goers in a local prison, to the workers at General Motors—had a story to tell.

Perhaps, a more productive way of looking at these concerns is to invert the question by asking why personal bias is so often excluded from informing us about the subject under investigation? In other words, why have we researchers tended to adopt models for doing research that do not incorporate the personal, subjective, and interpretative approach? Investigation into the theory of learning styles[13] and of personal involvement or appropriation of the learning process[14] suggest that research could benefit by acknowledging the intimate relationship between the seer and the seen, or the observer and the observed.

Video recording for research purpose cannot be without point of view or bias. What is characteristic of using video is that point of view cannot be overlooked. Even in the most "objective" research projects with video on a tripod in the corner of the room, the researcher chooses where to place the camera, how "tight" or wide the shot will be, at what angle the camera will record, and who will be in the camera's view. Moreover, her/his defining the use of the camera as a stationary object is also a point of view. One tends to think that the least manipulation of the camera is the most objective, but that may be missing the central issue. Even the "hidden" camera is a result of the researcher's perspective about 1) how s/he views the culture and 2) what her/his reaction to it is. Perhaps both Bateson and Leacock address this issue most satisfactorily: Bateson says that one comes to terms with point of view by reviewing and documenting your own personal responses; Leacock concisely and precisely puts it this way: "Filmmaking is the filmmaker's perspective of what takes place in front of the camera when the camera is turned on."[15]

To rephrase Leacock, video ethnography is the ethnographer's perspective of what takes place in front of the camera when the camera is turned on. An advantage to the video ethnographer using multimedia is that s/he may choose to supplement her/his video with text, documents, field notes, and other data.

How a "Culture" is Created by the Researcher Using Video Technology

When thinking about using new technologies with which to do research, the tendency is either to discredit the possibilities or to exaggerate the potential. One tends to forget that the individual researcher using the technology is a more significant indicator of the potential of the research than is the power of

the tool. Even a well-designed tool is only as good as its user. Often, the *bigger* or more sophisticated the technology, the less is our potential for observing what is really happening. The point is that regardless of the technology used, technologies need to be thought about in completely different ways. It is not enough to use better technologies to do the same things "better." The idea is to let new technologies enter our lives in a comfortable way in many domains, so that something new can happen to the cultural lives of people. As Papert says:

> Let me say some more about video or movies or the cinema. The first uses of movie cameras were exactly like that. *(Papert gestures at the camera in front of him.)* They set them in front of a stage and they acted a play. This was using the technology to do essentially what you were doing before but with a new twist. If we think of what's happened since then, then, as a result of it, it's not that the technology has gotten *better* and we can turn better cameras and more powerful cameras in front of the same stages. This thing that you call cinema, movies, or film—it's a culture not a technology. It's not a technology applied to something that existed before. It's produced new roles for people in society—take the concept of a *star*... The way movie stars enter into the lives of people growing up today is totally different than anything that happened ever before. I see this as a prime example of the way in which a technology has been integrated into the growth of a culture.[16]

Using the videocamera and videodisc technology is not merely a better research tool; it is a viable research tool which extends an already developing culture around the idea of the moving image. If Papert is correct, as I believe he is, about cultures growing in the context of technologies, then there is a need to investigate the impact upon the culture when video is collected and then viewed or manipulated.

Papert elaborates his theory of growing cultures by discussing how videomaking became part of the existing culture of the Hennigan School:

> I use the word "culture" and I'd like to bolster that by some images: I think a good image is the way some other technologies have been appropriated by society in creative ways... Ricki Goldman is working in the same Hennigan School and is exploring some exceedingly different ways of using this machine.

> She hangs around the school and tries to get pictures, unobtrusively, of what the children are doing and sometimes tries to use her presence as a way of evoking discussion. By interviewing the children and letting the children interview her, they talk about things in different ways, and this is part of the "picture-making" becoming part of the culture of the school: its presence there changes the way children think about what they see on television at home because they have been so intimately connected to the "television-making" in the school. And the way they talk to Ricki has a lot to do with the reactions they make to everything to do with moving images on screens everywhere in society. It's all part of a complex meshing of different processes. This is the way we have to see new technologies.[17]

Papert's main point is that we need to think about the emergence of new technologies in the way we think about art, filmmaking or transportation. Thinking about bigger and better carriages did not necessarily lead to the exploring the planets, and thinking about better Impressionism did not bring about Picasso's Cubism.[18] Papert's theory is that when we think about new technologies, we need to think about how technologies extend our natural cultures so that new kinds of things can happen to people.

Thus, when we think about a possible effect of the researcher on children's thinking who uses video technology as a tool, we need to address how the children appropriate the research. It is my contention that, if permitted, the children begin to direct the research and the adult researcher becomes the child's camera–person who follows the direction of the child. It is at this turning point that the child shows the adult what paths to follow if s/he is truly interested in finding out about who that child is.

How Events are Described, *Thickly*

To build a comprehensive video and text description of the three children in this Logo culture, I will often refer to Clifford Geertz's concept of *thick*[19] *descriptions*. Thick descriptions are descriptions that are layered enough to uncover the intentions of a given act, event, or process. What makes a description *thick* is the quality of the description.

Gilbert Ryle,[20] an Oxford scholar, first coined the expression thick descriptions as a means of differentiating between what is really happening when the same action appears to be happening. (For example, if there are five people sitting on a rock each with his hand on his chin, how do we know which of these persons is really the thinker of thoughts, "le Penseur," as Ryle calls her/him.)

The purpose of understanding thick descriptions for this dissertation is to make sense of the video observations taken in the school and to communicate the interpretation of these observations to others—*commensurability*, as Geertz would term the communication of one culture to another.

In a video research environment, thick descriptions are video images, which retain the original meaning. Neither the quantity nor the resolution of the images make the descriptions thick. What creates thickness is the ability of the visual description to transmit what is really being said. The reason for understanding the necessity of thick descriptions in a video or videodisc environment is that they provide us with a way of articulating the meaning of what we see. Thick descriptions also help us come to terms with the problems inherent in observational research—it "tends to resist any kind of systematic evaluation" and, like all interpretive approaches, it is "imprisoned in its own immediacy or detail."[21]

My interpretation of Geertz is that if my descriptions of children are thick enough—layered and dense enough to get close to understanding the intention of the act, then I can begin to say something meaningful about what was going on in this Logo culture. The contributions I would like to make to Geertz's theory are twofold. My first contribution is to apply the notion thick descriptions to the chunking of video data. Each chunk would need to contain enough contextual information for the content of the video to be interpreted within a range which does not distort the original meaning. A possible second contribution, to be addressed in a related research project, would be to apply thick descriptions in thinking about how people build their theories. For example, if learners are given opportunities to make connections which are layered, thick, or textured enough, then they also could build theories which come close not only to their own inner meanings but to the meaning of the object of their investigation.

Both in video recording and in putting together segments of video, the researcher builds a video description of a person, place or event to communicate the meaning or the intention of what was happening at the time it was recorded. Both in video and in text-based ethnographic research, one is working with the material "stuff" on a piece of tape or text as well as with the remembered stuff of the original experience of the event.[22] In editing the video data, both the material and the remembered products come together to create different video slices of the initial experience. Many directions emerge—each with its own truth to the total experience; each adding a more textured or thick description of what was going on at the time. The question is: how much layering is enough and how much is harmful?

An example of this problem can be illustrated by considering what happens during the editing phase. What gets placed beside a segment of children's fingers typing at a keyboard could lead to a piece about the exploration of typing styles by placing a shot of other children's fingers in the following segment; or it could lead to a piece about the body language of children using the computer—by placing shots of different parts of the body videotaped from different angles, directions, and distances in the following video segments. Neither may be the truest portrait of what happened as there may be many portraits. Moreover, each on its own may be *thick enough* to come close to what was experienced by the children at that particular time and place.

Another way of thinking about this is to consider when both video pieces are viewed together, the different directions provide the viewer with a closer understanding how children in this learning culture with computers gesture in ways which communicate their individual appropriation of the computer. What emerges by this layering of different video cuts may lead to a thickening of the description, enabling the viewer to come close to the meanings and intentions of the action.

How to Reach Conclusions from Selected Video Data

Since every user will access the data differently and will view even the same data through different eyes, the thickness of the description of the act, event, or process may provide a measure to ensure that conclusions, although not the same, fall in the same range.

To build thick descriptions one can begin by building up from the smallest unit of meaningful content. Whether this be a contraction of the eye–lids, a word, or constructing a program in Logo, content granularity is decided by examining the original purpose of the person who contracted her/his eye–lids, spoke, or wrote a program. Because researchers are bound, as Weber would say, by their "own webs of interpretation,"[23] conclusions will be both limited and enriched by the researchers' experiences. What researchers can do in this hypermedia environment is to show thick slices of what they observed. In other words, they can select and share the material to let the user come close to their interpretation of the intention of the person who experienced the event.

Although Andrew will be described in greater detail, a small slice may be most illustrative of this issue. My initial interpretation was that Andrew was an articulate child and an exceptionally good storyteller with a large fantasy life. He would tell me stories of a boy who flew to the planets, and about a duck who got fat/pregnant and had an ugly duckling who was hated by all his brothers and sisters. He often told me about journals he was writing, about his mother's aspirations for him, and his plans to be a professor. Once he told me how "memory in the computer is just like the memory in the mind. Only a kid, unlike adults, never forgets, not for at least two years. The computer can only remember for about a year."

Half a year later, I met with and videotaped Andrew's teacher, Linda Moriarty. The story got more involved, or thickened, when she told me about Andrew the liar, Andrew the child who brought a knife to school, and Andrew who did not write in his journal but rather made up stories.

The conclusions I built about Andrew still focus on the fact that he has a special ability to make up stories. These stories can be thought of as "lies" by those who believe that ten year old children should separate fantasy and reality. However, we can look at the stories and the things he makes up in his head in quite another way. We can use them to inform us about how children piece parts of experiences without appropriating them.

The point of view I want to communicate is that Andrew is a story*teller*. He was inventing the stories as he told them. It may also be that Andrew resolved his fears of a punitive parent; found confidence in himself as an interesting and unique person; and, for a small moment, experienced the glow of glory while telling his stories to a friend with a camera.

His constructed fantasy world might have worked better in a society less reality bound than is ours, in an earlier kind of society where storytellers were regarded as the keepers of the heritage. However, in our pragmatic world, few environments exist for a ten year old who spends a lot of time trying to distinguish between reality and fantasy in order to reach some negotiated balance.

It is my contention that the constructionist Logo environment at the Hennigan School encourages children with Andrew's narrative flair, with Mindy's interpersonal skills and with Josh's curiosity about moving things to find their own path.

Hopefully, I have captured these and other strengths of Mindy, Josh and Andrew in both my videodisc portraits and in the written case studies.

To conclude this chapter, I cite Hansen once again:

> The *Learning Constellations* package is a most liberating item for the researcher. The "stuff" of the research is the actions, words, contexts, and inferences that live through the film, that hang on the line to dry, to blow in the wind, to twist around the cord and each other, to be viewed by the neighbors, and, perhaps, to fall to the ground. The data for us is the children, teachers, classrooms, [and the children's] ideas, fears, and strengths. The video camera gives us this data. (July, 1990)

PART I

THEORETICAL OVERVIEW

1 Video Ethnography Perspective

Introduction

In this chapter I discuss the theoretical issues related to doing multimedia video ethnography using documentary–style video footage. I propose that Geertz's notion of *thick descriptions* can be used for investigating the meaning and intention what was being said or done. This search for understanding the meaning of an event often leads to problems of interference with what is going on as well as the personal bias in reporting it. The more the researcher participates, the greater the possibility of interfering with what is happening. Similarly, the more s/he participates, the greater the bias.

This chapter raises the delicate balance among these issues and illustrates, through an analysis of the films of Leacock, Marshall and one of my videos, that participation need not cause negative interference and point of view can enrich our understanding and inform us of what was going on when the event was recorded. I raise these concerns in order to address the problem of misrepresentation and misinterpretation of non-linear video. In non-linear multimedia ethnography the pieces or video chunks can more easily be taken out of context. Can we find a way to articulate what constitutes a chunk?

1.1 *Thick Descriptions* for Articulating and Building an Ethnographic Research Environment

As defined in the introduction, *thick descriptions* are descriptions that are layered enough for readers/viewers to draw conclusions and uncover the intentions of a given act, event, or process. In a video environment, thick descriptions are images/gestures/sequences that retain meaning. Neither the quantity nor the resolution of the images makes the descriptions thick. What creates thickness is the ability of the video image to transmit the meaning or intention of what is being said or done. The reason for understanding the necessity of thick descriptions in an interactive videodisc environment is that they provide us with a way to articulate the meaning of what we experience.

The notion of thick descriptions helps us come to terms with one of the problems inherent in video as research—that visual documentation tends to resist our reaching the same conclusions about the same video segment.

1.1.1 The Problem of Reaching Conclusions in Multimedia Ethnography

In general, one could say that documentary-style video ethnography combined with videodisc technology as a delivery system could enrich the future of ethnographic educational research. It could give the users of the videodisc workstation access to the selected and original data, encouraging them to manipulate the material in a variety of ways. Users of the videodisc research have the ability to examine the original documentation, make their own observations, compare their observations with other researchers/users, and compile the data with new levels of interpretation.

An attempt to address the problem of finding a systematic way for different viewers to reach similar conclusions about the same content was addressed in the design of *Learning Constellations* by paying attention to *content-granularity*. As mentioned earlier, content-granularity is a way of defining the smallest meaningful unit of content for any section of material on the disc. It is a measure for setting a minimum grain size to ensure that the unit cannot be subdivided. Building a system where each unit is a thick enough description enables the user to come closer to understanding the underlying intention of the action, event or process. As a result, conclusions, although not the same, tend to fall into the same range.

1.1.2 The Video ethnographer Recording the Video Data, *Thickly*

The Role of Thickness in Issues of Interference and Bias

When videotaping at Project Headlight, I recorded the data with as much context as possible. In this subsection, I will describe why the context or the thickness of the description is necessary during the first phase of recording the data.

Where does the thickness begin when one is studying cultures? Does it only begin when the ethnographer sits down to write her/his description or does it occur from the moment the participant observer enters the culture?

For Geertz and Bateson, even the ethnographer who is strongly committed to living in the culture without changing or manipulating any events for data collection is nonetheless affecting the environment.

Geertz emphasizes the fact that "anthropologists don't study villages, they study in villages."[1] For Geertz, if you want to understand anthropology or any science, then you should examine what those who do it do. Thus, in order to understand what anthropology is, it is important to describe what it is that anthropologists do. According to Geertz, anthropologists do ethnography. They establish rapport, select subjects or, informants, take notes, keep journals, and collect any other relevant data such as maps, genealogies, or texts.

Bateson describes this process of data collection as one which requires the least possible interference from the researcher. This does not mean Bateson is naive about the influence of the participating observer. Far from it. She is aware of the delicate relationship between the observer and the research. Her summary of the role of the anthropologist is someone who instead of using the field as a laboratory to set up and test hypotheses actually lives within the flux of human life. The anthropologist doesn't manipulate the environment to generate data, s/he studies it as it is. As she says in her own words:

> Anthropologists sometimes speak of their field as their laboratory, but in general our knowledge is based on observation rather than manipulation. **Where we act for change it is to achieve goals seen as valuable rather than to generate data.** Usually, our experiments are those arranged by history and most of our variables are embedded in the flux of human life and cannot be isolated, having neither beginning nor end but unfolding over time. Traditionally anthropologists have not been able to work with randomly selected populations and matched controls; their data have come from one to another only because the place of each was known. Each life history, and the record of each community with its own distinctive and interlocking patterns of adaptation, is valuable and to be recorded, a unique experiment.[2] (bold added)

Ethnographers begin their documentation by accepting the fact that what they record in their field notes is already an interpretation of an event. The recording of the event is, in some respect, fiction, because it is a picture of what the person who is participating in the event is experiencing.

Moreover, the observer/recorder, by her presence in the environment, is affecting the culture within which she is collecting her data. Readers of all the social sciences often have a tendency to accept the results of researchers who have gone into the field to do their studies without questioning the underlying biases of this initial phase of the documentation; they do not ask the following questions: When does the ethnographer put pencil to paper? When does the video ethnographer turn on the camera? What does she select to record? What does she not select? What is in the frame and what is not? What detail is focused on and what is excluded. What does she experience while she is recording, looking through the viewfinder? What does she stop experiencing of the event she is recording, the moment she starts the process?

The main question to ask is not whether or not the results were influenced by the presence of the video ethnographer but rather how s/he provides us with thick descriptions in her recording of the people, processes or events s/he was investigating to understand the meaning of what was happening.[3] What ethnographers can contribute is a way to look at differences and appreciate them. They do this by their involvement with the cultures they study. Thus, when we consider the building of thick descriptions by ethnographers, we need to look at the relationship of the ethnographer to the culture, her/his participation within it, and the point of view s/he entered the culture with.

If we believe that communicating with other cultures is crucial for the welfare of our planet, or, on a less grand but nevertheless important scale, helpful for our day to day relationships with people around us, who are microcosms of the cultures they come from, then understanding how the participant observer interpreted what s/he recorded—when someone contracted her eyelids, or raised her eyebrows, sat with her arms crossed above her head, or scratched her forehead—becomes the basis for our initial discourse with that culture.

To answer the question of how the video ethnographer builds thick descriptions, we need to be aware of not only why s/he chose to shoot a particular scene, but also what has been selected and what has not been selected in both the recording and editing process. For example, in a Leacock film, called *Young Republicans, A New Breed*[4], ten or more Barry Goldwater campaign organizers are sitting in a hotel room discussing an upcoming campaign.

Lunch is being served to them by a conscientious young waiter. One of the politicians decides it is incumbent upon him to decide who gets which steak—as some are rare, some medium rare and some medium. Leacock, interested in how decisions are made, was first following the political discussion. Instinctively(?), Leacock realizes that the truer story[5] about the way these men make decisions, or rather, have problems making decisions, is the confusion they create as they each go about figuring out which steak is the one they each ordered. The shift of focus from the business of campaigning to the finding of their steaks provides a thicker description of the situation than would have been possible had Leacock stayed with the content of the meeting. In fact, it almost becomes the content of the sequence.

What I am referring to is not just a better shot made for aesthetic purposes. What Leacock did was to make a strong statement about how these politicians make decisions by capturing the modus operandi which each of them uses to get what he wants—in this case, the steak which he ordered. This recording of data is the first stage in the process of ethnographic filmmaking which may influence the total thickness of the description of a person, action or event. Leacock makes an instinctive and spontaneous decision about what to record; his peripheral vision seems to catch more of the intention of the action than does the sequence of the logical, chronological events. Not only does he reject; he selects, and vice versa. His camera work seems first instinctual and then becomes precise and deliberate.

The recording phase of ethnographic filmmaking obviously influences the thickness of the description.

One spring I drove to Washington to do a video piece on cherry blossoms.[6] A friend mentioned that free food was being prepared and given to the homeless outside the Capitol; immediately, I went to see what was going on there. I videotaped the men eating, the mushy food in huge pots (reminiscent of labour and concentration camps), the snow falling on the pink and white cherry blossoms, and of the Capitol looming above in a grey mist. One toothless black man in his thirties kept talking to me while I took my shots; I responded with reluctance to his persistent banter—until I realized that the story was not just the juxtaposition of blossoms and snow, nor of grandeur and poverty; the story was about this man's persistent interest in my activity. He wanted to know what I was doing and why. He wanted to make contact with me, to get my phone number and call me in Boston.

The moment I became aware of my reluctance to film him, I shifted my focus and let the camera record how he talked to me; how he found a wet match-package in the garbage to write down my telephone number; how he bit off the wood at the nib of the pencil so it would be sharp enough to write with; and how he smiled shyly and winked one eye when he spoke of where he lived and why he comes to eat a meal at the steps of the Capitol.

The toothless man became the focus of the story not because of *the story he told me.* He became the story because, as the video ethnographer, I realized that his every movement, gesture, and action added more thickness about coping with this situation. The truth (or interpretation, as Geertz would say,) about this event lies embedded in the richness of my visual description of a man standing in the rainy snow trying to write down a phone number of a woman holding a camera.[7]

In the same way, my filming at the Hennigan School reflected initial choices about what I wanted to say about that particular Logo culture. I knew what to film as soon as I asked myself what I needed to say about the lives of these children As Jean Rouch states:

> I think that to make a film is to tell a story. . . Good ethnography is a theory and a brilliant exposition of this theory—and that's what a film is. That is, you have something to say. I go in the subway, I look at it and I note that the subway is dirty and that the people are bored—that's not a film. I go on the subway and I say to myself, 'These people are bored, why? What's happening, what are they doing here? Why do they accept it? Why don't they smash the subway? Why do they sit here going over the same route every day?' At that moment you can make a film.[8]

1.1.3 The Video Ethnographer Editing the Video Data, *Thickly*

Another phase which influences the thickness of the description in ethnographic filmmaking is the editing of the documentary footage. In *N'ai,* [9] a film by the documentary filmmaker and ethnographer John Marshall, the African Bushmen are out on a hunt to kill a giraffe. The men run up to their prey throwing their poisoned spears at this majestic beast. After a long chase, the giraffe finally falls, affected by the slow-acting poison. The fall is not tragic, nor sad.

The viewer does not experience the hunt as a cruel, unnecessary act of the human against the beast. Quite the contrary, the delicate balance of nature is seen in the careful attention to both the men and the giraffe.

The beauty of this film as a tool for understanding the event is that the observation, recording, and selection of material for sequences are so sensitive, so thick, that the viewer can see as close a replication of the experience as possible—in this case, the thin and hungry look of the men and the frail poise of the giraffe. The Bushmen's throwing of the spears is not an act of hatred for the animal, but rather an act of respect for a giraffe which will provide the sustenance for life. The Bushmen do not rejoice in the killing; they rejoice in the knowledge that they and their families can eat again. As strong an image as the gentle falling of the giraffe to the earth is, so is the image of the sleek walk of the Bushmen on their hunt.

The manner in which this sequence is edited is made even more powerful by a contrasting scene when the white park warden comes to the village to tell the tribe that they cannot kill giraffes anymore. He explains how the preservation of the giraffes has to take precedence over their needs. Although the warden is a kind-speaking person, the juxtaposition of these scenes makes one question how the balance which the Bushmen maintained with their environment for centuries has suddenly become endangered. The very people paying the price for the rape of their land are the indigenous peoples who knew how to live and how to die with what nature provided for them. Kate Higginson, a thirteen year old girl in the audience, understood the intention of the movie as embedded in the thickness of the description when, after watching the film, she said:

> It's so sad. They can't live in the world they used to live in because it doesn't exist anymore; and they can never fit into the world the white people live in either. What will happen to them?[10]

1.1.4 The Video ethnographer Assessing the Video Data, *Thickly*

Thick descriptions can help us articulate the meaning of what we see as data in video ethnography. Nonetheless, there is still the problem of "systematic modes of assessment"[11] which Geertz thinks descriptive forms of research do not address.

His concern is that descriptions are often "imprisoned in their own detail" and do not reach defensible generalizations.

> The besetting sin of interpretive approaches to anything—literature, dreams, symptoms, culture—is that they tend to resist, or to be permitted to resist, conceptual articulation and thus to escape systematic modes of assessment....You either grasp an interpretation or you do not, accept it or you do not. Imprisoned in the immediacy of its own detail, it is presented as self-validating, or worse, as validated by the supposedly developed sensitivities of the person who presents it; any attempt to cast what it says in terms other than its own is regarded as a travesty —as, the anthropologists severest term of moral abuse, ethnocentric.[12]

Geertz is saying that if indeed we want to consider ethnography a field a science, then ethnographers must formulate a conceptual framework even if the terms in which it is expressed are nearly nonexistent. The task of building a theoretical framework is to make *thick descriptions* possible in order to generalize within the particular event. In other words, within each event, we should be able to start with a set of signifiers or symbolic acts and to analyze how they fit into the framework of social discourse. This does not preclude the possibility of using theoretical ideas from one study to the next. As each new interpretive study yields its theoretical frameworks, certain discoveries are made. Geertz's acid-test for theoretical ideas are their usefulness. If they continue to be used, revised, elaborated upon, then they are defensible interpretations; if they stop being used, then they are reformulated and eventually discarded.

1.1.5 Thick Descriptions to Uncover *Universal Signifiers*

The purpose of building thick descriptions is to communicate the meaning of the signifiers of one culture to another. When we consider the ethnography of the moving image, we are struck with the difficulty in assessing the conceptual framework of a film by Leacock or one by John Marshall. Yet, we can begin to see that a language of signifiers emerges in both. It is not the same language—the politicians asking for their steaks and the Bushmen spearing the giraffe—but within each film a language of symbolic acts emerges.

Sensitivity to the uniqueness of the thick description within each language builds a discourse between them.

> [I]t is not only interpretation that goes all the way down to the most immediate observational level: the theory upon which such interpretation conceptually depends does so also.[15]

Multimedia may provide us with the tools to explore these and other related questions. If we can unlock the selected video data and thereby allow access to the theoretical assumptions embedded implicitly or explicitly by the researcher, will we find that there are syntactic or semantic rules governing the way we interpret a particular scene or chunk of video or film?[16] Could multimedia video ethnography bring the user through the layers of interpretation? The use of thick descriptions in light the multimedia environments is the next and obvious topic to delve.

1.2 *Thick Descriptions and Conviviality* for Multimedia Video Ethnography

1.2.1 Illich's *Conviviality* in *Learning Constellations*

The creation of interactive multimedia environments integrating the principles of Geertz's thick descriptions and Illich's conviviality can provide us with a deeper understanding of the topic under investigation. In fact, this statement implies that many current interactive environments do not offer this kind of experience to the user. The best way of explaining why I believe this is to discuss how conviviality was built into Learning Constellations and then discuss several interactive and hyper-media environments. The purpose of this comparison is to recommend that multimedia ethnography be *convivial* research environments for understanding the meaning of the subject matter.

Learning Constellations is particularly unique in relation to other multimedia interactive videodisc environments is that it was designed conceptually according to a specific educational philosophy of Ivan Illich notion of *conviviality*.

Illich's three conditions of a convivial tool are that it be **accessible, easy to use, and beneficial to humankind.** Although the user interface community has incorporated words like *friendly*, they have not paid attention to the underlying principle of caring for and about others.

Illich's description of conviviality includes the following conditions:

> Tools foster conviviality to the extent to which they can be easily used, by anybody, as often or as seldom as desired, for the accomplishment of a purpose chosen by the user. The use of such tools by one person does not restrain another from using them equally. They do not require previous certification of the user. Their existence does not impose any obligation to use them. They allow the user to express his meaning in action...[17]
>
> People need not only to obtain things, they need above all the freedom to make things among which they can live, to give shape to them according to their own tastes and to put them to use in caring for and about others.[18]

Accessibility

Conviviality should be one of the guiding principles in designing multimedia research environments to encourage the user to use the system for accessing the original footage and to enter into the world of the author who created the work. One could argue that since a videodisc workstation consists of a computer, the appropriate software, a videodisc player, a video monitor and the connecting cables, it is not a convivial tool. A convivial multimedia tool, as defined it in this dissertation, is not the hardware but the way the video data are accessed.

Learning Constellations was designed to give others accessibility to my data and to let others build their own interpretations. Hopefully, the accessibility to the hardware will eventually provide others with opportunities to access the content.

Easy to Use

The interface for *Learning Constellations* is also easy to use,[19] as Illich recommends. In fact, it was designed thinking about the novice who may be an expert researcher or teacher but may not be as comfortable with computers as the average user is. *Easy to use* in this interactive environment means that:

- the tool quickly becomes transparent so that the focus is on the content and not on the software,
- someone who is not familiar with either the software or the videodisc material feels comfortable quite soon;
- the pathways are clearly marked; and
- the user can return to the main artery instantly, whenever s/he is feeling lost.

Beneficial to Other People

In responding to Illich's call for tools to be beneficial to humankind, one could say that the entire research project including the software was designed to contribute to human understanding. Certainly, in designing *Learning Constellations*, we worked on a tool for many kinds of users to access the research. To be more specific, I could say that it responds to all users as individuals rather than as novices or experts.

1.2.2 Instructional vs Descriptive Multimedia Environments

To highlight the subtle yet significant difference between *Learning Constellations* and other multimedia environments, I will describe three others in this section.

At Brown University, the Institute for Research in Information and Scholarship (IRIS) uses interactive multimedia environments for instructional purposes. Several professors[20] from different disciplines have worked collaboratively with the interface designers to use this medium in a way which would integrate random-access technology with the curriculum. The multimedia course work ranges from History to English Literature to Biology. In the module on English Literature, a student can choose a certain poet or a writer, read the source material on-line, make notes, excerpt citations—following the various paths established by the professor and the designer. The number of paths are only limited by the time and effort put into the development of the program and by the richness of the subject matter. Landow's English Literature module allows the student to go along different paths either by going deeper into the subject matter—finding out more about the meaning of a poem, or searching for definitions of certain words—or by branching outward to other possible overlapping fields, such as art, philosophy, history.

In a sense, one can see this environment as a multimedia environment with different rooms made available to the user. The user has many choices to make along the predetermined paths; there is no best path to take.

This use of linking and path-making is a model for instructional design where the content is prescribed. It is an instructional tool to supplement an existing curriculum on Shakespeare, Shelly, Keats, et al.

The instructional model of multimedia provides students with a thicker description of the media-author's interpretations of the material as well as access to the source material. The user is guided into making certain connections among discrete units.

Davenport,[21] Gerstein[22] and Sasnet[23] did not build instructional tools, but rather experiential ones—to provide users/viewers with an interpretation through a thick description. They leave the viewer/user with questions rather than answers. The purpose of Gerstein's hypermedia environment, *Marital Fractures*,[24] is to encourage the user to begin to develop a more textured understanding of who Judy and Alan are as individuals. The user "experiences" how being perceived as a member of a married couple can be quite different from how one perceives one's own identity. In *Marital Fractures*, the user has access to Gerstein's interpretations, but feels the connection with both Judy and Alan. The user is not *forced into* Gerstein's mediation role as much as s/he is encouraged to explore the tenuousness of marital relationships. One also becomes interested in how Gerstein mediated, and what went on in the mediation sessions. However, the focus remains on Alan and Judy.

Similarly, a three hour movie by Davenport called *City in Transition, New Orleans 1983–1986* edited with the intention of being used for interactive videodisc, is now accessible at a workstation to users who can choose to watch the movie or to follow different people or places throughout the redevelopment of the Vieux Carré at the time when New Orleans was preparing itself for the World's Fair. The film is a complex, detailed ethnographic study of people who are affecting and being affected by changes in their physical environment. Moreover, while the thread that brings these diverse individuals and events together in one film may be the urban redevelopment theme, the fact is that alternative threads appear which could be just as significant depending on the interests of the viewer.

My fundamental concern is with the creation of open-ended research and learning environments in which three criteria are met: the integrity of the original data is preserved; the interpretation of the providers of the data is kept within bounds; and the user is encouraged to execute a degree of discretion in her/his manipulation of the material.

City in Transition, New Orleans 1983–1986 comes the closest to meeting the above criteria. The video part of the monitor depicts a windowless room with some of the main 'characters' discussing the architect's proposal for the glass structure designed for the to-be-renovated Jax Brewery. One woman, Lynda Friedman, uncomfortable with the all present camera is seen with an agitated look on her face. Our first impression of her is not a particularly good one. She seems to add to the tension already existing between the architect and Lambert, the director of the Vieux Carré Commission (VCC). Over and over, we encounter Lynda, the woman who appears both helpless and powerful at the same time. Being interested in human interaction, one's inclination is to find out more about her. Through a simple query to the data base, by "mousing an icon," one can access the dossier or biography of this seemingly meek woman who held the position as director of the VCC for seven years. One has to ask oneself, what affect did she have in the power struggle.

In fact, it is relatively easy to find the kind of background information which previously would only have been available to the filmmaker—time line of the events, stills of the Vieux Carré, maps and even budgets that influenced the decisions. One becomes an investigative journalist asking: to what possible inside information was Lynda Friedmann privy? how is she a useful ally of a developer and an architect who want their buildings built? how does she go about her professional negotiations throughout the course of this film? The fact is that viewers do not only receive; they can ask their own questions and find some degree of success at finding the answers.

The thickness of the user's final description of Lynda is partially a result of the video ethnographer/videodisc designer's ability to provide the user with the tools to be my a "investigative detective." Some of these tools are embedded in the richness of description given to the user; some of them exist in the interface which allows her/him to accumulate the sequences of Lynda and juxtapose them with other relevant data. What emerges is a detailed picture of Lynda adjusting to each new situation with agility and determination.

My initial image of Lynda sitting in the windowless room with an agitated and uncomfortable expression takes on a new significance. She is not a frustrated secretary listening to her boss explain why glass is a wonderful material for the new Jax Brewry; nor is she a bored businesswoman trying to finish the day's work. Lynda is a central force in the play that unfolds; and each new expression and gesture gives us, the detectives, one more key to solving the puzzle about how individual attitudes affect the decisions which are made. As the filmmaker, Davenport, once said: "If you can give the viewer more knowledge, then the viewer can better understand how these decisions are made."

Concluding Remarks

In conclusion, the theoretical question facing future researchers using new multimedia technologies will be: how can the hypermedia environment create a place in which the context or the culture is easily felt, accessed and can be expressed to others for the good of others? My answer, addressed throughout this dissertation, is that it is possible to accomplish this by paying more attention to the possibility of providing users with tools for building thick descriptions of a person, place, or event, within a convivial research environment. In building *Learning Constellations* I attempted to create what could be considered a convivial research environment wherein thick descriptions are created not only by the multimedia ethnographic researcher but by the user as well. I did this by, first, ensuring that the body of work was robust and, then, by the encouraging the linking of chunks into meaningful groupings which still maintained the integrity of the original data.

In short, the dilemma facing builders of new technologies is how to give the user freedom of movement within the source material while maintaining the integrity of the original event as experienced by those who experienced it. What happens to the meaning of an event which was originally experienced by the subjects and seen through the eyes of the video ethnographer, if the pieces or units are taken out of context and misrepresented by the user? Will this new technology enable even thicker descriptions of an event or with will it create even greater misrepresentations of events?

The image that comes to mind is one of Humpty Dumpty after the fall. Does chunking video create a collection of pieces which cannot be put together even by "all the king's horses and all the king's men?" How can we ensure that the whole will survive if we break certain pieces apart? In Chapter 3 on Methodology, I try to answer this question by describing, in detail, how using the theoretical approach of Geertz's thick descriptions and Illich's conviviality in designing *Learning Constellations* provided the basis for avoiding misinterpretations and misrepresentation of research data.

2 Epistemological Perspective

Introduction to Epistemological Perspective

To begin this chapter, I discuss the possible roots of thinking as a stage–like hierarchical progression and thinking as a preferred style. Toward the end of the chapter, I will explain how thinking about thinking as preferred styles as well as the epistemology embedded in postpositivist holistic ethnography guided this study of three children—Andrew, Mindy and Josh.

In this chapter, I will establish the epistemological foundation for thinking about Mindy's, Andrew's and Josh's preferred styles (which are described *thickly* in the case studies part of this dissertation.) The purpose is not to generate new categories of thinking about styles, but rather to recognize that three styles of thinking have an intellectual and cultural history. The three styles I am referring to are the empirical, the narrative and the social/interpersonal. Although these styles have been recognized,[1] the tacit assumption by curriculum developers has been that the empirical is the superior style of thinking about science.[2] The narrative is acceptable in certain situations; the social/interpersonal is rarely acknowledged as a viable and interesting style for doing science. This discussion will challenge these assumptions.

2.1 Stages and Styles

In this section, I explore the idea that thinking about thinking as styles has its roots in the pre-literate narrative tradition whereas thinking as stages is rooted in an empirical system of written laws. Moreover, I will reflect upon the possible relationship between the narrative and the empirical as two styles of thinking and then introduce a third style, the interpersonal. Although the discussion of the prehistorical origins is somewhat speculative, this interpretation elucidates the meaning of my own and other thinkers about epistemological issues.

2.1.1 The Empirical Roots of Stages Theory: A Developmental Model of Thinking

2.1.1.1 Patriarchal Influences

Over the last century, theories about thinking have followed the developmental theme—Freud's, Erikson's and Piaget's—reflecting a search for the organization of thinking into stages. Theoretical endeavors in epistemology (over the past two hundred years) turned to the belief in science and the empirical mode of thinking for constructing their models for understanding the nature of the human mind.

One could say that the history of Western Civilization is based upon the belief in dualistic thinking: Good and Evil, Man and Woman, Sacred and Profane, Material and Spiritual, Thesis and Antithesis, Reward and Punishment, and so forth. Usually one is set against the other (in spite of the fact that each is intrinsically woven with the other—one can't know Good unless there is Evil.) An integral part of this dualistic approach is that the letter of the law is bestowed upon "man" from an entity larger and more powerful than "him"—by the giving of the Ten Commandments [Matan Torah], the Greek Oracles, or the Koran. The belief in a more–powerful–than–man entity or God enables the custodians of the laws to sanctify certain facts over others.[3] The "best" thinking, the most moral behavior and the most holy act is decided by the guardians of the truth, men of religion. Before the Enlightenment, it was the men of religion who articulated the rules governing human behavior to the men in charge of the state or the kingdoms. Not long ago, secular governing was heretic even to consider. Kings governed kingdoms but the ultimate kingdom was the Kingdom of Heaven.[4] Church and State were one.

According to Edward E. Sampson, the Enlightenment only changed the ownership of who ordained the facts, but the patriarchal belief held by the Church—that man must control, tame, and master Nature, which is female—was passed down to those who replaced their belief in God with the belief in science and technology. "Through science and technology, man would come to dominate the unruly forces of Nature and so clearly establish his sovereignty."[5]

What Sampson is emphasizing is the concept of knowledge as power, traditionally used to control not only Nature but also other men and women.

> The tasks of mastery over nature demand a kind of patriarchal and commanding relationship between people and nature that fosters an instrumental process of reasoning and thinking; that is, reasoning is employed as an instrument or tool designed to accomplish the ends of greater control over a particular phenomenon.[6]

The roots of thinking about thinking as stages may have its beginnings in the written laws which produced a system of separating Good from Evil, so that Good could be rewarded and Evil punished. Dualistic thinking is thus the precursor for the establishment of hierarchies or stages in thinking; if Good and Evil exist, then there are many levels of gradation between the two poles.

Thinking about thinking as advancing stages may have its roots in the written laws which produced a system of separating Good from Evil—so that Good could be rewarded and Evil punished, (if not in this world then at least in the world to come.) Thinking about thinking in ways which categorize knowledge into hierarchies—one set of things is better to know than another—has led to an epistemological view supporting the existence of levels or stages of knowledge.

Modern developmental theorists use science-like models to show how maturation takes place in logical causal sequences according to observable stages in growth patterns. Always the final stage is the highest and best. Developmental theories, such as Freud's oral, anal and genital,[7] Erikson's[8] eight stages of psychological growth from basic trust to generativity or Piaget's stages from sensori-motor to formal operational thinking,[9] are based on the belief that the human organism must pass through these stages at critical periods in their development in order to reach full healthy integrated maturation, be it psychological or intellectual.

Carol Gilligan,[10] among others, suggests that there is a "different voice" as powerful in its origins throughout the last few thousand years as the hierarchical one. To describe the narrative part of this voice, one needs to think about human thinking before what Illich and Sanders[11] refer to as, "the book," to a period of pre-literate thinking.

2.1.2 The Narrative Mind

In sharp contrast to the developmental mode of thinking is the relativistic narrative mode. To think about the "unfolding" of the narrative, Illich and

Sanders take their readers back to the thinking of Plato who reflects on thinking in pre-literate pre-historic times:

> Prior to history, Plato says, there is a narrative that unfolds, not in accordance with the rules of art and knowledge, but out of divine enthusiasm and deep emotion. Corresponding to this prior time is a different truth– namely, myth. In this truly oral culture, before phonetic writing, there can be no words and therefore no text, no original, to which tradition can refer, no subject matter that can be passed on. **A new rendering is never just a new version, but always a new song. Thinking itself takes wing; inseparable from speech, it is never there but always gone, like a bird in flight. The storyteller spins his threads, on and on, never repeating himself word for word.** No variants can ever be established. This is often overlooked by those who engage in the 'reading' of the prehistorical mind, whether their reading is literary, structuralist, or psychological. (bold print added to highlight its meaning, but moreso, its poetry.) [12]

Our knowledge of this pre-literate period is limited by the obvious: we can only know how dead people thought through the records they left behind. However, our only records of the pre-historic period are the few remaining hieroglyphics. In as much as words are artifacts of thinking and incomplete pictures of how people really think, we have to accept that the written word of dead people is the most reliable means for making hypotheses about how they thought. According to Illich and Sanders, understanding the thinking of our pre-alphabetic ancestors in terms of how we understand thinking today is absolutely impossible. The pre-historic mode of thinking was a relativistic experience; what was expressed at any given moment in time changed from the previous time it was expressed. In this way, there could be no fixed recall, no truth as we define it today. "A new rendering is never just a new version, but always a new song."[13]

The concept of knowledge as a continually changing "truth," dependent on the cultural rules established both by the will of the community as well as the ability of the storytellers, dramatically changed with the introduction of a system of written rules. The moment a statement could be written down, it could be referred to. Memory changed from being an image of a former indivisible time to being method of retrieving a fixed, repeatable piece or section of an experience.

One might say that before alphabetic script, facts could not exist. If we think of the mind as a bucket, then the pre-literate mind could be compared to a bucket of water being both filled and emptied by experience whereas the alphabetic mind more comparable to a crate of carefully marked boxes containing the groups of experiences or facts most aligned to the box type. The "facts" travel from box to box given the nature of the operation. Although the perception of the box, changes, the facts remain constant. We can change our minds by changing the point of view, but, according to the literate mind, facts are fixed.

2.1.3 The Pluralistic Mind

A new breed of epistemologists is now examining the relational, subjective and personal approach to doing science. Their approach does not necessarily dispute the empirical foundations of stage theory, but rather offers a wider range of styles which includes the relational and what I term, the interpersonal.

Fox Keller addresses the relational model as a style of doing science. Science is a "deeply personal as well as a social activity." She reaches a conclusion that scientific thinking is currently gender-biased—preferential to the male and "objective" way of thinking. Fox Keller combines Thomas Kuhn's ideas about the nature of scientific thinking with Freud's analysis of the different relationship between young boys and their mothers and between girls and their mothers. The fact that boys are encouraged to separate from their mothers whereas girls to maintain attachments may influence the manner in which they relate to physical objects. Moreover, the young boy in competition with his father for his mother's attentions learns to compete in order to succeed. Girls may experience that becoming personally involved with the things in her world— getting *A Feeling for the Organism*[14]—to be the preferred mode of making sense of her relationship with physical objects.

Fox Keller's insights about the impersonal and the personal approach to doing science could open the door for thinking about science in personal and social, rather than in an objective and often "anti-social" way:

> Just as science is not the purely cognitive endeavor we once thought it, neither is it as impersonal as we thought: science is a deeply personal as well as a social activity. [15]

Papert and Turkle, in a direction similar to Fox Keller's, introduce the terms "hard thinking" and "soft thinking"[16] to name equally significant styles of thinking. Papert, a mathematician working with Jean Piaget, departed from the genetic epistemology of developmental stages to an examination of how different kinds of thinking—sensori-motor, concrete, formal—interact throughout life. Papert's learning theory recognizes all learners as constructionists moving from novice to expert in accordance with their learning styes.

Turkle, who examines the psychoanalytical dimension of thinkers engaged in working or playing with computers, richly describes the way people talk about their relationship with the computer. *The Second Self*[17] is more than a title for her book; it reflects her understanding about how the computer becomes the alter ego of the self. Turkle, a keen listener of the inner meanings people have while discussing the computer, has used the reflections of others as the basis upon which she has formulated her theories about the role of the computer in our consciousness and perhaps our subconscious. Turkle analyzes her anecdotal interviews with people who use computers to come to grips with the relational or anthropomorphic role the computer and its user develop. The significance of Turkle's work is greater than her immediate findings. What she accomplished within a traditional scientific community was to open the door for others to think about conducting research which informs scientific investigation through relational and interpersonal methods.

Papert's and Turkle's theory is that, traditionally, hard thinking has been the basis of defining logical thinking. "And logical thinking has been given a privileged status which can be challenged only by developing a respectful understanding of other styles where logic is seen as a powerful instrument of thought but not as the 'law of thought.'"[18] According to Papert, Turkle, Motherwell,[19] Ackermann,[20] and Globerson,[21] soft thinking is more negotiational and contextual, or what Lévi–Strauss terms, *bricolage*. This group's orientation focuses on the closeness to objects aspect of the soft style of thinkers.

When Turkle and Papert compare the programming approaches of hard thinking *planners* and soft thinking *bricoleurs*, this is what they say:

> While hierarchy and abstraction are valued by the structured programmers' "planners" aesthetic, bricoleur programmers, like Lévi-Strauss' bricoleur scientists, prefer negotiation and rearrangement of their materials. The bricoleur resembles the painter who stands between brushstrokes, looks at the canvas and only after this contemplation, decides what to do next. Bricoleurs use a mastery of associations and interactions. For planners, a program is an instrument for premeditated control; bricoleur's have goals, but set out to realize them in the spirit of collaborative venture with the machine. For planners, getting a program to work is like "saying one's piece"; for bricoleur's it is more like a conversation than a monologue.[22]

Although Turkle and Papert use the terms "hard" and "soft" to explain different and equally significant approaches to computation, their contribution reaches out to broader domains. Their aim is to contribute to the acceptance of *epistemological pluralism,* the title of their most recent collaboration. They cite "feminism, ethnography of science and computation"[23] as three of several movements which promote concrete thinking "to an object of science in its own right."[24] They also believe that by accepting diverse styles of appropriating knowledge and understanding formal systems as being equally significant to the world of scientific thought, the personal relational perspective of concrete human thinking will gain respectability within the scientific community.[25]

To explore his theories, Papert encourages the creation of learning environments wherein individuals with diverse styles of thinking can have equal opportunity to the tools they need to build their own (micro)worlds. It was this belief in the importance of exploring the growth of learning cultures in the context of new technologies which led to the implementation of Project Headlight and which influenced the epistemological approach of my research project.

Papert addresses the interpersonal through the objects–to–think–with. He has a genuine love of objects as intellectually challenging models to understand. While engaged in a conversation, he often hold an object (that he can move) in his hands, even if he is not discussing the object. The tactile relationship with his objects seems to stimulate his thinking. When he describes understanding an idea, he often uses the term, "getting a handle on it," as if the idea is a three dimensional object.

His relationship with functionality and concreteness underlies much of the philosophical premises embedded in Logo. Children in the Logo culture are encouraged to play with powerful ideas as if they are objects to be manipulated, turned around and put together to build even more sophisticated ideas.

2.1.4 The Interpersonal as the Starting Point for Thinking about Science

Where my thinking moves tangentially from Papert's is that I believe that the starting point of thinking about science is embedded in our human relationships. My view is that if we are going to make this world into a more convivial place, as Illich proposed in 1972, then we need to promote negotiation, as Gilligan says, and commensurability, as Geertz says. Tools are the objects which can help us build contextually supportive learning environments for conviviality and commensurability. The *known, knowing* and the *knowable* are intimately connected with the interaction between being known to oneself and others, and knowing others. In a sense, I might say that knowledge is a tool for human relationships and not a goal in and of itself.

What guides this work in delving into the thinking of children is a belief in a world view, a *Weltanschauung*, the search for the wholeness of what is known and what is knowable, the object and the subject, the objective and the subjective as an indivisible unity. Thinking about thinking **without** thinking about the relational—soft, bricolage, or sometimes called the female—aspects is to be less scientific and less representative of reporting the whole of human inquiry.

2.2 Epistemological Concerns of Research Methodology

2.2.1 Influence of a Conceptual Framework

One of the first questions to be asked when considering the influence of conceptual framework upon the methodology is the epistemological one: where is the source of knowledge? To oversimplify this statement one could say that if one doesn't have a position concerning where knowledge is, how can one know where to look for the answers about human thinking?

In order to avoid the nature versus nurture black hole of rationalism and empiricism, let us focus upon a powerful statement of Illich: "The world does not contain any information. The world is as it is."[26] Illich believes that knowledge does not exist outside the realm of human consciousness. Knowledge interacts with cultural institutions which, to some extent, organize human behavior. Illich, an opponent of compulsory and manipulative institutionalization, believes that much of what we term knowledge is simply the passive acceptance of values expressed by the structural properties of the school. Accordingly, we have ceased to experience the world and to interact with our environment in a personal and creative way. Our questions about the universe have lost their subjective component because of the scientism which only lauds certainty and objective reality. Both Illich and Ludwig Wittgenstein understand the world as a unified whole which must be experienced totally at each moment. As Wittgenstein states: "It is not how things are in the world that is mystical, but that it exists...Feeling the world as a limited whole—it is this that is mystical."[27]

As Donald Polkinghorne understands Wittgenstein concept of humanity, human beings

> ...cannot stand outside their language systems and cultures and obtain an absolute viewpoint. All our knowledge is conditional knowledge, constructed within our conceptual systems, and thus knowledge is a communal achievement and is relative to time and place.[28]

This link among human consciousness, knowledge and the culture from which knowledge derives its meaning is what is of central concern to my study. The questions that informed my research at the Hennigan School were those that dealt with the individual within her/his cultural milieu. As mentioned above, Illich says: "The world is as it is."[29]

This epistemological stance does not downgrade the importance of positive learning experiences, but it does emphasize the role of the learner rather than the teacher. It also suggests that there is no information in the world that must be learned. The importance of the content of the learning "is relative to time and space."[30] A society, nation, or world can impose meaning onto a variety of things and can dictate what is learned.

However, this does not imply that knowing how to compose a symphony is better than how to build a canoe.[31] By "better" I do not mean the value attributed to each of these functions, as Bronislaw Malinowski suggested in his functionalist world view which states that "every cultural item plays a functional role."[32] What I mean is that in the process of internalizing the necessary elements in the world to build a canoe, one builds internal conceptual structures which can be as complex, varied, patterned, intelligent as those required to know how to compose a symphony.[33]

2.2.2 Influence of Postpositivist Holistic Ethnography

Polkinghorne refers to the Postpositivist direction in epistemology as the movement from the positivist approach—only that which we know to be true can be called knowledge—to the post-positivist—that which we know now may be the best understanding about the truth, but may not include all that the truth is. In the Positivist view, "only those things which we are absolutely certain of can be counted as knowledge."[34] Whereas,

> Postpositivism holds that we do not have access to undubitable truths...Knowledge is understood to be the best understanding that we have been able to produce thus far, not a statement of what is ultimately real. Postpositivism is not a school of thought with an agreed-upon set of propositions. It is an attitude about knowledge.[35]

According to Polkinghorne, in the postpositivist school of research, an understanding of the epistemological issues concerning the nature of knowledge is a conceptual tool. To find the answer to a research question, it is necessary to use the method or strategy that best suits the uniqueness of the problem. This means that the researcher must know which methods are appropriate to certain questions and how to use them in a way that relates to the special nature of the situation. The Postpositivist researcher cannot apply a method of investigation without first understanding her/his epistemological stance. With this position, I am in complete agreement.

Evelyn Jacob contends that the researcher must respond to the environment as a whole. Instead of testing to find out answers, s/he must explore and learn about the culture.

> [A]nalyzing and describing a culture or part of a culture as a whole, usually with the goal of describing a unique way of life and showing how the parts fit together into an integrated whole. The goal is to try to understand the unique configuration of the culture of the bounded group with a minimum of preconceived ideas or theories... Thus, the holistic ethnographers frequently have an attitude of exploration and learning rather than one of testing.[36]

According to Jacob, the holistic ethnographer must gather her/his data from direct participation with the culture being studied. Participant observation, where the researcher lives with the group and takes part in many aspects of the life of the community, is crucial for obtaining the views of those observed.

Where my study diverges from Jacob's and Polkinghorne's postpositivist holistic ethnography is that they study the whole culture and I study the culture by focusing my attention to the individuals within the culture. Polkinghorne's systems of inquiry approach suggests that human beings are systematically organized[37] and it is the organization of the system which is what needs to be studied.

The premise my research is that the individual child can be both unique and also representative of her/his group at the same time. Moreover, the individual is part of the whole environment as is the whole environment part of the individual. To understand the individual, one needs to have a grasp of the whole environment. To understand the whole environment, one needs to know the individuals. According to my epistemological stance, the researcher, the tools the researcher uses, and the total environment within which the researcher and the children interact cannot be separated. In fact, each individual has his own cultural heritage which he brings with him or her into his learning environment. When we speak of culture as being the culture of the school, the Logo culture or even the culture of children, we need to respect to the culture of the individual. How can we deny the transfer of generations of family members who have left their marks on each of us? How can we deny the influence of a myriad of choices which our individual organisms have made in the seven or seventy years of interactions with the media, our physical environment, and with society? Each child has her/his own cultural heritage, greater than her/his ethnic, racial or religious background, yet respectfully including those unique interactions.

Limiting the study of culture to groups of people, be they exotic or commonplace is simply too limiting when considering how the culture of the individual's life shapes her/his preferred way of thinking. This study addresses the culture of the individual child.

PART II

METHODOLOGY

3 Method of Multimedia Video Ethnography

This chapter consists of an examination of each of the five phases of the research process. As the research process evolved, many decisions and ideas occurred which were not there at the outset. They could not have been there. The *whole* had to grow from the rigor demanded at each step in the process. The five major phases, as I now define them, are:

- Phase I: Collecting data by observing and videotaping my interactions with the children called, **"Researcher as Participant Recorder."**
- Phase II: Editing linear 'movies' and non-linear chunks from the video data called, **"Editing for Linear and Non-linear Presentation."**
- Phase III: Identifying, selecting, classifying, and categorizing the video segments for videodiscs, called **"Selecting Video Data for the Videodiscs."**
- Phase IV: Building the interface for *Learning Constellations,* called **"Designing *Learning Constellations.*"**
- Phase V: Using *Learning Constellations* to analyze data and to build theories about the children's styles of thinking, called **"Analyzing Data in an Videodisc Environment"**

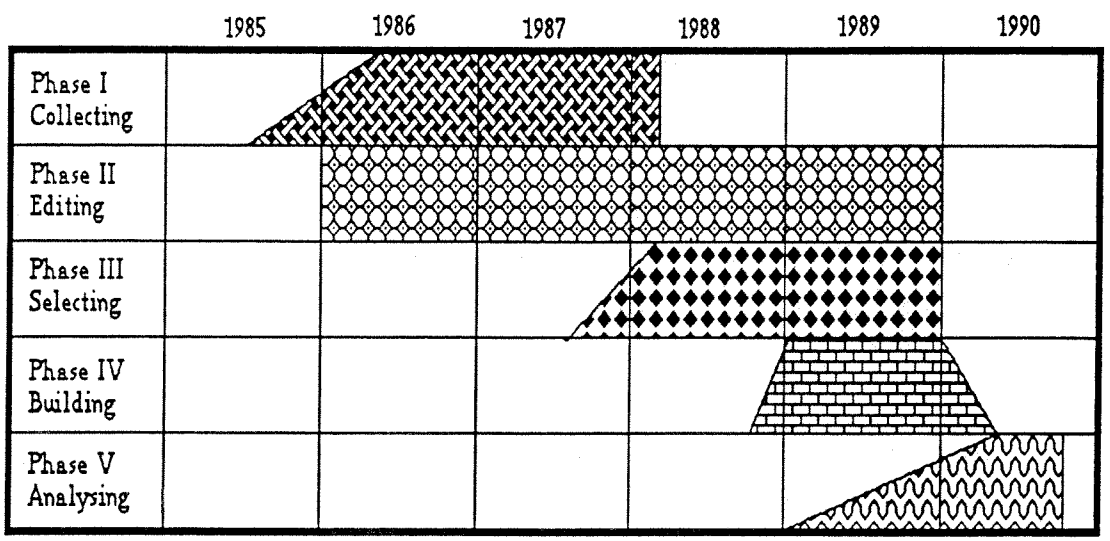

Figure 1: Timeline of Longitudinal Video Study

Multimedia video ethnography is a term I use for combining what has traditionally been referred to as *visual or multivocal ethnography*[1] when it is used in conjunction with computer applications to organize and analyze the video and text data. The multivocal and visual ethnographic research of Tobin, Wu and Davidson in their study of preschools in China, Japan and the United States conducted during the same period as this study was, provides a good context within which to situate my approach:

> Our research methods are unlike those used in most comparative research in early child education. We have not tested children...We have not measured the frequency of teacher-student interaction... Although we touch on all these issues, and others in this book, **our focus instead has been on eliciting meanings.**[2]

The overall theme of this chapter is that the researcher, the video technology the researcher uses, and the total environment within which the researcher and the children interact cannot be separated from each other.

3.1 Phase I: Researcher as Participant Recorder (1985-1987)

To start this description of Phase I, I would like to introduce the theme of the researcher reflecting in a personal manner upon her/his observations. In fact, the following section has a strong "resonance between the personal and the professional."[3] At times, the reader may want to ask how the personal involvement of the researcher can be prevented from leading to distortions. I respond to that by citing Bateson who seems to have found a way to answer this:

> These resonances between the personal and the professional are the source of both insight and error. You avoid mistakes and distortions not so much by trying to build a wall between the observer and the observed as by observing the observer—observing yourself—as well, and bringing the personal issues into consciousness.

> You can do some of that at the time of the work and more in retrospect. You dream, you imagine, you superimpose and compare images, you allow yourself to feel and then try to put what you feel into words. **Then you look at the record to understand the way in which observation and interpretation have been affected by personal factors, to know the characteristics of any instrument of observation that make it possible to look through it but that also introduced a degree of distortion in that looking.** All light is refracted in the mind. To look through the lens, it becomes important to know the properties of the lens. This is the scientific goal of biographical work on the social sciences.[4]

3.1.1 Early Problems and Solutions

I delineate the beginning of Phase I of my video research project from the time I first took the videocamera into the Hennigan School on my regular twice a week visits. However, the real beginning, my exploratory (pre-production) phase, occurred during the four months I spent at the research site without a camera. In those early months I had the opportunity of becoming acquainted with the teachers and the children, as well as with my colleagues from MIT who were planning their own research projects within this same culture.

During my first rainy New England autumn at the school, I did not use public transportation to get to the school. I would get a ride to and from the school with either Sylvia Weir, a faculty researcher, or with some other graduate student researcher. I mention this for two reasons. First of all, because it informs one about the constraints of the physical location—I had been told that it was unsafe to walk from the Boston transit stop to the school. (Within the equivalence to two city blocks, I could be mugged or hurt during daylight. This possibility also prevented me from walking around on my own to explore the neighborhood.[5]) The second reason I mention taking a ride with researchers or faculty members was that the driving provided times for informal "interviews" or conversations about the school. Many of my lasting impressions were shaped by the immediacy of that contact and the intensity of sorting through these many experiences.

Nevertheless, the shape of my research project as it exists today can be dated back to the time I entered the school with the camera.

My study began by having to decide when to turn the camera on, what to videotape, how to hold the camera, and most importantly, how to respond to the children with this invasive tool in my hands. To put it as simply as Temaner and Quinn do: "Every filmmaker, or anyone behind the camera and in front of the editing table, faces three questions. What to shoot? How to shoot it? How to put it together?"[6]

3.1.1.1 Step 1: Limitations of Original Hypothesis

My first research agenda with the camera was to study the teachers who were working with children in a computer environment. With the hypothesis that educators are similar to artists, who think about themselves as creators of mental images in the minds of the children they inspire, I went into the environment "to capture it." However, watching the footage of what was actually videotaped convinced me that I was capturing something quite different from what I had thought I would. Instead of educators being like artists, I discovered that teachers were desperately struggling with how to get what they needed to get, in order to do the job they were trying to do. As long as these teachers were struggling to learn Logo, to rearrange their teaching schedules, to rethink how children learn, and to resolve the daily personal and professional pecking-order conflicts that emerged, they were not going to have the luxury of thinking of themselves as artists.

Bateson speaks about the change in research focus in the following way:

> [F]or many kinds of psychological research, the observer's attention is highly specified and he will record only certain defined types of events. Similarly, a sociologist's data are often structured by pre-set questions. But, in anthropological fieldwork, even when you take with you certain questions you want answered or certain expectations about how a society functions, you must be willing to turn your attention from one focus to another, depending on what you are offered by events, looking for clues to pattern and not knowing what will prove to be important or how your own attentions and responsiveness have been shaped.[7]

To find the focus, I needed to become a member of the environment and to determine which "conceptual tools"[8] would be necessary for studying an appropriate topic.

3.1.1.2 Step 2: Appropriate Conceptual Tools

Polkinghorne points out the importance of building the appropriate conceptual tools for conducting research. He states that the researcher should have a knowledge of the principles of tool-making; s/he must first make many attempts at building their conceptual tools and then know the job the tool must perform.

> Developing sets of conceptual tools that will provide the understanding necessary to approach more successful solutions to our human problems requires a knowledge of the principles of tool-making, a familiarity with previous attempts (both successful and unsuccessful) at developing such tools, and an awareness of the job to be performed with the tools. It is a characteristic of tools that they are not worthy in themselves—their value is dependent upon **the particular job to be done...The researcher as tool-builder—and as tool-user—will need an understanding of the conceptual bases out of which the previous tools have been derived.**[9]

Polkinghorne's closing statement addresses where one finds the principles for conceptual tool-building; the roots are in the conceptual bases out of which previous tools were derived. A rather recursive answer, but nevertheless, a possible hint to a complex problem; one defines one's conceptual tools from understanding of one's past experiences in dealing with similar problems.

"The particular job to be done" in this case was to study the Logo culture and try to make sense of it for others to understand at some later date. I decided to build upon the conceptual tools which emerged from my living in diverse cultures and from participating in a range of school cultures in Canada and Israel.[10] My conceptual tools within my video research, shaped by my past experience but carved out while I became a member of this emerging Logo culture, were:

- a commitment to scientific inquiry that did not include any form of testing or manipulation of the physical environment;
- a belief that each person's story reflected the human condition; and
- a respect for the topic of the communication initiated by the person.

These three "tools" would guide not only how I interacted with the children throughout the following years but also how I *painted my portrait* of this learning culture either on video or in text.

3.1.1.3 Step 3: The Videocamera and Videomaking

In the spring of 1986, I wrote this fieldnote about my research methodology:

> I know I will use the videocamera to document children's thinking to focus on the stories children tell me as they use the computer. I also know that I will study three or four children intensely. More than that, I cannot say.

A major obstacle to conducting a video research study is that it requires some expertise of videomaking.[11] The main question is: how long and how much effort does it require to become proficient enough with the technology to capture the images on videotape which hold together as a unified body of work?

In the early stages of videotaping, I produced results which I had not been able to produce using fieldnotes and audio tape–recorders. Perhaps this was due to both the excitement and the frustration of using the medium of video which allows for instant viewing, or, for reflection and correction; one can critique one's own work immediately. Daily, I would view both the content and the technique of my shooting. The combination of this instant self-instruction combined with the feedback in my film courses from Leacock, Davenport, and others taught me how to look at my research environment without pre-judging it; how to see what was worth filming and what was not. Temaner and Quinn address this issue in the following manner:

> [F]ilmmaking and research began to become one process...Since our filmmaking became the means of our inquiry and was controlled by the same considerations which control a social scientific observer ..., filmmaking became research. We employed the shooting, the viewing of our footage, and the editing as methods of study. (Even at this early stage, when we did do some shooting, we immediately edited the material to help us learn more about our subject and to help us decide on further shooting.)[12]

Using video as an ethnographic research tool, for me, meant capturing images of the culture by using the camera as an expressive medium. With the camera, I could better respond to what the environment *told* me to record. To state this in Erik Erickson's words—as Bateson uses them—I wanted to attain *disciplined subjectivity*.

> The process is an aesthetic one, one of listening for resonance between the inner and the outer, an echo that brings the attention into focus. Poets work this way as the curve of a leaf evokes the poignancy of a past moment. Therapists work this way, moving back and forth between their own task of self-knowledge and the task of understanding a patient. Indeed, I have always thought of this effort to become aware of and draw systematically on internal processes in the terms of Erik Erikson's description of clinical method as ***"disciplined subjectivity."*** [13]

3.1.1.4 Step 4: Responding to the Children

Problems in First (Audio Tape Recorded) Case Study

Shannon was my first research "subject" at the Hennigan School. I interviewed him with an audio tape–recorder several times from September, 1985, to February, 1986. With the audio tape recorder, my questions were more directive than they were with the videocamera. Instead of listening to the meaning of what Shannon was telling me, I was trying to get Shannon to answer my questions. I was curious to know if children, when working with objects on the computer monitor, thought themselves to be moving from inside the object on the computer or whether they were directing the movement. I wanted to compare their responses with those children Piaget interviewed when finding out about children's thinking about their dreams.[14] Being in an academic culture of Papert, Turkle and Ackermann, I was sifting through the various qualitative approaches of studying children using interview techniques.

The following excerpt is a pre-video example of an early (directive) stage in my study. It illustrates my growth within the learning culture. (The critique of my questions in italics was added afterwards.)

Ricki: **What have you been doing lately?** *(open question)*

Shannon: What have I been doing? I've been working with the word processor on the computer. I just got the new program that I've been working with. It's a flight simulator for fighter pilots.

Ricki: **What does it do?** *(more specific, but leads to description)*

Shannon: It's for people who are trained for the Air Force. This is on my own computer at home. But I got it right here. It's called F15 Strike Eagle. It's got 500 sticks of bombs, four side-winder missiles; it's got a radar warfare display; and it has four sparrow missiles; and it has 1000 rounds of ammunition, toy millimeter machine guns at 600 rounds per minute.

After the interview, I wrote the following analysis of what I had been trying to elicit in this discussion with Shannon:

> At this point in the conversation, I remembered Shannon's fascination with numbers and details. Unlike some children who talk strategy or rules first, Shannon gives the statistical information. **I directed our talk** to a current topic of interest in our research group, that of locus of control. I am also curious about *where* Shannon sees himself in relation to an action that is simulated by his activity. Does he see himself inside controlling the action or outside observing?[15] In other words, is he like the girls I interviewed outside in the playground who point inside themselves, referring to the movement of the turtle as being "in here, right here," or is he outside looking in? (December, 1985)

The interview with Shannon continued like this:

Ricki: **Do you have a joystick? How do you control the shooting?** *(Yes/no answer to be expected from the first question. More descriptive answer to be expected from second question.)*

Shannon: No, with the keyboard. All you have to do is press the arrows and you have special keys to control the missiles and bombs and stuff. And you have to go below 2000 feet to shoot a bomb, and stuff.

Ricki: **So, who's shooting the bomb?** *(Directive question to answer)*

Shannon: Me. The F15 Strike Eagle.

Ricki: **So, you're sitting in the F15 Strike Eagle and you're shooting these missiles?** *(Restating response with elaboration)*

Shannon: Yeah, and there's like Mig 21s that attack you.

***Ricki:* And you have to shoot them down?** *(Following train of thought)*

Shannon: With either guns or the missiles. I usually use side-winder missiles, they're heat seekers.

Ricki: **What does that mean?** *(Open–ended question, asking for deeper explanation)*

Shannon: It means it can track down anything that's at a special temperature. Like the temperature of the burning heat on the engine. And it shoots directly at it.

***Ricki:* When you're doing it, are you controlling the F15 or where exactly are you? Are you in the F15?** *(Going back to directive question)*

Shannon: Right.

***Ricki:* The objects on the screen, are you coming at them or are they coming towards you?** *(Directive question)*

Shannon: Well, it's like, I'm in the seat. Here's the monitor. Now the monitor shows what you would see directly in front of you when you're sitting in the ejection seat. So, it's like you're in the cockpit and you have a steel wall around you.

***Ricki:* So you're actually in the cockpit and you're moving towards these objects.** *(Reflective listening; repeating what interviewee stated)*

Shannon: Mig 21's, they mostly shoot heat seeking missiles like me. But sometimes, they hit you and you have to bail out with the ejection seat.

While audio taping Shannon, I guided him into answering my questions. Consequently, the results I was getting did not seem to be leading me anywhere new. When switching to video in the interviews, I paid more attention to children's gestures while speaking with them. The clues I received from the gestural communication led me to change my responses.

Switching to Video

Using video, I asked fewer questions, waited longer for responses, made fewer suggestions and guided the discussion less. If I did ask a question, I waited longer for a response—several seconds at least. I even waited longer if I made a reflective comment, such as, "That looks [intriguing, hard, fun, interesting or exciting]." I found that the longer I waited without filling in the gap of silence, the more open we both became about being in each other's company.

I also found that by sitting beside the child without saying anything, while s/he worked, we created an intimate space. I wasn't there to guide, to instruct, to teach or to lecture. I was there because I wanted to share the experience with a child.

Learning how to elicit children's thinking rather than encourage them to reflect my own thinking was a major challenge. Children want to please adults; they want our approval and they want to tell us what we want to hear.[16] Although I asked children questions and sometimes sat with them in a closed room with the videocamera turned on, I thought about our discussions as conversations and not interviews.[17]

Young discusses the Cinema Verité moviemakers' use of observation and interviews in the following manner:

> After 1963 the new documentary filmmaker abandoned the interview as an appropriate component of cinema verité. About that same time Jean Luc Godard started using "interviews" in his fiction. Richard Leacock tried to do without the interview because he was imposing the discipline upon himself to look for other ways of gathering information about the subjects of his films: **"I want to discover something about people. When you interview someone they always tell you what you want to know about them"** (Marcorelles 1973:55). This was the birth of the observational style of shooting. Godard used the interview because, being a common device from current affairs or news programs, it lent an apparent authenticity to his fiction. But just as fiction was raiding the territory of documentary, documentary had to move further towards its subject and further away from fiction.[18] (bold added)

The conversations I had with children over a two year period corroborated with Leacock's position.

The Open-ended Question or Statement

My "roaming" technique of videotaping was to meander up to a child in the computer pod and then ask an open-ended question by commenting upon the immediate situation. My remarks followed this pattern:

- "Can I sit here and watch what you are doing today?"
- "Do you want to tell/show/talk about what you've been doing?"

- "That looks interesting. Would you like to tell me about it?"
- "What have you been doing lately?"
- "Hi, Andrew, what are you working on today?"
- "Your game has really changed. What have you been doing to it lately?"
- "What have you been working on since the last time we talked?"
- "I really like what you've done to your [canoe trip through the Amazon]."
- "I really missed you this past week. Where have you been?"

These questions were not scripted; they were responses to the situation. If it felt comfortable to take the next step into the conversation, I did. If it did not, I did not venture further.

Many children, like adults, don't enjoy talking about their work while they are working. However, some children find the reflection on their own processes helpful in deciding what to do next. I would venture to conclude that the bricoleur[19] style thinker—who makes decisions at each junction—enjoys having someone to talk about the process, and the planners probably find it disruptive.

For example, Josh was sometimes a planner and sometimes a bricoleur. While he was puttering on the computer, he often enjoyed talking and telling me what he was working on. But, when he was carrying out a specific project, he would be so engrossed that his eyes never left the monitor. He would maintain a passable conversation, but we would both know he wasn't really *in* the conversation. One of the best illustrations of this was when Josh and Joe discussed the advantages and disadvantages of making versus playing a game.[20] It was evident that Josh was working in deep concentration on one of his *blowing-up-cars* program and had no time to discuss anything. He spoke with Joe and me, but his eyes never left the monitor. Other times, when Josh was tinkering around without any set plan, he would enjoy describing how his programs worked.

3.1.1.5 Step 5: Constraints of Research Tools

Children's Performing for the Camera—Good or Bad?

The videocamera is an excellent tool for eliciting responses. The camera can stay propped on the lap or on the shoulder. The researcher can maintain eye-contact regularly, if not most of the time, only checking the image in the view-

finder from time to time to make sure that the child is within the frame. Conversations in the presence of cameras can evolve in a way that limits, but does not discredit, the performance aspect of videotaping. Since there was no evaluation, no testing, no competition with their peers, and no time pressure, the children performed for the camera much less than expected. Moreover, continued exposure over the entire school year meant that the children became less conscious of the camera.

The issue of performance is more complex than acclimatization to the camera. Research is no less valuable if the children's personalities are "brought out" while using the camera. In fact, one of the goals of studying the emergence of technology in a culture is that children will appropriate the camera as theirs and make it their own.[21] For some children, this will mean becoming more animated than usual, more dramatic, and more *full of the stuff of life.* Videotaping children tends to provide them with expressive tools for responding to situations. Analogously, when we introduce paints to children, we bring out new responses to the physical world of color and texture. Children exposed to the videocamera develop new expressive means of communication, even if the camera is not in their hands (which, for some children, it is already, and, for others, it will be in the near future).[22]

The fact that Josh, Andrew and Mindy were so articulate and dramatic in front of the camera may suggest that the camera contributed to their expressiveness. Should we discredit their "performance"?[23]

It is essential to remember that the children were not responding to a camera on a tripod or to a random camera–person. They were responding to a person with whom they had had many opportunities to interact while working or playing, indoors or outdoors, at school or at home, and, at the computers or in the classroom.[24]

3.1.1.6 Step 6: Documentary-Style Video

Another step in this phase of becoming a video ethnographer occurred when I realized was that I was accustomed to viewing movies and television programs shot with stationary cameras in front of which actors are brought to perform. In order to change my concept of viewing documentary footage, two things had to be learned. One was to accept a less steady image; the other was to permit the camera to move to the center of the action with the action.

Perhaps the rationale for this approach is best described by Jean Renoir in an interview with Andre Bazin (from the Summer 1959 issue of *Sight and Sound*):

> [I]n the Cinema at present the camera has become a sort of god. You have a camera, fixed on its tripod or crane, which is just like a heathen altar; about it are the high priests—the director, cameraman, assistants—who bring victims before the camera, like burnt offerings, and cast them into the flames. And the camera is there, immobile—or almost so—and when it does move it follows patterns ordained by the high priests, not by the victims.
>
> Now, I am trying to extend my old ideas, and to establish that the camera finally has only one right—that of recording what happens. That's all. I don't want the movements of the actors to be determined by the camera, but the movements of the camera to be determined by the actor. This means working like a newsreel cameraman.[25]

One might think that documenting children at a school for research purposes does not merit this comparison. But, to my mind, this is precisely what prevents research with video from being anything other than the recording of prescriptive testing sequences.

The point is that the researcher using video need not discard the non-aesthetic images in the footage. The issue in film ethnography is not finding the truth[26] but rather describing accurately and maybe making new connections and discoveries. Often, an insightful piece of video is out of focus, badly lit, or the image is shaky. That is permissible in research. However, the goal is to use the camera in such a way that the footage best reflects the topic being explored. There is a visual language which although not articulated to date, is a subject currently under investigation.[27] The researcher needs to learn how to record the event in a manner that best communicates the meaning.

3.1.1.7 Step 7: Caring about the Culture

Early the first spring of 1986, I started looking forward to going to the school. In the process of becoming friends with the children, the sharing of feelings and thoughts began. Josh treated me like his playmate. He would call me over to hang out with him whenever I would walk into the computer pod.

Children related to me me as someone to talk to, to play with, and someone who cared about their own image of themselves. On one of the days while I was videotaping, James got upset with me because I did not come over to play with him! I said, "James, I have to work now." He looked at me with total confusion and said, "I thought you came here to play!"

To become a member of the community, I had to be able both to play while I worked and to work while I played.[28] To become a member of the community of children, I had to be perceived as someone who was not going to evaluate them or to exercise any form of control over their behavior or their learning. If I was to be told authentic and personal thoughts, I could share my ideas with them but not instruct or supervise.

To summarize, this phase was what Leacock would call the "love affair between the filmmaker and the image." He states:

> By *love affair* I do not imply that you have to love what you are filming; in fact, you may hate it but you are involved emotionally, or intellectually. You are engaged.[29]

3.1.1.8 Step 8: Transparent and Non-invasive Tools

Another breakthrough in my work occurred one afternoon when filmmaker, David Parry, who was visiting the Media Lab, came to shoot with me at the Hennigan School.[30] Parry showed me how to move with the camera into the center of the action without disturbing the activity. Parry held the camera in both his hands in front of him. He moved the camera in and out of the center of the activity. I was shocked. I was sure he would invade the personal space or "bubble" surrounding those he was videotaping. I had never dared move so close to the children at work. But the children behaved comfortably with Parry because he was comfortable with what he was doing.

From that day on, my camera work changed; the camera moved with me. When I participated in the activities with the children, the camera was turned on and was close to them. Eventually, I *stopped thinking about the camera* and just used it *invisibly*.

Along with learning how to get close enough to the visual image, I also had to record the sound well. Working in the school meant that loud ambient noise often ruined even the most expressive images.
Moreover, no sound rendered even the most powerful visual image almost impotent. Therefore, *miking* the sound that *carried* the image became another obstacle to overcome. Eventually, I chose a directional microphone—an ME 80—with a four foot cord. With the camera in the right arm and the mike in the left hand, I would approach a child, and then place the mike down on the table facing the child and sit down beside the child.

3.1.1.9 Step 9: Developing an "Affectionate" Style of Shooting

By the end of Phase I, **I had developed a style of shooting which was immediate, intimate and affectionate.** It consisted of the following techniques:

- holding the camera on my right hip or lap (with the view-finder pointed up) and the microphone in my left hand or on a table to ensure direct eye to eye contact with those children I was in conversation with;
- holding the camera quite close to the center of the action to recreate a feeling of intimacy;
- pointing the camera up to the child, when possible, to give the viewer the feeling of looking up to the child;
- following the activity with the camera to give the viewer the sense of moving his or her eyes with the activity—in other words, to recreate reality;
- videotaping one interaction for as long as the interaction lasted; and
- stepping back from the activity, from time to time, to pan the overall atmosphere to provide context for a given scene.

In conclusion, Phase I could best be described as my letting go of my original hypotheses and becoming technically proficient as well as emotionally and intellectually engaged. This attitude of caring about the children and feeling comfortable with my research tool, the videocamera, laid the foundation for the next phase, editing the video footage—a phase which overlapped with the shooting phase and continued for more than three years.

3.2 Phase II: Editing for Linear and Non-linear Presentation (1986-1989)

3.2.1 Step 1: Editing for Linear Presentations

Step 1 consisted of editing for linear cuts—five to fifteen minute video pieces about the children in Logo culture. In the editing room I could juxtapose images to create new ways of looking at the footage. Children's anecdotal comments could become alive with a certain amount of editing; yet they could lose their truthfulness when overworked. Moreover, in the editing room I discovered what sequences I had missed because I turned off the camera too soon, ran out of tape, or did not have charged batteries. The importance of this process of shooting, viewing, and then editing taught me how to look at the environment more carefully and videotape with a more attuned eye on my next visit to the school.

If I were to itemize the major turning points during the linear editing phase, they would be the following:

- showing and presenting the footage to filmmakers and researchers;
- not using a narration—letting the children talk without using a voice over describing what the video ethnographer sees or wants the viewer to pay attention to;
- learning simple techniques: how to black a tape, make L cuts, and other related skills;
- building video sequences, then scenes, then stories;
- experimenting with the same footage to show how different slices of the same video could bring deeper interpretations—simulating a videodisc environment;
- editing collaboratively with a colleague (for a fresh point of view); and editing alone (for intimacy with the data and closeness to one's art and intuition);
- changing from linear to non-linear thinking for videodiscs environment; and
- becoming video proficient: buying a camera, setting up an editing suite, experimenting with many cameras and in different editing suites, and teaching other researchers of children's thinking how to use, how to think about the camera.

The first two of these concerns, I will discuss in more detail below.

3.2.1.1 Presenting the Footage to Filmmakers and Researchers

The Known Audience

Once a week, a group of filmmakers and students in a video/filmmaking class organized by Leacock and Davenport met and examined each other's work. The loosely structured atmosphere meant that everyone could show about five to ten minutes of rushes. Discussion and "instruction" followed the showings. The students responded to the material candidly.

What I learned from this interaction with aspiring filmmakers was that there is no one way to communicate a message. Each student's content and style was varied.[31] Hasin's style was realism with political overtones; Waite's was aesthetic, poetic and feminist; while Gianbalvo's style was bold, and provocative. Viewing the video *products* of our ways of interpreting our experiences and what we wanted to say to others about our experiences led me to reflect deeply upon my own "realistic," enthusiastic and optimistic style. Whatever I edited seemed to contain a mixture of humor and seriousness about the human condition. My subjects on video tended to make viewers smile from inside, intentionally.

The Unknown Audience

Presenting one's work in a darkened movie theater was another step in this orientation to the filmmaking experience. At the end of each semester, students would show their works in the Media Lab's Bartos Theater. Open to the public, this evening was an opportunity to test out whether what one thought one was communicating was in fact being communicated. This event provided an opportunity to observe how others responded to a semi-finished product. These were evenings of learning from one's own work and the work of others.

In many of the disciplines in the arts and sciences, "presentation" means that we can make adjustments as we watch our audience respond. But once the film is cut or the video is edited, the producer/director cannot make changes. The audience laughs or they don't laugh; they feel something or they don't. The creator can only stand in the dark and wait for the response. Finding those moments to share with others what the children had told me was a major challenge.

An example of a successful communication is the scene with Mark and Kathy sitting at their computers telling me why they like the Hennigan School better than their last school. The *expected* answer is that there are more computers at the Hennigan and they get to use them more. Indeed, they do say this. Then, Kathy looks up to the camera and whispers with great passion and a crinkled nose that the Hennigan School has "better FOOD!" The way she says the word, "food," lengthening the "oo" so the word seems to last a minute is a wonderful video moment, both in terms of content and style. I ended the scene on her comment.

In short, having a regular *known* audience in the classroom and, from time to time, an *unknown* one in the theater contributed to my understanding how to communicate the recorded moving image. Researchers who use video may need to consider the impact of the video images upon their audiences; the *known* and the *unknown* audiences are to be considered.

3.2.1.2 Letting the Story Tell itself without Narration

The art of editing is like any other art; it is highly dependent upon technical competence. Many people prefer to think of it as a skill or a craft; but those who have done it for any extended period of time know that there is an aesthetic sensibility similar to the stroke of the paintbrush. Knowing how much is enough and not too much is one of the first and most difficult lessons to learn.

The filmmaker or video ethnographer is often *in love* with the image s/he shot. Selecting means cutting out images still beloved. In a sense, editing is the more akin to sculpting than to painting. It is the removal of the excess, so that the object hidden in the stone appears. The editor must disclose the essence without breaking the stone. S/he must decide how to place the small sculptures into a community of sculptures so that the collection is a complete work.

In my video editing, my decision was **not to include narration** to tell the story but rather to let the children tell their story with as little interference from adults as possible. For example, in the introduction of the mini-movie, *The Growth of a Culture*, Papert briefly explains how, in the context of computers, cultures would grow. The outdoor scene introduces the main themes of the piece without a narration.[32]

My decision to encourage the children tell their own story and not use a voice-over narration is embedded in this first action scene of the mini-movie. (The fact that a huge playground was without an adequate playground facilities spoke of the poverty of an inner-city school. Nonetheless, the video of the recess period is not one of sadness or poverty. The piece takes a close look at what may be happening for the girls who are actively making circles and learning negotiational skills in a contextual way. The first scene contains strong images of energetic young females making the most of their situation by doing the best that they can do in a restricted environment.)

3.2.2 Step 2: Editing for Videodisc

3.2.2.1 Arranging Chunks for Linear and for Non-linear Delivery

Editing for linear presentation gave way to thinking about how to present the material in meaningful chunks for non-linear access. Having made the decision to produce videodiscs, I had to rethink the process of editing for creating linear *stories* to editing for non-linear *stories*. I use the term, story, not in the sense that the video pieces are fiction, but rather in the sense that the data needed to be organized in a manner which made descriptive and narrative sense.

As mentioned earlier, an (as yet) unarticulated visual language exists; we recognize this language when we see it. For example, if three pans of a landscape each starting from the left and going to the right occurred one after the other as a sequence, the average movie–goer would know a grammatical or structural error occurred. This is not to say that breaking the conventions of the visual language are not what make the visual experience rich. As a ten year old boy named Tod at the Gardiner School in San Jose, California once told me: the issue is one of intentionality. Comparing his programming in Logo to dancing in a ballet, he said that if a ballet dancer is on "his tippy-toes" and he knows why he is there, then making a circle has meaning. If it is "without purpose," then it is does not hold together. In the same sense, editing can break conventions, but the video artist or researcher has to know why s/he is changing the language.

When I started editing, I was never taught what makes a scene or a sequence in the building of a story; classes with Leacock and Davenport helped

us learn what did not work. The guiding principle while editing was to be honest to the story one was trying to tell, given the limitations of the footage.

Other considerations learned while editing were to pay attention to:

- the timing—the length of a given cut in the overall relationship of all the individual cuts;
- the balance between diversity and stability of kinds of shots to ensure that the viewer will be able to focus on what is important and be stimulated with a broad enough range to maintain the focus over a period of time; and, most important,
- the thematic development without interruption—starting from the opening shots to the closing ones and credit.

Leacock used to tell us that if you don't "grab your audience" in the first minutes, they don't get involved in the film. In research documentaries, the leeway may be greater given the fact that viewers are supposedly less interested in the stylistic aspects and more attuned to the content. Aesthetic treatment of research data requires learning the stylistics that best communicate the ideas. Learning to use video technology for research while paying attention to the grammar and stylistics of the medium requires time and adequate facilities, patience to face the endless technical problems in editing and filming, and the willingness to collaborate with others. One could say that the researcher has to come in touch with the creative parts of her/himself, to reach into that inner core, and to be unafraid of the unknown. In a sense, the researcher becomes like the young child who has to find out how to use new tools, in ways that are appropriate for her/his learning.

3.2.2.2 Integrating the Artistic and the Scientific

Editing videotape footage demands a respect for both aspects of the human potential, the artistic and the scientific. Becoming an artist enhances the researcher's science. The aesthetic sensitivity of the artist combined with the precision of the scientist both contribute to video research.

To date, there are no conventions for videodisc chunking and for placement, or *real estate,* as is often called. Some designers opt for sectioning off an existing linear piece into bite-size chunks.

Others organize a linear piece for easy chunking at a later date—as was done in the American Broadcasting Corporation's (ABC) videodisc called *The Holy Land*. When a piece edited for linear presentation is chunked, the beginnings and endings of the cuts can be problematic. (L-cuts are divided so that the sound under a video shot is stopped abruptly.) Another problem is that the context is usually destroyed. Furthermore, a short or long cut (which worked well in the linear story) may not stand on its own in the non-linear.

In deciding how to edit for videodisc environments, a HyperCard application called *Star Notes*[33] (described in detail in the next section of this chapter) was designed for making decisions about:

- how to select relevant scenes;
- how to chunk video sequences;
- how *big* the chunk needs to be in order to communicate the message; and
- what chunks go well with other chunks, and for what purposes.

3.3 Phase III: Selecting Video Data for the Videodiscs (1988-1989)

To explain how the process of selecting the video occurred, I will describe how the tool *Star Notes* led to the *real estate*, or placement, of the video on the six videodiscs of *Learning Constellation*.

3.3.1 From "Video Scenes/Intervals" to "Video Chunks" for Videodisc

The next major phase in the process was to build and use the hypermedia tool, called *Star Notes* for selecting the relevant video data. The following six steps describe this process of thinking about video as scenes to thinking about it as chunks:

- Step 1: Re-viewing the relevant video data.
- Step 2: Selecting and recording the video chunks onto 10 one inch videotapes.
- Step 3: Logging the scenes/intervals on a HyperCard application, *Star Notes*.
- Step 4: Entering the data.
- Step 5: Assigning Keywords/Themes.
- Step 6: Building stacks from Keywords to compare and contrast the data.

3.3.1.1 Step 1: Re-viewing the Relevant Video Data

The first step which Orni Mester, my assistant, and myself implemented was to re-view the seventy to eighty hours of relevant video data. Watching the video on one's own and with others is the most crucial step. The attitude one has towards the data shapes the final result. Fortunately, my video data never lost my interest; each viewing was a deepening of the experience I had had with the children; each viewing brought me close to understanding what the children meant when they did or said certain things. Sharing the with a filmmaker on a daily basis added a fresh view.

The obvious question was: How does one decide what is the most representative of a large body of material? As we watched another time, we dubbed large pieces of video onto about fifteen one–hour 3/4 inch tapes. Our chunks were long pieces to be later refined.

3.3.1.2 Step 2: Selecting and Recording the Video Chunks onto 10 One–Inch Videotapes

At this point, we dubbed similar chunks directly from the original footage of the VHS source tapes onto ten one inch videotapes. While doing this, the next step was also in motion.

3.3.1.3 Step 3: Logging the scenes/intervals onto *Star Notes.*

The next step we implemented was to work on the design of a HyperCard tool called *Star Notes* for logging the scenes from all the data. HyperCard, an Apple application for the Macintosh computer, was released in the fall of 1987. HyperCard made it possible to link video and text data. Each chunk can be described on a 'card', a 'window' or a defined space on the computer monitor which resembles a filing card. Cards can be arranged in 'stacks' according to the categories from a keyword box. When calling up a stack, each card in the stack will appear and then be replaced by the next card in the stack. Searches can be carried out easily as each word in a field is an object to be found and displayed.

The history and definition of hypermedia is described by Lampert and Ball in the following way:

> Hypermedia is a new concept in educational technology. It combines elements of multimedia environments for learning and teaching with recent development in computer software called "hypertext" (Ambron and Hooper, 1988, Jones, 1990; Richards, Chignell, and Lacy, 1990; Wilson and Tally, 1990). Hypertext grew out of a system called "memex" imagined by Vannevar Bush in the 1940's. Bush (1945/1988) foresaw the possibility of building electronic linking tools, based on ideas about how people connect ideas in flexible networks, to enable scientists to cope with the "information explosion" occurring in many fields. **Hypertext is a representation of multiple and flexible links between discrete pieces of data which allows users to navigate among multiple paths through a network of chunks of information and to build and store their own links.** When the data to be linked include video, audio, and graphic as well as textual information, the representation is called hypermedia.[34] (bold added)

On each card in *Star Notes* there was a space for the following information: Name (of scene), Description (of scene), Source (which tape number it came from), Date (that the video was shot), and most important, Keywords, (which later became the themes).

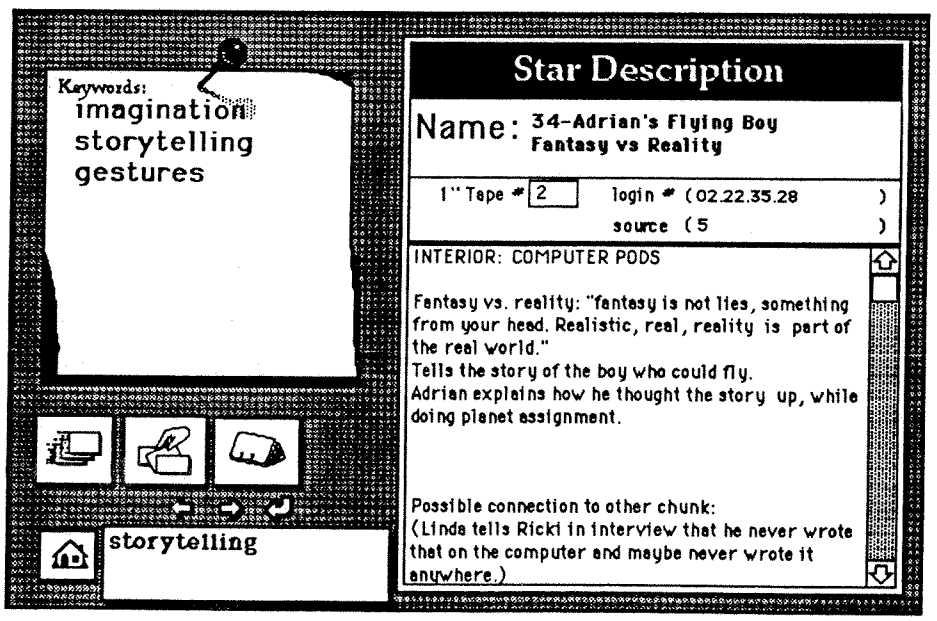

Figure 2: ***Star Notes*** **Logging Tool**

Notice how each card contained a list of categories, or Keywords, stacks of cards in the same category which were instantly accessible by clicking with the "mouse" on the name of the Keyword.

3.3.1.4 Step 4: Entering the Text Data

Step four consisted of entering the text data which corresponded to each chunk of video: a brief description, the name of the chunk, and on which tape it was to be found. Although the data entry was time-consuming and often tedious, it changed the nature of the research project. With *Star Notes*, we could "subdivide" the video data into discrete units and describing each scene, the information on the cards could be manipulated as separate entities. (We did not always agree on when a scene started and ended, but we always reached a comfortable negotiated compromise. The fact that Orni Mester had never been to the school enabled me to understand that what I thought of as a scene may have been effected by my remembering the context in which it was shot.) Working as a team in assigning the Keywords meant that the categories emerged from the material and not only from my point of view.

3.3.1.5 Step 5: Assigning Keywords/Themes

While categorizing each chunk of video, no predetermined set of Keywords existed. They emerged from the data. We would watched the video and decided the keywords according to the content. At first the process was quite slow; but it speeded up as the content kept pointing to about ten different Keywords which soon became the underlying themes running throughout the footage. The themes which emerged were: *Inventing, Imagination, Girl/Boy Talk, Story-telling, Lying and Punishment, Discipline, Reflecting on oneself or others, Teaching/Learning, Gestures, Cooperative Learning, Curriculum, Independent Play, Space, and Reflections.*

3.3.1.6 Step 6: Building Stacks from Keywords to Compare and Contrast the Data

In step six, the thematic Keywords were organized into stacks, or groups of cards, in order to compare and contrast the data. For example, all the cards with *Inventing* as a Keyword were grouped together on–line and in hard copy.

In this way, we could determine which thematic categories were the most dominant and representative of the entire body of footage. In a sense, the thematic Keyword stacks helped us understand what was often an unarticulated undercurrent in my videotaping. These stacks became the foundation upon which *Learning Constellations* was built and more important, upon which the video data were discussed by the community of Project Headlight researchers.

Keywords to Themes

Not only were cards grouped into stacks, but stacks were grouped within stacks and searches were done throughout the stacks to link various subgroups. For example, the word "punishment" kept recurring in the descriptions even before punishment became a Keyword and an eventual theme. A simple search linked many "punishment" cards together for us to compare the context in which children thought about punishment. For Josh, punishment meant having to do anything he did not want or choose to do, like following the school curriculum when he had a better idea for his own project. For Andrew, it meant being grounded—not being able to go outside the house for a long period of time. Mindy's punishment was sitting in class and not being allowed to go to the computer because she had decided that going to a party the previous night was more important than doing her homework.[35]

In this linking and comparing the text data, unexpected connections began to occur—Andrew's story about the a boy travelling from planet to planet could be cross-referenced with his teacher, Linda Moriarty teaching Logo commands in a class project on the planets in their constellations project. Did Andrew get the idea of from her constellation project?

The problem we were having in this step was that one could not view video with the cards. *Star Notes* was a card indexing file, with sorting and linking capacities, but it was not an application linking video and text. Being as patient as possible, we spent the next few months categorizing and arranging the data until we arrived at a rough outline of themes for the videodiscs. This categorizing was an important stage in our thinking about interactive features for *Learning Constellations*.[36]

One Chunk Relating to Different Stacks

One of our time–consuming activities during this step was that our community was curious about how this approach to logging, categorizing and selecting data was affecting research tools and methodology. Since "new territory" was being broken, our colleagues wanted to be shown how a multimedia videodisc research environment would work. Without the videodiscs, we would edit different "slices" of the video, sometimes starting with the same chunk and building different but complementary pictures of the children. For example, one of my theories about using videodisc as a research tool was that a particular chunk of video, in the context of one set of video cuts, could connote another layer of interpretation if placed in the context of a different set of video cuts. In other words, one could build different yet complementary ways of examining the same chunk of data.

3.3.1.7 Step 7: Selecting Video Chunks and Editing onto 1 Inch Videotape

In the beginning of step six, the stacks were grouped together by arranging the HyperCard stacks into what seemed like unified thirty minute videodisc "chapters." Having each videodisc represent Themes such as Inventing and Imagination, for example, seemed to miss the point of users being able to build *thick descriptions* to get close to the meanings of what the children were doing. However, by combining the notion of *thick descriptions* with the Keyword Themes, we were able to chunk the video more precisely. At this point in step six, we began to select video chunks (which we thought would encourage users to build thick descriptions) and recorded them onto 1 inch videotape. This step entailed going back to the original seventy to eighty hours of usable footage, selecting and chunking the video, and dubbing the chunks onto ten one-hour tapes. This task took us approximately half a year.

3.3.2 From Videodisc Chunks to Videodisc Chapters

Creating six videodiscs or three hours of running video from the selected ten hours (which was also a selection from the original seventy to eighty useable video) was the next part of Phase Three. Some researchers approach deal with analyzing video data on videodisc differently. They use a small but dense body of data in its entirety.[37]

Ackermann, a disciple of Piaget, believes that the selection phase is a crucial and valuable part of the research process. From the filmmaker's prospective, Schneider speaks about the selection in the following way:

> In Flaherty's work, as in most personal documentaries, specifically in the work of Leacock, the Mayseles, Wiseman and Pincus—**the use of selection is crucial. Not only does this give the film its style and structure, but it is process which the viewer is able to get to know the subject.** What we care about is the person, if he is confronted with a problem, for example in *Chester Grimes*: we live through it with him. The problem is not irrelevant. "The issue is there but it is the not the starting point; the human being is the starting point."[38] (bold added)

In "making sense" of longitudinal research video data, researchers must make selections and as Schneider and others contend, the selection should relate to the deeper human issues underlying the vast data.

The criteria upon which these selections were based were: that my initial contact and experience with the children would guide the selection; that multiple interpretations of the video data would be encouraged; and that multiple interpretations would enrich the description of each child.

3.3.2.1 Establishing the Context for the Videodiscs

Another crucial issue arose at this point in the selection and design: How would we provide a rich enough context for the user who is not familiar with this culture? Would chunking the video leave the viewer feeling fragmented? The answer to this was to use the first fifteen minutes of the Videodisc One for the linear movie, *The Growth of the Culture*. Not only would the user be able to access the whole linear mini-movie (as in the ABC *Holy Land* videodisc) but s/he would be able to access it in chunks.

Thus, the first edit for Videodisc One was the fifteen minute movie about the Logo culture—an overview of the culture. It introduces the main themes, the characters, major and minor, the school culture, the Logo culture, some of the research faculty, and it introduces the research goals of this project. To provide background information about the project, Orni Mester interviewed me about my study. We assembled the audio on the second audio track of Videodisc One.

Also included were chunks of video from a presentation I gave to the teachers and researchers of Project Headlight (in the summer of 1987). This material addressed the goals, methodology, and ethnographic approach of the project. It also included a discussion of Josh and Joe. And, of course, Josh, Joe, Mindy and Andrew are all part of the overview, as are many of the themes. One can hear a bit about inventing, some boy/girl talk, watch a teacher interact with Josh and Joe, and listen to the children telling us about the Logo culture.

Linear within the Non-linear

Regularly discussions took place whether or not the chunks should make sense if viewed linearly, from beginning to end. After all, why not take advantage of both linearity and non-linearity if possible? From these discussions, an idea emerged that each videodisc could function as a chapter. However, unlike a chapter in a book, the user would have the advantage of being able to move to a related themes, find more about each person, search for recurrences of a word or phrase, and most importantly, keep track of what s/he wanted to save along the way so that it can be grouped together as a cluster.[39]

In deciding about the real estate of the next five videodiscs, we paid closer attention to the notion of themes and thick descriptions. The end result is that the video on each videodisc seems to be woven together syntactically and semantically. Moreover, there is a story-like order to the whole body of six videodiscs. Videodisc One is the introduction and overview; Videodisc Two is an in-depth portrait of one child, Josh, at home and at school; Videodisc Three follows the *Invention* and *Imagination* themes of the children working with Logo and LEGO/Logo; Videodisc Four is a close look at Andrew's *Storytelling* and his efforts to distinguish between fantasy and reality. Videodisc Five is a description of Mindy's *Girl/Boy Talk* and the children's views on *Punishment, Lying* and the interpersonal aspects within the learning environment. Videodisc Six is the end, a closure to the videodisc set with a variety of persons talking about the relationship between education, technology and humanity.

The work, looked at together, reflects diversity more than it does convention. We examined alternative way to arrange the video on the videodisc without judging which is best. The material guided each videodisc separately. Themes and *thick descriptions* guided the exploration and established the constraints within which we negotiated the videodisc real estate.

We found that building stories with video data still requires the basic structure embedded in a good story: a beginning, good characters, plot development, and an end. The set of six videodiscs can be thought of as a small story, a novella.

3.4 Phase IV: Designing *Learning Constellations* (1989-1990)

3.4.1 Building the Interface for *Learning Constellations*

The purpose of building *Learning Constellations* was to analyze my data. However, the environment was also conceived as one wherein my observations and interpretations of children would be shared. Along with the incorporating of thick descriptions within *Learning Constellations,* was the notion of supporting convivial[40] interactions and collaborations. To accomplish this and to build the interface for *Learning Constellations,* David Greschler joined our team.[41]

3.4.2 Overview of the Tool, *Learning Constellations*

Unique to *Learning Constellation* is that each (hyper) card can be thought of as a star and the combining of stars as the building of thematic constellations. I chose the title *Learning Constellations* because stars group together differently from different perspectives in the universe. The linking of one set of stars to another is dependent upon where one is located at a given moment. The fact that we draw conclusions from what we are able to see and grasp from these different perspectives is not only a good metaphor for thinking about how we think but also a helpful model for designing an ethnographic tool where different users will have an opportunity to explore a range of themes.

The following overview of the system will illustrate how one interacts with the video material.

3.4.2.1 Description of the System and its Use

Upon entering the system, several introductory cards appear describing the project and explaining how to think about units or *Stars* of discrete video and text chunks (see Figure 3).

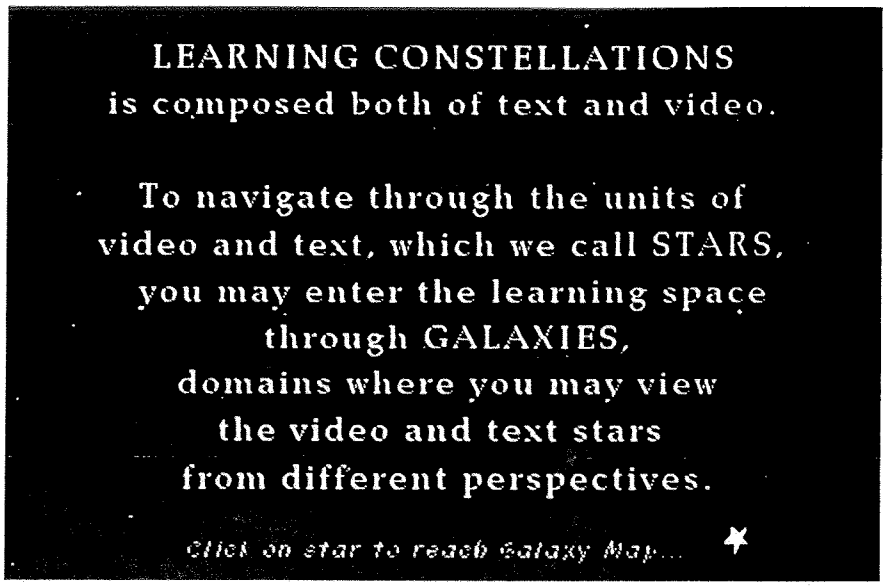

Figure 3: An Introduction Page

The Galaxy Map (Figure 4) acts as the main artery through which all navigation occurs. It has two main functions. First, it provides an easy touchstone to prevent getting lost amidst the groupings of data. Second, it separates large domains of data, such as visual linear, visual non-linear, textual linear, and textual non-linear.

By clicking on any of these domains, the next level of operation occurs.

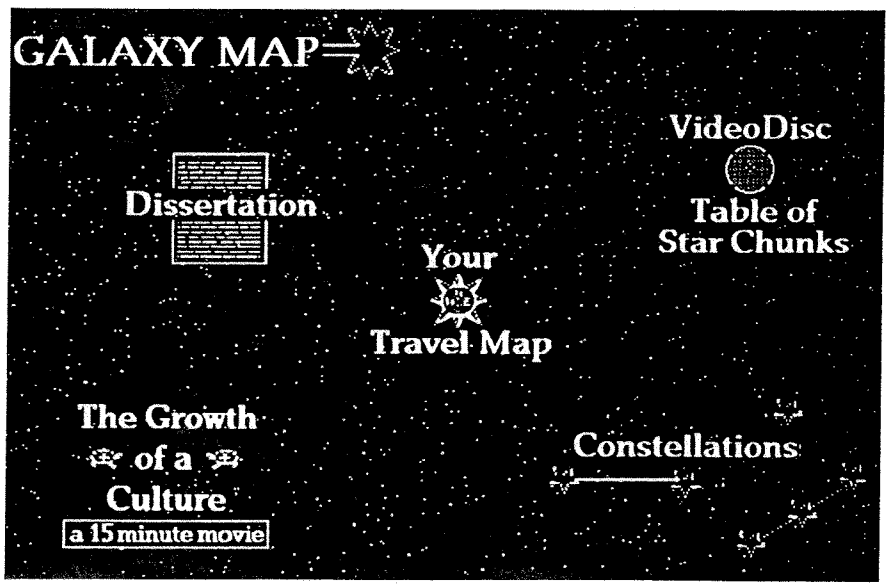

Figure 4: The Galaxy Map

In other words, one can begin the exploration by watching a fifteen minute video which I filmed and edited called *The Growth of a Culture.*

Another option is that one can click on the Dissertation domain (Figure 5). Special video icons take the user to the actual video footage relating to that chunk of text. These Video Notes are represented by an icon resembling a video camera. Clicking on them immediately activates the selected video.

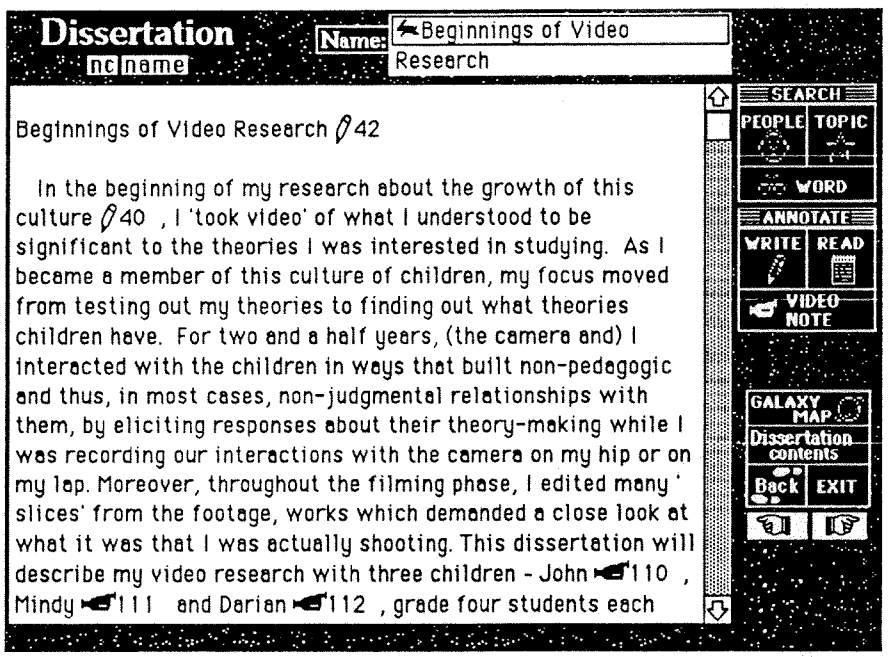

Figure 5: Dissertation Domain with Video & Text Notes represented as icons.

Another domain is the Videodisc Table of Star Chunks (see Figure 6). This domain can be thought of as a linear table of contents listing each of the video chunk on the six videodiscs. To be more precise, the video was put onto the discs in chunks which could make sense linearly if played as half–hour mini-movies on each subject. However, each chunk is independent and can be accessed non-linearly. This table of contents provides the user with the actual breakdown of the chunks for skimming the topics and making choices. By clicking on a selected line brings one to the Video Star Chunk on the computer screen and to also to the corresponding video on the monitor (see Figure 7).

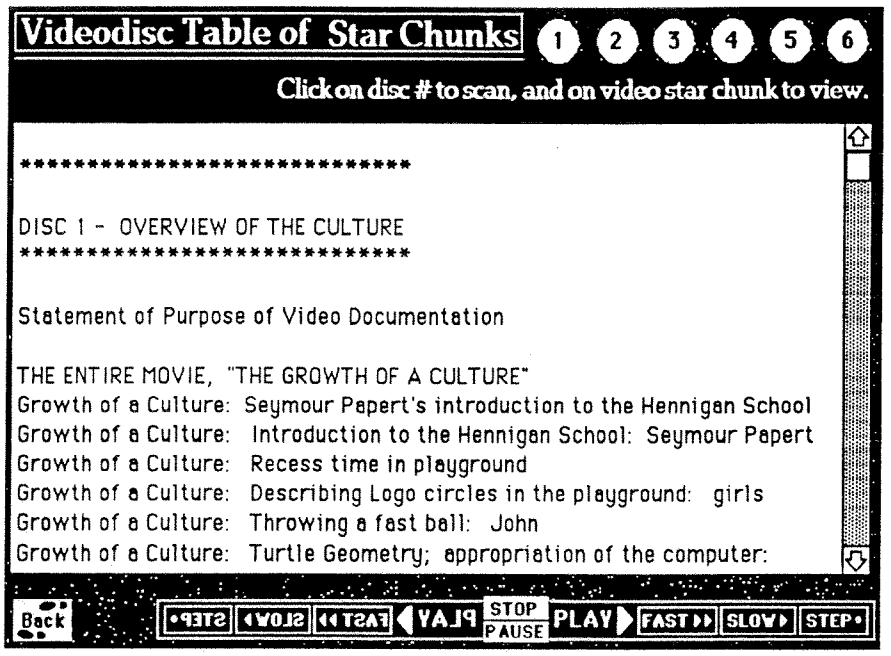

Figure 6: Videodisc Table of Contents with easy access to all chunks on discs.

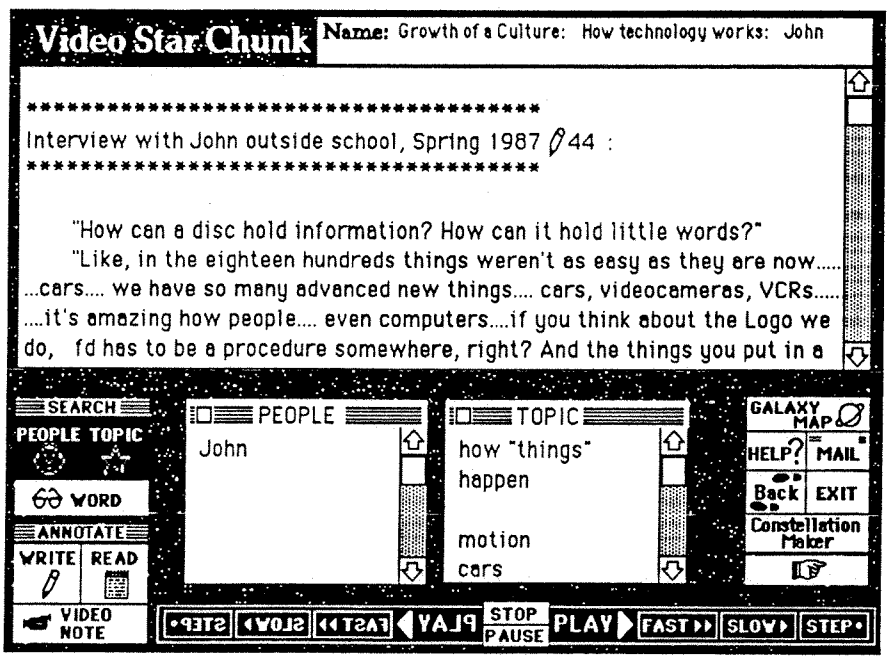

Figure 7: Video Chunk with People and Topic Search fields open.

Arriving at the selected video chunk (see Figure 7), one can read the transcript, find the background information, search according to person, topic or word throughout the system, go back to the last operation, go forward to the next video chunk on the videodisc, and, 'grab' this chunk to place it into a

Constellation group with other video chunks. While viewing, one can control the speed of the video by using the Video Control Panel at the bottom of the card.

Extremely important as a research tool, one needs to have the ability to make annotations and keep track of these annotations. Two types of annotations are possible in this system. When the Write button is clicked, the user has a choice of whether to make a regular Note or a Footnote. If the choice is to footnote, the cursor turns into a pencil icon (see Figure 8). When a word or phrase in the text is clicked on, a field for writing footnotes appears. After completing the Footnote, the field is closed by clicking on the field; it can be reopened by clicking on the pencil icon, permanently embedded in the text.

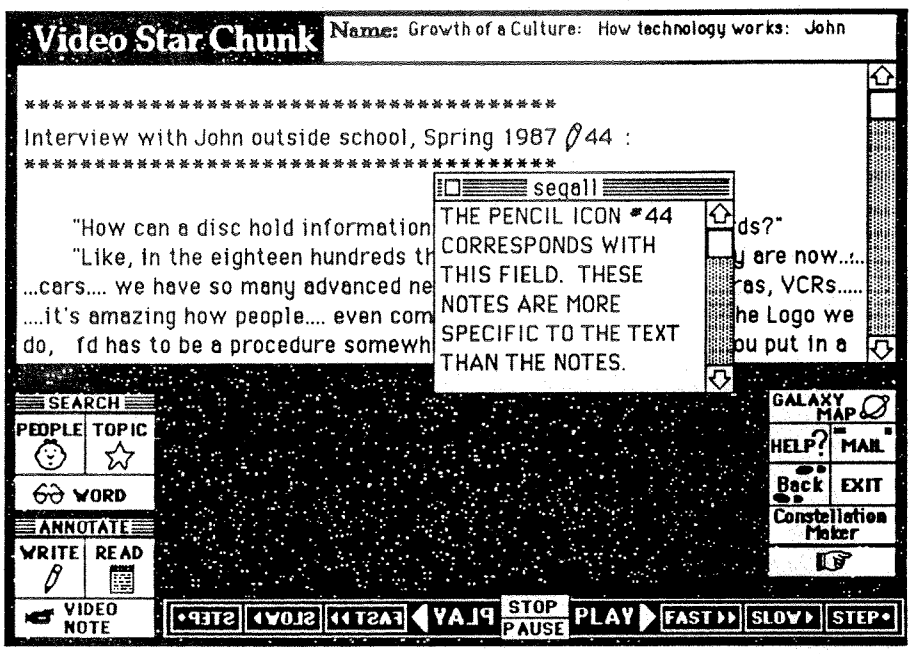

Figure 8: Text Footnotes

Another type of annotation is called Note (see Figure 9). Notes are stored according to the person's name. Thus they are accessible not only on the chunk but also in the public and private notebook domains. By clicking on the Note icon, a writing field pops up in which one can record written observations about the data. When closing the field after writing the annotation, one is asked whether this is a Private or Public note. Public notes only go out to other users; Private notes only go to the Personal Notebook; choosing Both does both.

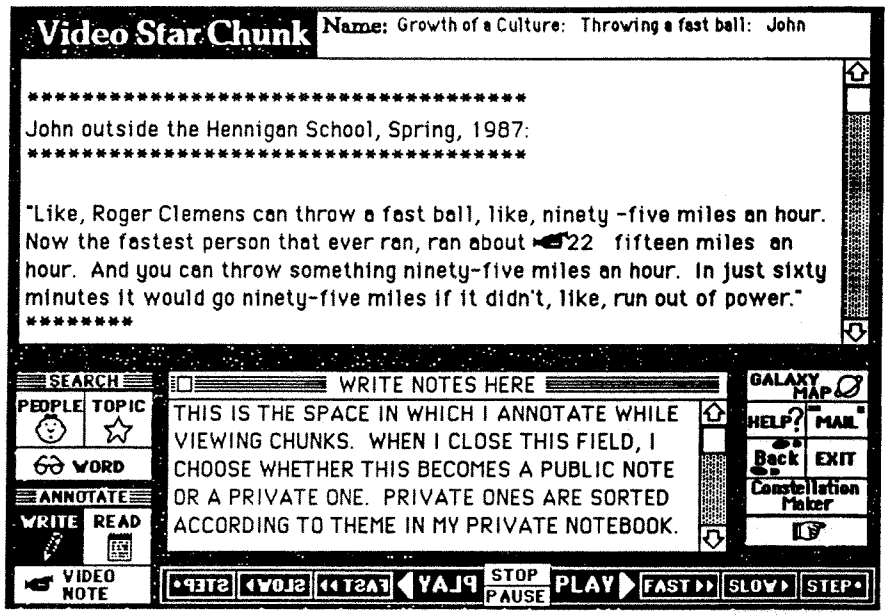

Figure 9: Notebook Annotations: for public or private use.

When choosing either Private or Both, one is asked to categorize the note by Theme. By placing the note in a Theme, one decides why the chosen chunk of video is significant. To read, the Read button is clicked. One's private annotations are found in the Private Notebook (see Figure 10).

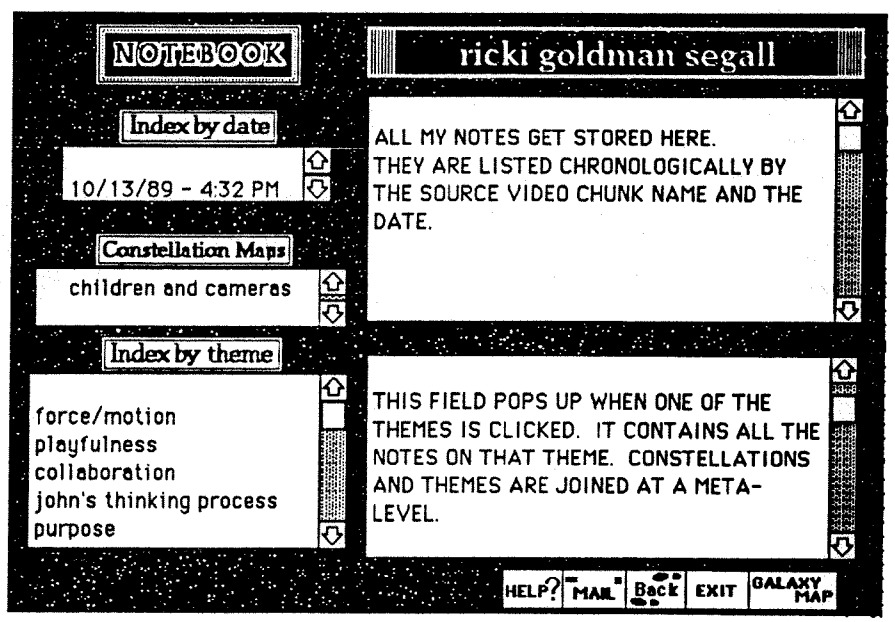

Figure 10: The Private Notebook

Once the constellation is built, it stays in the system for others to view. One of the built-in constraints of *Learning Constellations* is that the chunks are defined by the researcher. This protects the data from being taken out of context. An alternative chunking is available to users. One can build a grouping of mini-chunks, defining the beginning and end point of each chunk, by using the Videonote builder—a videodisc editing tool. Researchers who are concerned about not having their research re-structured by users need to consider how this affects the interpretation of their data by others.

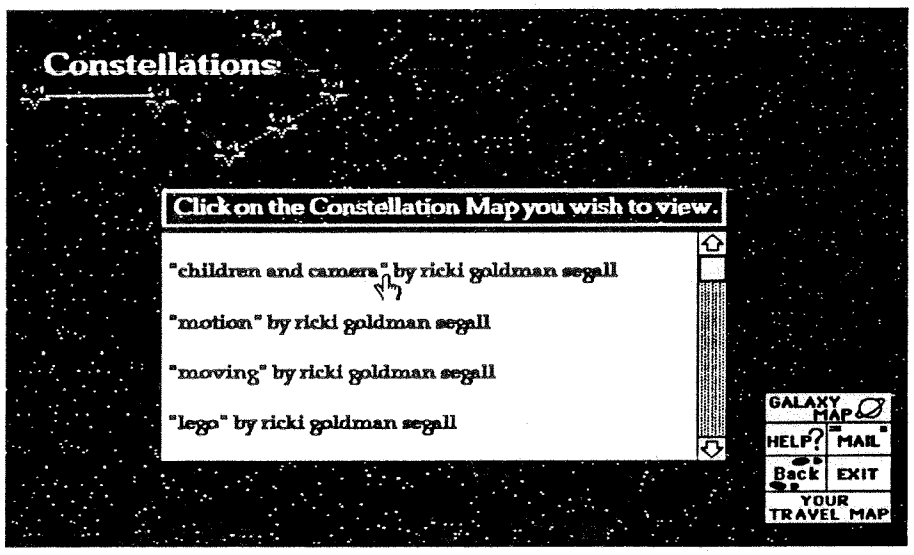

Figure 11: List of Constellation Contents

Figure 12: The Constellation: "Children and Camera" with digitized images.

Building constellations is useful in exploring ideas by linking related video together chronologically to analyze changes. For example, one of the constellations I built is called "children and the camera" (see Figure 11). I wanted to take a close look at how Josh's gestures in front of the camera changed throughout the two years of videotaping. I selected eight video chunks ranging from my first video encounter with him to the last ones (see Figure 12). What I discovered by viewing these video chunks together is that initially Josh was quite shy in front of the camera, but quickly became comfortable—to the extent that, toward the end of my research, he holds the camera and describes a movie he wants to make about himself in the school.

As mentioned earlier, embedded in the design of *Learning Constellations* is the belief that our interpretations of video data are affected by the ways in which the interface for accessing video on videodisc are designed. As such, it was crucial to present the chunks of video in ways which would preserve the integrity of the original data yet also enable the synthesis of data. The simple and accessible design features and the ability to link video into constellations is an important step toward keeping the interpretations close to the original event by enabling thick descriptions. The key to understanding the conceptual basis of Learning Constellations is not to look for complexity but to think about transparency, conviviality and thick descriptions.

3.5 Phase V: Analyzing Data in an Videodisc Environment

3.5.1 Reconstructing from the Deconstructed Video Data

In this section I will describe the phase closest to the present time, the phase of reconstructing individual case studies of the children from the linked chunks of video data. In other words, this phase covers the period of using *Learning Constellations* as a research tool (for analyzing the video data) to the period of writing detailed case studies. The case studies of the children can be found in chapters four through and including seven.

This phase can be thought of as a period of deconstruction leading to reconstruction. For the sake of coherence, I will use the term, steps, to describe how deconstruction led to reconstruction, but the reader should not assume that the steps were chronological and separate.

Using multimedia research tools means that steps overlap and intertwine throughout a given investigation.

3.5.1.1 Step 1: Searching through the Data Making New Connections

The most basic hypermedia tool, the Search function, is simple yet powerful. Searching for a word, a person, or a topic through the whole body of research data can lead to new connections. For example, two words which kept reoccurring were "good" and "bad." By following the path of the word I found unexpected connections among video clips and transcripts.

Not so dramatic were and are the daily uses of the search of the Topic button. While I was transcribing the video onto the cards in *Learning Constellations*, I entered topics—which seemed to best describe what I thought was going on in a given video chunk—into a Topic field. In a sense, one could think of the Topics as the Keywords/thematic field in *Star Notes*. The process of deciding the topic name and how to categorize each chunk was similar to how the Keyword categories developed in *Star Notes*. The central difference is that in the Topic linking of *Learning Constellations*, the video is activated and can be viewed instantly. Moreover, the contextual information—the transcripts, dates, names of people in chunk, and annotations—is available as well and can be copied into a document writing interface (in the Dissertation Galaxy).

The best example of a search through Topics which led to a discovery was when I followed the topic, *how things happen/work*. This topic occurred quite often (as could be expected in a Logo constructionist culture); children and adults were regularly building things, reflecting on their constructions and coming up with connected ideas. However, I had always thought that one particular chunk of video when Josh tells me about what he would buy for everyone if he were rich was about how Josh sees his relationship to his family members. I had thought that this was *the* most important aspect of the video chunk. What I discovered, however, is that this interpretation is only one aspect and that others are equally significant.)

In the chunk of video, Josh is sitting in my car telling me about a toy he would buy for himself. This topic of conversation developed from a previous talk we had had about his grandparents and how people make decisions about what they want to do with their lives.

Josh told me he wanted to have lots of money so he could buy things for members of his family. He would get "all the Buddy Holly records ever made" for his dad, a big house and a "maid" to clean it for his mother, and so forth. When I asked him what he would buy for himself he immediately knew what he wanted. He told me:

> There's this store in the Dedham Mall and it's called, The Enchanted Forest. It's a store and everything in the store is stuffed animals, like, and they cost, like, $100 each. They're, like, minks, and everything; and they're stuffed animals; and they're so neat; and there's, like, a giant one, like, as big as this car, and they have, like, they have a string hung across the thing and **it doesn't need power. It doesn't need power.** And this little guy is on his unicycle and it's a little bear. This little stuffed animal bear and it goes back and forth. **It doesn't need any power,** it just, like, put it one side and it keeps on rolling. **[It] won't stop unless you stop it. You have to get it started but it won't stop!**

This chunk may have remained a cute anecdotal comment about a young boy's fantasy rather than understood within the context of his fascination with the source of energy, even when he talks about a favorite toy. Playing this chunking the context of other chunks of video—his constructing things that move and his reflecting upon these kinds of moving objects—helps build the layers of richness about Josh's thinking about moving things

This analysis by connecting seemingly unrelated chunks became possible with the linking of video from simple searches throughout the video data.

3.5.1.2 Step 2: Annotating and Reading Annotations

Another step in analyzing the video data was to respond to the chunk as I was browsing or filling in transcripts by annotating the chunks. Often, as I transcribed, new connections would occur. Using *Learning Constellations* enabled me to reflect upon the video in a way I had never done when it was on videotape. (While viewing on tape, I would sketch out notes to myself, but they never got integrated into my formal thinking. They were my "subliminal" notes.) With the multimedia environment, instant flashes which lead to ideas could stay on line and be accessed later. Moreover, in *Learning Constellations,* notes are categorized by theme.

As a result, building categories took place without my specifically looking for links in the data. The theme tool also provides a list of previous themes, as an aid for remembering the previous categories.

3.5.1.3 Step 3: Using "Videonote" to Isolate and Segment Chunks and to Build Mini-movies

Learning Constellations has another feature called Videonote, for making finer-grained links. Using Videonote, we can isolate chunks within chunks and link them together. Two examples will illustrate the importance of this feature.

A reoccurring theme in my videotaping of Josh how he seemed to think with objects in much the same way as does Papert. At first this comparison between Josh and Papert struck me as idiosyncratic more than related to a style. However, both these themes came together in a small Videonote that I built from two segments within two chunks. In the first video segment, Papert, in an interview points at the camera and says: "They're pointing that camera at me..." Josh, in a conversation with me, points to the camera in almost the identical gesture saying, "And like when they made video cameras, like you're shooting me now. When they made them, they probably thought about cameras."

The gestures are almost identical. Is this just coincidental or are they both appropriators of physical objects? Although at this point, this is just an interesting conjecture, as the case study will show, Josh does tend to be comfortable in using objects around him to think with.

3.5.1.4 Step 4: Slow Motion for Fine-grained Analysis

Another level of analysis occurred by using the slow motion feature. Watching video in slow motion informs us about people's attitudes. An example is when Linda Moriarty is describing Josh in one video segment and Andrew in another. Her hands make circles and wave in front of her. But, her hands move differently when speaking of the two children. Not only do they move differently, they connote different meanings. In slow motion, the contrast is more evident.

Another example is when Mindy tells me about Josh and Joe while I videotape her in her classroom. During this conversation, there are several interruptions. The slowed down video shows her responses to: a classmate, her teacher, another classmate and me, the interviewer. In slow motion, we can see the way she looks at different persons. Her dramatic personal presence is highlighted in a way I might never have seen. Particularly helpful is that the sound is cut off while the video moves slow or fast. Without sound, the focus is on the gestural.

One could ask why slowing down the movement is important for researchers studying human behavior. One response could be that facial imaging, a topic under investigation by computer cognition researchers, relies on understanding the meaning of gestures.[42] The response in terms of this study is that it enables one to link what one says with what one means. (One does not say, "I love you" convincingly if one's arms are folded over the chest.)

3.5.1.5 Step 5: Reconstructing the Video Data into Case Studies

The final step in this research analysis phase was to put the ideas underlying the chunks together in a way that communicates what I believe these children were telling me about their thinking. In this step, it was necessary to build portraits or case studies of the school culture and three children who experienced the introduction of Project Headlight. After the data had been dissected and linked in hundreds of ways by me and many others, it was not an easy task to describe each child uniquely and yet multi–faceted. Yet, this is what each human being is.

The case studies are the results of my dissertation. As such, it was important that I bring to light the most salient characteristics of each child which relate to their overriding style. The purpose was to show their main thinking style focus, however, this is not to say that my interpretations are the final ones. In fact, *Learning Constellations* will store my dissertation as one interpretation of the data. Alternative interpretations by others will continue to grow in the coming years.

Closing Remarks

To conclude this chapter, I would like to emphasize two aspects of the video methodology. The first is the convivial design of *Learning Constellations and* the second is this method of filmmaking as a research approach.

Design of Learning Constellations

The design of *Learning Constellations* followed closest to the principle that the structure will emerge from the content of the video. Thus, the end result was guided by each step in the process of the video ethnography. However, the overall architecture of *Learning Constellations* was outlined in my mind for two years before designing the interface. In thinking about an interactive videodisc environment, I knew the interface had to have a certain *look and feel* of conviviality to it. It had to follow thematic grouping which would encourage the user to delve more deeply into the material without getting lost in his or her travels and without running out of new connections to make.

Designing for a convivial and "friendly" environment to access my data and other research data was part of the thinking that went on throughout the years.

Filmmaking and Research

Regarding the use of video as a research tool, it seems that Temaner and Quinn have touched on what I was hoping to accomplish in my approach to research:

> If research and inquiry have to be carried on and stated in statistical terms of explicitly conceptual models,we were not doing research....If research has to be replicable, we were not doing research. Someone with better eyes and better ideas would have made better discoveries and a better movie. What has been outlined here is not a universal method of discovery and proof. In the last analysis, it may be that we were functioning as some sort of social artists. From that standpoint, the method of cinematic social inquiry is a means of intelligently surrendering to a situation without losing creative identity.

> It is a way of trying to assure that the basic meanings and values which are the stuff of the maker's imagination, out of which a work's form and matter emerge, are primarily derived from the situation. Further, as you surrender yourselves to the situation, the situation surrenders its meaning to you. You express its expressions.[43]

To describe the situation of children at work at their computers and my "surrendering myself" to this situation is difficult to do in language. However, finding some means of articulating how I elicited the comments from children which I did elicit needs some closing statement.

Imagine that there is someone with you, while you are reading this dissertation and thinking about these ideas. Someone is in the room with you, not working on his or her work, not playing an instrument or reading a book, but rather, s/he is responding to your response of the reading. When you want to shout with glee and talk about it, s/he is ready to listen. When you are frustrated and angry, s/he is also there. Whatever your response to this dissertation, that person is ready to accept what your response as being the whole truth for you. No conditions. No censors. Not even any responsibility to make that person feel comfortable. In a nutshell, that is how I tried to relate to the children. I tried my best to be their friend.

PART III

CASE STUDIES

4 The Logo Culture at the Hennigan School: Changes within defined boundaries

Whenever two cultures interact, both cultures are affected. What I documented and discuss here is my snapshot of what the research Logo culture met when it first entered the lives of children and adults at the Hennigan School. What I leave for a future study is an examination of how the adults and children became the integral part of the Logo culture.[1]

In this chapter, I present the meeting of the Logo culture with the Hennigan School culture. To do this, I describe the physical environment and the typical school rituals which seem to best characterize this school. Then, I introduce several of the teachers and children who reflect a range of attitudes and approaches to education which were prevalent during the first years of Project Headlight. A case study of Shannon's becoming a member of the Logo culture will also provide a contextual understanding of the first year of the project. I conclude this chapter with an introduction to the three children I continued to study in greater depth over the following years.

4.1 Introducing Project Headlight

From the very beginning, the goal of Project Headlight was to find a way of entering into the culture of the school system in order to make incremental changes to the lives of children and adults. The goal of the Logo culture was not to create a free school such as the one in England called Summerhill, inspired by A.S. Neill, nor to change the existing structure of the school.[2]

From 1984 to 1985, Papert and his first team of researchers conducted a formal search for the appropriate school within the Greater Boston School District. Two teachers at the Hennigan School, supported by their principal and vice–principal, responded to this search. This was the only proposal originating from teachers and not from the administration.

Papert, collaborating closely with Sylvia Weir, Sherry Turkle, and his team of graduate student researchers, also selected the Hennigan School because it was a school facing problems similar to many American inner city schools. Problems such as: how to deal with children at risk; how to cope with the drug problem; how to provide equal choices and opportunities for children from diverse ethnic and socioeconomic backgrounds; and how to encourage learning in the sciences. An additional reason for selecting the Hennigan School was that the open–style architecture with large area "pods" seemed the perfect place to make the changes Papert wanted to make within the school system.

As a result of selecting a traditional inner-city school, our research goals were kept within bounds—fundamental changes to the overall structure of the school would be constrained; changes affecting a small section of the school consisting of twelve teachers would be enhanced.

My own research within this project, which began the year the project began, 1985, had less to do with how computers affect changes within the school system and more to do with how a Logo culture gives children and adults the physical, social, and intellectual space to understand their own thinking about the things they build, the things they do, and the things they imagine. In other words, what I documented on video is the quality of children's expressing of their thinking within the Logo culture.

4.2 Denizens in the School Structure

4.2.1 Outdoor Recess: A Time for Separation

The Hennigan School is not a model school environment. The lasting impression is one of gray concrete covered with graffiti—and the graffiti seems a fitting response to the intransigence of the rigid physical structure. The building is low and sprawling, with no lawns except for a huge empty field in the back of the school. In a far corner of the field a few climbing structures are available to the children at recess. The girls, mostly Black, Hispanic, and some Caucasian, play skip rope while talking,[3] braiding hair, and watching each other on the asphalt of the parking lot. Smaller groups of girls and boys, in smaller gender–based groups, often hang out by the climbing apparatus, climbing or playing games.

The boys tend to use the open field for kicking a few balls around, and running in all directions.

At recess, playground supervisors monitor the children. (From my experience over a two–and–a–half year period, I rarely saw a teacher outdoors supervising or playing with the children.[4]) The concern of the playground supervisors is to maintain a sense of order and to ensure the children's safety. In the name of protecting the children from harm, adults involve themselves in the interactions among the children. Often they are involved in resolving conflicts. The method most commonly used is one of singling out certain children to monitor an individual's behavior. Josh's theory about this is that, when yelling at a group of children, certain adults will make up a name, such as Jill, on the likelihood that one of the children's name's will be Jill. Or if no one's name is Jill, the children will still be brought to attention for fear of their name being used next.

At the end of recess, an old-fashioned hand bell is rung by the head supervisor; the children return to their classrooms either when their teachers come to fetch them or when the supervisor leads them in lines to their classroom. They walk in rather scraggly lines through large hallways and the open area pods into their classrooms.

4.2.2 The Computer Pods: Circles for Collaboration

The pods are the open spaces wherein the computers are situated. This description is taken in my notes on September 12, 1985, after my first visit to the school:

> I walk into the school for the first time to attend a teachers' meeting. The school is a low two-story concrete building with graffiti covering the outside walls. I walk into the building without sensing I have come inside; the inside corridors have the same cold, empty, wide feeling that the outside of the building has. I follow the stairs to the right and proceed up a long graduated ramp to find myself in a large open space connected to another open space by a wide corridor. These two open spaces are what we call the pods, with classrooms jutting out around each of the two pods. The spaces are quite open, bare and gray—the presence of concrete walls, with strong florescent lighting. Children's posters of projects hang on the walls, brightening the space.

> In the center of each pod are the computers, arranged like a Y with equal arms. My first reaction is that the exposed wires and the cramping of spaces around the joining of the tables is a possible danger for children. Moreover, the structure connotes a philosophy which situates the teacher as the leader, rather than the facilitator. I envision a pod with the computers arranged in circles,with the wires in the center and out of the children's way, promoting both freedom of movement, and collaboration. My second reaction is how to create a more aesthetically pleasing space....color? plants? more textures?.....By "texture" I mean the tactile and the cultural feel of the place need to have more diversity. My third reaction to the setting is that in spite of my initial desire to change things in the setting, I [still] recognize the potential to create a new cultural environment from what exists.

My reaction to the placement of the computers, mentioned in this fieldnote, actually brought about a change in the physical environment. One Saturday afternoon a group of researchers and staff went to the school; while attaching extra memory to the computers, we arranged the computers in circles—two circles in each of the two pods. (They remain that way today.) Some computers were also placed along the walls.

Branching off from the wide hall connecting the pods are the teachers' lunch room and a room that became known as "Turtle Cove." Turtle Cove was the room our MIT research group used as a common office, workspace, cloakroom and meeting room. This windowless concrete space, with infrequent rodent visitors, acted as much as a meeting place as a storage room. It contained extraneous camera and computer equipment, a blackboard, several children size chairs, and a slab of plywood—once a door—that functioned as a large work table.

In contrast to the rules existing in other parts of the school, the children of several of the Project Headlight classes meandered around the computer pods with a fair amount of freedom during their daily computer time. The wide corridor between the pods was sometimes used for large group activities, ranging from making paper maché objects to having weekly teachers' meetings with Papert and a representative group from the researchers.

The computers in the pods acted much as a meeting place for adults to facilitate children's programming ideas, to talk to the myriad of visitors from all corners of the world, to visit children working at their computers, and to have brief intimate talks with each other. It was a welcome sight/site.

4.2.3 The Lunch Room: The Receiving of *Stuff*

Throughout the day, the children walk in lines to different parts of the school. At lunch time, the children walk to a large auditorium. Hot meals are provided which are palatable if not tasty. Some of the children bring their own lunches from home in spite of the fact that the lunches are free. The tables in the auditorium are arranged in rows which can easily be monitored by the same persons who monitor the outdoor recess period. The supervisors walk around their tables while the children eat. When spoken to at all by adults, the children are addressed in loud voices and told not to talk during lunchtime. Those tables which have been 'good' and did not talk too much during lunch are the first tables to get permission to leave the auditorium after finishing lunch. (The auditorium is also used as the detention room throughout the day; thus, being detained in the auditorium may connote more punitive meanings for the children than one first imagines.) Children are regularly warned that if they talk they will be the last to go outside for the break after lunch.

Instead of taking my lunch back to the teachers' lunch room, I often sat with the children in the auditorium. After several visits there, I realized that hanging out in the auditorium provided me with a good opportunity to observe the overall school culture. While routinely having the cooks and kitchen staff fill my Styrofoam plate with school food, I came to understand the *receiving of stuff* culture of the school. Children in schools are receivers—receivers of knowledge, of acceptable ways of behaving, of homework assignments and, when available, of food.

In school, food and standards of behavior are combined as they often are at home, in restaurants, and in friends' homes. The difference is that at home there is an effort to combine enjoyable social intercourse with satisfying the biological need for food. The atmosphere of lunches at the Hennigan School were experiences in receiving but not of digesting, or integrating the outside into the inner body. One could not use Papert's term, *appropriation,* in this situation. Children are given the food, given the "raw materials," without the

environment encouraging a sense of feeling that "this is mine; I'm going to make it part of me." Anny, Josh's sister, particularly indignant about the way she was treated, told me how it bothered her to have adults yelling while she was eating. Josh also complained in his usual creative manner. He told me that all this yelling at children by adults should be videotaped so that one could see what being in school is really like:

> *Josh:* You should, like, either pretend you're a kid or let a kid film and, like, say that this is one of my normal days, and he'll film the whole day.
> *Ricki:* So what do you think would come out of this?
> *Josh:* Like what it would be like. Like, all the yelling. And you tell all the teachers: 'Just 'cause you're on videotape, do not, like, hold back from yelling or anything.' And, like, they probably, like....
> *Ricki:* They should just act naturally?
> *Josh:* And it would be funny if the person who was videotaping got yelled at! Get someone to do it for you! I'll do it!!

Josh's idea is that a kid should do the filming (or I should pretend to be a kid). The footage which would result from a child conducting the filming would be that the material would be authentic. Although tongue-in-cheek, Josh clearly has captured some truth about the school as well as understood how difficult it would be for an outside observer to really understand what the child is experiencing within the walls of a school.

4.2.4 Teachers and Children Apart

The teachers are not part of the daily lunch-time activity. They eat together in small groups throughout the different sections of the school close to their classrooms. Often the teachers use this time to have a break from the children, to talk with their colleagues, and to catch up with the constant demands of the bureaucracy to fill in forms, such as grade sheets and attendance forms.

The teachers in Project Headlight were often engaged in a series of discussions with MIT researchers and faculty during lunch. From time to time, there would be a special session on mathematical thinking, Logo projects or other related activities. These teachers also participated in weekly meetings discussing a range of topics from the distribution of computers to the fair

allocation of time and attention from the MIT researchers. In fact, one could say that the extra time needed for the full participation in Project Headlight did not encourage the teachers to spend more routine time with the children.

The question I am addressing is: what is the message we send to children about the school culture by the absence of teachers during these and other routine experiences? Does the separation of teachers from their children during the routine functions reinforce the hierarchical structure within which the separate pieces of school life fit? Are teachers, children, staff members and even principals equally separated from each other by demarcation lines to maintain an illusion of order and stability? My sense is that the hierarchy is not one in which those closer to the top feel more secure about their position. No one is really at the top of the school pyramid; everyone from cook to principal feels accountable to meeting standards established outside their domain. In other words, not only the children are 'receivers of stuff,' the adults in this culture are also receivers. For adults, the stuff is different but just as clearly delineated.

This description of the separation of teachers and pupils during routine functions is not implying that adults and children will be less isolated if the same person is caring for their needs throughout the day. In fact, one of the lessons we learn from cultural studies of indigenous peoples of North America, Africa and Australia is that providing an environment with a diversity of adults carrying out a range of functions is extremely healthy for the development of the child. Margaret Mead in caring for her daughter, Mary Catherine Bateson, was surrounded by women and men who participated in the care and well-being of her physical, social, intellectual and emotional development. She tried to emulate the tribal notion of having a range of persons available for her daughter's development. Bateson speaks of this experience in the following way:

> My own coherent memories of childhood begin at Perry Street, a complex household with much coming and going, a huge table spread with great meals for which [Aunt] Mary baked and baked. It was a five-story brownstone house, the bottom two floors set aside for the Batesons, the Franks on the upper three. During the war the downstairs was vacant for long periods and my life was upstairs with the Franks, Uncle Larry and Aunt Mary, while my parents came and went, longed for and welcomed transients.

> Thus, I didn't grow up in a nuclear family or as an only child, but as a member of a flexible and welcoming extended family, full of children of all ages, in which five or six pairs of hands could be mobilized to shell peas or dry dishes. My mother paid for servants of various kinds over the years and Aunt Mary provided a guiding and discriminating maternal spirit. She was beautiful, Irish, and very young to take on all that household, and she danced jigs for Colin and me in the living room, balancing a broomstick on her finger. [5]

What characterizes the school culture is that in spite of a range of adults with many diverse interests and abilities, children are not exposed to persons who can enter into their lives on many different levels. Cooks cook; teachers teach; janitors clean up; children obey rules and are expected to learn the curriculum; and everyone is losing out from not being allowed to give and receive their best. The *receiving of stuff* culture of the school stifles the possibility of children contributing to others, to adults and to other children.

The Logo culture was different in that sharing one's unique approach was encouraged. Roles were expected to change and indeed, over the five years, they did. As Edith Ackermann[6] predicted in my video interview of her in 1986:

> One of the aspects I find very interesting in the Hennigan Project is the fact that the different people who participate in the project change their usual roles; and learning occurs through changing approaches and perspectives on the same phenomena. The teachers have to put in question and to reflect upon their ways of teaching. The teachers become researchers.

In studying the emergence of this Logo culture, I watched how the roles between teachers and learners, between teachers and researchers, and between researchers and learners began to shift. Even if they did not disappear, each member began to contribute to the experience of the other. Teachers really did become closer to being researchers, as Ackermann thought they might. Teachers began to reflect upon the children's learning which was not the result of instruction.

4.3 Making Changes within the Structure of the School

4.3.1 A Teacher in Transition: Linda Moriarty

Adults in charge of classrooms—teachers—are torn between the demands of standardized testing and curriculum expectations on the one hand, and the needs of individual children. Too often, providing a collaborative environment for children to learn and play is the icing on a cake which never has the time to be baked. Teachers, principals, staff members and visiting researchers are as much participants in what Illich calls "institutionalization" as are children. The main difference is that individual adults are able to make significant changes whereas children, usually, are not.

The issue is both believing that changes can happen as well as being willing to exert the extra effort required to make fundamental changes. Introducing the Logo culture at the Hennigan was a major attempt by many adults, teachers and researchers, to make such changes.

Linda Moriarty, a fourth and fifth grade teacher, welcomed the MIT "invasion" of researchers and different ideas with remarkable enthusiasm. She was reaching a turning point in her professional life and was eager to change what she had been doing in the school for over ten years. Although her main expertise was Language and Literature, she adapted to the Logo culture like a *turtle* to water. The possibility of being part of an evolving technological change was a guiding force in her undaunted energy and resourcefulness throughout the following three years. As Linda Moriarty describes herself, she is a believer in technology:

> You know, I so believe in technology. I so disagree with back to nature or that kind of stuff... It's just that we're distorting things because we're not paying attention to our trade-offs that we're making as we're moving along. But how can you stop the mind from moving? The whole idea is so absurd! Of course people are going to create, and create, and get more technology. It has to happen, or we'll stop the brain.[7]

Moriarty's classroom was set up with her desk by the entrance to the room. The children's desks were usually directed in semi-circular rows towards the chalkboard. Two children sat at each desk, which encouraged collaboration.

The walls were covered with the work of the children, as is the case in all the Hennigan School classrooms. Children would come to her desk to ask her for assistance when she was not in front of the class teaching nor working with the children in the computer pods. Once I observed her helping a child who needed holes punched in her essay. She accidentally put the holes on the wrong side of the paper because she was busy reprimanding another child! Realizing her error, she got a bit flustered and then immediately apologized to the child who was staring down at her work with the holes on the wrong side of the page. Linda Moriarty is a very human teacher.

As a classroom teacher, Moriarty was remarkably competent and talented—as comfortable in front of a classroom explaining Logo commands, as she was kneeling on the floor beside a child, working one-to-one with a child on a programing difficulty. In fact, she is one of those unique individuals who radiates inner wholeness, vitality, and a natural sensuality held under the gentle constraint of conventionality. What she offered the children was exposure to an adult with a strong sense of self-esteem and self-respect.

Moriarty used a combination of directness and humor to organize her class. On one particular visit I made to the class, she was teaching a class on Logo programing for the children's constellations project. Although she did not usually *teach* Logo, several children were having trouble with how to use four turtle cursors in their constellation project, so she was explaining SetPosition. As usual she was standing very upright and comfortably in front of the overhead projector—speaking in an extremely articulated manner. She punctuated her speech very carefully and slowly which kept the focus on the instructions. Her manner of presentation also included consciously pausing after every three to five words to emphasize her directions. These articulated instructions sounded very much like someone giving street directions to a foreign visitor (which may not be a bad metaphor for explaining how to get from one place to another in Logo):

> The turtle, *(pause)* that you're using...*(pause)* If you're using turtle 0, *(pause)* then make sure *(pause)* that you push that one *(pause)* over *(pause)* before you ask for the position, so it uses the same turtle that you began with ... *(pause)* Suppose you had it like that, *(pause)* just move your turtle over *(pause)* and then *(pause)* type: *(pause)* Position. *(pause)* It will flash underneath it *(pause)* —two *(pause)* numerals.

> They may have a minus in front of them or it might be a positive numeral without it, *(pause)* but there'll be two of them. *(pause)* Then, *(pause)* in your procedure, *(pause)* you use *(pause)* the command *(pause)*: Set *(pause)* Position. *(pause)* You're going to set it now, *(pause)* and you use those same two numbers *(pause)* except only you put brackets around them, *(pause)* because it's a list. *(pause)* If you have more than one word *(pause)* you must have the brackets.

I highlight her pauses because they reflect her great ability to accentuate and dramatize with comic dimensions, changing the atmosphere in the classroom with her extensive use of pitch and inflection. Moriarty regularly used her facial expressions to make a point; her head would reach to the side almost flirtatiously; her eyes could dart from side to side with eyebrows raised; and her shoulders sometimes lifted as she breathed and then exaggeratedly fell into place as she let out some pearls of wisdom—and often they were.

Moriarty sought to bring her whole self into the teaching experience. That is not to say, that she did not miss important things that were going on with individual children from time to time. One of her advanced level pupils, Andrew, *fell through the cracks,* as educators often say. If Linda Moriarty had listened to Andrew talk in the classroom, as she did the following summer when she sat in my office watching hours of videotapes of him, would she have been better equipped to help him stay with the other children? Linda Moriarty gives her own answer to this:

> *Linda:* You know, Ricki..... you're just limited in the classroom and you do not hear the kids individually talk a lot. When I've heard him talk—unfortunately it was in a circumstance he was in trouble that time—I was just floored at how verbal he was and how he understood his behavior.[8]

4.3.2 Teacher as Listener

Elementary school teachers have too little time to follow the ideas of individual children with any depth, to prepare them for the state examinations, and to keep up with the extra curriculum allotment for special classes. Moriarty mentioned that the only time she could listen to the children is when they were answering the questions she asked or when they asked a question related to the subject being studied.

After watching and listening to Andrew on video, Moriarty decided that the following year she would plan a time during the day for children to tell their own stories to the rest of the class. Unfortunately for Andrew and for the school, Linda Moriarty transferred from the Hennigan School that next fall, taking a break from teaching, and she took a position as a school administrator. She felt a need to explore new domains. She needed a change in perspective, a different set of responsibilities, new colleagues, and all the other changes to prevent total 'burn-out.'

Moriarty left her position believing that she might have been able to work things out with Andrew had she taken the time to listen to his stories in order to integrate his style of learning into the framework of the classroom activities.

Although teachers are often the gatekeepers of the institutionalization of schooling, this is not to say that many do not find their own unique ways of 'getting around' the system in order to make school a more convivial place. Within the various classrooms of Project Headlight which I observed on a regular basis, with and without my camera, teachers implemented their own methods of organizing the activities in their classrooms, thereby establishing alternative sub-cultures wherein individual children were able to maintain and develop their personhood.

4.2.3 Teacher and Child Growing Together

A very demonstrative and extraverted teacher, named Maria Gonzales, had a special flair for creating a warm, homelike atmosphere in the classroom. She was a teacher of a special needs class, who could work well with several learning groups simultaneously occurring in different parts of the room. On one particular day, I observed four groupings: an MIT research affiliate was working with a teacher's aide explaining Lego/Logo to him while a young boy sat close by, listening and watching the two men; some children were drawing at their desks; others were doing homework; and Gonzales was working with a small group beside the stand-up blackboard. With some teachers, working in groups is what they learned in teachers' colleges; with Gonzales, it seemed to be an outgrowth of her gregarious nature. The class was 'structured' like a home, not like a school room.

Gonzales' outstanding quality was her motherly earthiness which the children responded to with warmth.

Upon entering her classroom, one was always welcomed openly and warmly, greeted as a visitor. The classroom community seemed to have so many special needs that at first I felt a great sense of guilt that I would not be able to fill all the gaps I could identify.

Gonzales and I often discussed one of the children in her classroom, a small girl named Jane with a peculiar inability or unwillingness to speak. There were no known physiological reasons preventing her from speaking. She just sat in her quiet world, smiling timidly when eyes would meet. Jane could speak with her eyes, with her delicate tilt of the head, and with her soft mannerisms, and, sometimes, with her small questioning voice.

The plight of Jane was heart–rendering. She was physically frail and small; one could have thought her a wounded baby bird who still had the sparkle in her eyes but no ability to vocalize her pain. Jane hardly ever spoke but her delicate gestures and turned in shoulders communicated her situation. She weighed very little, had straight limp hair usually held erratically by a barrette, and had a pallid skin color. She looked two years younger than she actually was. Jane was seeing a school therapist whom I spoke with several times. According to the therapist and Gonzales, Jane had been abandoned by her mother (who had only wanted sons), and was living with her grandmother, a seemingly kind woman who was struggling to come to terms with being the primary caregiver once again.

What I admired about Gonzales is that she "listened" to Jane's body language and heard the little messages. Once, on Jane's birthday, I was invited to the classroom party. When I asked Gonzales what small gift I could bring Jane, she instantly answered, "stickers." It turned out to be a most appropriate gift. Jane 's face beamed with excitement as she took a love sticker, wrote her name next to mine, struggling with the each letter she wrote, and gave me her gift. It was then I realized that instead of thinking about the children as having huge gaps "to be filled," as in the behaviorist model of the *tabula rasa* or empty slate, one could think about children at risk as having the ability to contribute meaningfully to the lives of others. In other words, by allowing children the right to bring their experience and deep knowledge of the world to others, they could be active participants in their communal life.

What I am questioning is thinking about school as a place to force children into receiving rather that providing them with situations where they can give their gifts to others. Had Gonzales not "listened" to Jane, Jane would not have

been able to give her gift to me. Gonzales' listening to the inner voice of Jane, knowing that stickers would be a real present for her, are the big gifts adults can give children in schools. She had an ability to address the concerns we tend to overlook as meaningless in solving the big problems of children at risk. Perhaps this example of the power of a sticker seems to contradict the fact that what I am examining is the emergence of a computer culture. After all, with truly powerful machines around, how can a package of stickers be significant?

What counts is not the power of the technology, but the manner in which it is introduced and used by people to do the things that they need to do. Jane and the other children of Project Headlight were surrounded by adults who were interested in understanding them. These adults participated in the children's projects and they helped them plan new activities. This mixture of researchers and teachers becoming friends with the children and working with them in their building new things was pervasive in every corner of Project Headlight.

Jane was very much a part of this emerging Logo culture. She often spent time with me in the computer pods, sitting on my lap in front of the computer. At first her response was very minimal but within a few weeks she would smile with glee just typing in a number and watching how far the turtle would go. She was also delighted to change the colors. But her favorite thing to do, over and over again, was to build a "casa." Making a square and a triangle were not very interesting to her; but using squares and triangles to build herself a home (when she had been sent away from her own home) was not only interesting but fulfilling a need.

Jane's story always seemed to be the crystallization of what Papert is trying to accomplish in the schools: not focusing on teaching mathematics in Logo, but rather on using mathematical principles to extend children's inner cultures and to develop their deep understanding of what using mathematics as a tool for thinking means.

My fieldnotes of January 31, 1986, show both what was happening to Jane and what I was experiencing as a researcher whose task it was to explore the thinking of children in this culture. My reservations about getting close to one child at the expense of another are particularly interesting when one considers that only by getting close to these children could I find out about them. These notes contain the flavor of what was happening in that first year of the project.

Today I sat with Jane in Maria Gonzales' classroom. This is the first time that Jane has initiated anything by herself at the computer. We sat together and she quickly showed me how she knew *FD 100 RT 90* . Last week she seemed to grasp what we were doing together, but I was not sure if she understood that *RT 90* turns the turtle cursor 90 degrees to the right and *FD 100* moves the turtle cursor 100 turtle steps in the direction it is facing.

As usual, Jane made her CASA and was quite animated the whole time. Usually she sits at the computer without any significant body movements. This time, she did not stop moving!

Our interaction lasted about 20 minutes. There was another child sitting at the adjacent computer. Jane showed her how to make the Turtle change directions. After Jane demonstrated what she knew, to me and to this child, she looked up at me and said that she wanted to go back to her classmates.

One observation about this interaction leads me to believe that it is very problematic singling out a child with whom to work or about whom to do research. And yet, the kinds of things I need to know require that I form close relationships with the children. Jane is a sensitive child. She senses that our relationship is special. And so do the other kids. When I walk into Gonzales' classroom, the other children look right at Jane. I'm not sure how I feel about this. On the one hand, Jane is a child who could easily get lost in the school system. Her passivity and her inability to make her needs known could be of great detriment to her future. Maybe the special attention at this time of her life will encourage her to realize her importance to herself. On the other hand, the best kind of recognition must come from her peer group where she can be seen as an active member. And what effect am I having on the other children who may not understand why I am focusing so much time on Jane?

Gonzales' class did not spend as much time as the other classes in the computer pods. This always struck me as problematic. Weir's[9] research with special needs children showed how working with Logo can produce remarkable results not only in academic performance but also in self-esteem. Weir often mentions how important manipulating Lego bricks and Logo turtles on the screen are as a means of helping the child bring their whole selves into the classroom. Home and school become less clearly demarcated. Certainly this atmosphere was an asset for Jane and Gonzales.

4.3.4 Building Children's Autonomy

During my initial observations at the school, I noticed that when children are listened to and their ideas are appreciated, they begin to develop intellectually, socially, and emotionally, I would like to mention another teacher, Maggie Mason, who took risks in making changes. Mason established remarkably candid relationships with her children, both inside and outside the classroom. Most exemplary about Mason was that she spoke with children exactly the same way she spoke with adults. She did not use the *teacher voice* with her children inside or outside the classroom. She was also a remarkably public person.

In a private interview I was conducting with Anny, Josh's sister, Mason walked in and then sat down and joined us! While the three of us spoke about schools, teaching, rules, and an assortment of topics, Mason never excluded Anny in tone or content for one instance. She told us stories about her work with special needs students long before teachers were required to have official certificates in special needs education. She spoke with so much love, strength and sadness, that one could not but question the rules which now make it impossible for her to ever teach in a special needs classroom. This is fortunate for her present pupils, I might add, since she treats each pupil in her class as a special person.

Mason did not come across as a soft–touch. She seemed the kind of person who had seen so much that she was not going to get very emotional about anything except for family matters. But, Mason was a softy. At graduation ceremonies in 1987, she was sitting with her pupils who were leaving her after two full years in her class. She sat amongst girls in white frilly dresses and boys in black pants and white shirts. The children sang with the recording of a song called The *Greatest Love of All* sung by the popular female vocalist, Whitney Houston. The lyrics go like this:

> I believe that children are our future,
> Teach them well and let them lead the way,
> Show them all the beauty they possess inside,
> Give them a sense of pride—to make it easier,
> Let the children's laughter remind us how we used to be.

Everybody's searching for a hero,
People need someone to look up to—
I never found anyone who fulfilled my needs,
A lonely place to be and so I learned to depend on me.

I decided long ago
Never to walk in anyone's shadow.
If I fail; if I succeed
At least I live as I believe
No matter what they take from me,
They can't take away my dignity,
Because the greatest love of all
Is happening to me.
I found the greatest love of all inside of me.
The greatest love of all is easy to achieve
Learning to love yourself is the greatest love of all.[10]

Mason stood with her children in her crisp white and black dress, crying. She pulled her thick glasses off her face, wiped her eyes, and then very shyly but proudly looked up hearing the confirmation that, "children are the future."

Mason's forté was to encourage classroom discussions about ethics, morality, freedom and other topics. The children of her class enjoyed many self-directed activities, were good planners of group outings, and seemed to be exceptionally comfortable in and around the classroom. Not at ease around computers herself, she emulated a spirit of independence that brought about computer expertise in her children. Perhaps the best description I can give of Mason and her approach is to describe one of the children in her classroom, Shannon, who reflects a great deal of the fiercely independent spirit of this group.

4.3.5 The First Case Study: Shannon

I observed and audiotape interviewed Shannon regularly during my first semester at the Hennigan. His slow easy-going nature, his pudgy appearance, and his unusual approach to the computer all peeked my curiosity.

For over a month, Shannon would sit in front of the computer only changing the colors of a complex procedure for which he had received the code from another child. The procedure filled the screen with hundreds of lines of intensely bright colors jutting off in all directions. After forty-five minutes, he had only managed to type five or six repetitive commands and watch the colors change. He would then log out. What was so interesting to me was that Shannon's body language did not suggest that he was bored nor despondent. His forward posture while sitting in his chair suggested that a very purposeful activity was going on which he was not quite ready to take further. When asked if he wanted "help," the look received was one of: "Why should I want help?" Luckily for Shannon no one interfered too much in those early stages and when he was ready, he sought out the information he needed to become a very competent ten year old programmer/hacker.

As the year progressed, Shannon appeared socially ill-equipped for grade five; he had tenuous relationships with the other children at the school except for one other boy. "Not many kids in school are my friends because they're real tough and stuff," he told me one day. In addition to being in a school with rough tough children, he lived in a neighborhood with few children except for one young girl with whom he describes his friendship as being "mostly computer talk." He spent most of his time after school with adults, with his computer, playing with his transformers or watching television. When I asked him if he played any musical instruments, he answered, "lip-syncing. You pretend you're playing but you're not!" Shannon lip-syncs with an instrument, the saxophone, which he has never even held. Another curious interest of Shannon's, which he calls his hobby, is to balance himself on chairs. "I like balancing myself on one foot, and then I like balancing my chair like this."

I often observed Shannon by himself a great deal—perhaps because he was overweight and did not fit into the ten year old boy thing of playing sports and being loud, or perhaps because he related to people with a sense of detachment. When he was involved in group activities, he participated more peripherally than centrally, although his voice did get louder as the year progressed.

Shannon set up a computer club, became the president, and then questioned the process of how, when others became involved, they could want re-elections! Our conversation in January of 1986 illustrates how Shannon was constantly dealing with issues such as what is fair and what is not.

From discussing his use of *Scale* in Logo, I directed the conversation to ethical and democratic concerns with which he seemed to be grappling:

> *Shannon:* I can make it bigger or smaller. I can make it twice as big as it already was or fifty times smaller.
>
> *Ricki:* How do you do that?
>
> *Shannon:* By *Scale*. Well, first you take this thing and say, Scale, in the middle of the thing and it does it automatically. And instead of saying Lion, you say Lion space 99. That will make it the size it already was. Or instead you write: Lion space 1, and it will make it this small. *(He gestures with his hand)*
>
> *Ricki:* Do you understand why it does that?
>
> *Shannon:* Mmm-huh.
>
> *Ricki:*Can you explain it to me?
>
> *Shannon:* A little bit. Well, it's a procedure that's spelled in Logo Learner. It's called Scale and all you do is scale and stuff, and it works automatically. When you go to Scale it has a Write Protection on it.
>
> *Ricki:*What are Write Protections?
>
> *Shannon:* They're things that jam you from going into everything and finding out what procedures they are.
>
> *Ricki:* Why do you think there are things like that?
>
> *Shannon:* Well, because some people, they take all the procedures and put them on their own disc and sell them!
>
> *Ricki:* And you think there is something unethical or immoral about that?
>
> *Shannon:* Yeah!
>
> *Ricki:* How do you feel about sharing the stuff you do?
>
> *Shannon:* I like it, but not if they're going to go out and sell it.
>
> *Ricki:* So you would not want your stuff to be sold?
>
> *Shannon:* No. Especially if they take credit and stuff!
>
> *Ricki:* So, you do not like when people take credit for the work that you're doing. Has that happened to you?
>
> *Shannon:* Yeah!! Like, when I did the computer club. Now since it's going so well, everyone wants to be president.
>
> *Ricki:* And?
>
> *Shannon:* And they did it. They're having a re-election.

The reason I asked him about sharing was because our research group was exploring how children and adults feel about children sharing their programs with other children. (One of the many questions addressed was: When children are encouraged to share their programs, do adults have to change their perspective in the evaluation of children's work?)

Another reason for my question was that I knew Shannon to be an exceedingly generous child with his time and knowledge. Whenever anybody came to him for help at the computer, he was always willing to go help her/him. He would spend as long a time as was needed in helping and then go back to his own work as though he had not been interrupted in the least. Shannon shared his knowledge without hesitation and told me very straightforwardly that he did this because of his "natural habitat."

Shannon's answer to my question about sharing his procedures with other children is that it is wrong to profit from someone else's work. This has always struck me as a good beginning for a serious talk about ethics, no matter the age or stage of a person.

Nevertheless, Shannon was angry and indignant that the group decided to have re–elections. My response was to ask if he felt proud about the contribution he made by knowing he started the group.

Ricki: They're having a new elections and you started the club. You started it with whom?

Shannon: Jim, but Jim did not do much work. I wrote the proposal and stuff.

Ricki: How many members do you have now?

Shannon: Fourteen.

Ricki: That's kind of nice. You're still the one that started it!

Shannon: Right!!

Ricki: Does that give you any satisfaction or would you still like to be president?

Shannon: That gives me satisfaction anyway. Since the MIT person, Lesley, took over, I feel like I'm just another member.

Ricki: So, you do not think it's yours anymore?

Shannon: Right!

Ricki: What did Lesley do?

Shannon: Lesley started writing the program. I tried to make suggestions and Lesley said, "Wait your turn, wait your turn." Like I'm not even president!

Ricki: Maybe Lesley did not know you were the president?

Shannon: Lesley knew. Lesley knew.

Knowing that Shannon's parents were very active in community affairs and that Shannon often attended municipal meetings with them, I could only speculate on what Shannon was experiencing regarding the democratic system of his club. A computer club which he had initiated, was now being 'taken over' by one of the MIT persons who obviously thought of himself as a facilitator. What could I suggest?

Ricki: Did you go talk to Lesley about it?

Shannon: No.

Ricki: Why? Because Lesley's an adult and from MIT?

Shannon: No!

Ricki: If that had happened with another kid, would you have gone and talked to him?

Shannon: Yeah!

Ricki: So, was it because he was an adult?

Shannon: No. I did not have the time.

Ricki: Do you not want to talk about it some more?

Shannon: No. I think I'll talk about it with him next time I see Lesley. But I'm not going to stay president for much longer.

Ricki: Well, even the presidents of countries do not stay president for very long.

Shannon: Well, Franklin Roosevelt stayed for four terms!!

As Shannon got more accustomed to the fact that presidents do change, he spent many extra hours with Lesley and other MIT staff and researchers learning how to program. Not surprisingly, at the end of the school year when the MIT group administered a test examining how children program a given diagram, Shannon whipped out a rather elegant procedure in minutes—not without releasing a rather unbecoming groan which he explained to me:

Shannon: Aaggh means it's boring. I do not like it!

Ricki: What makes things not boring for you?

Shannon: It just happens. Somebody makes something nice and I do not say, 'Aaggh.' I hate tests so I always say, 'Aaggh, Ohhhhhh.'

Ricki: Why do you hate tests?

Shannon: Because all they show is that you can color in the little circles without going outside the lines. Like, they did a survey; they gave kids a test telling them it was a test and they gave another group of kids a test without telling them it was a test. And the people without telling them it was a test, got better!

Ricki: Why?

Shannon: Because they got nervous when they hear it's a test.

The combination of having Mason as a classroom teacher, being part of the Logo culture, and having interested parents willing to share their adult life with Shannon contributed greatly to his confidence at the end of grade five. Shannon did not fall through the cracks. Last time I saw him was here at the Media Lab. I overheard him telling some other visitors to the Lab how working with Logo and with LEGO/Logo "helps children think scientifically."

4.4 Introducing the Children in the Video Research Study

> The filmmaker limits himself to that which occurs naturally and spontaneously in front of his camera. The richness of human behavior and the propensity of people to talk about their affairs, past and present, are what allow this method of inquiry to succeed. [11]
>
> —*David MacDougall*

4.4.1 Josh, Andrew and Mindy

It feels as if I have always known Josh, Andrew and Mindy. Sometimes it strikes me as strange that I only knew them for a few years during my collection of video data at the school. The fact is that I spent a total of about three hours a week over a period of about two school years with them in some direct or indirect way. (As a researcher that may seem like a great deal of field time; as a friend it is a glance.) Many of my best moments "in the company of" the children were while I was editing the footage, trying to make sense of what it was he had shared with me. As a video ethnographer, I have spent between one and two thousand hours working with the video data. Now that the final phase of my research is almost complete, I realize how, as in every case study, the researcher accepts that what she is going to say about a given child is not the

child. Nonetheless, I want to repeat that statement. What I am about to describe is not Josh, Andrew or Mindy; it is the experiences I shared with them "in the presence of a camera." As Leacock would say about this method of research, my descriptions are based on "aspects of the observer's perception of what happened in the presence of a camera."[12]

My relationship with these children did not continue while I was engaged in analyzing my data. Part of this is due to the fact that every new experience with them would point me in new directions and make me aware of how much more I needed to find out. At a certain point, I had to stop the building of the relationships so I could reflect on each of them. I apologize to Josh, Andrew and Mindy here and now. More than that, I want to say that I miss these persons who shared with me things that Josh said he "never told anyone else."

My task here and now is to share with my readers the sense of wonder, curiosity and honesty which Josh, Andrew and Mindy shared with me. I hope my pictures of them—on video and in my mind—are ones they and their family would want me to share with my readers to help future educators understand the potential depth and natural ability of the ten year old child.

4.4.2 The Child in a Changing Culture

> [T]he knowledge drawn from the life of some single organism or community or from some intimate experience of an individual may prove to be relevant to decisions that affect the health of a city or the peace of the world.[13]
>
> —*Mary Catherine Bateson*

The following case studies are closest in approach to the ethnographic philosophy espoused by Bateson. What concerned me was how the uniqueness of a person can be understood or misunderstood by others in a changing culture. The core question underlying my analysis is how individuals try to maintain their identity, their basic human values, and their personal integrity as unique human beings under changing conditions.

In the next three chapters of the dissertation, I will build a picture—through my verbal descriptions of three children—of how three children, each in her/his own way, moved among the changes: integrating, rejecting, accepting, and coming to terms with the powerful impact of the Logo culture.[14]

The first child described here is Josh, who eagerly adapted to the emerging culture without losing his, already strong, sense of self. In fact, my interest in Josh was kindled by two things: his amazing ability to *maintain* his personality and adapt to new environments while bringing new ideas into his own framework; and, the energy he gave in explaining how he understood what he was thinking. Because Josh was not an 'ageist,' our conversations were without the usual limitations attributed to adults and children in a dialogue. Josh and I became friends. He brought me into his world, sharing what he knew, what he thought, and how he thought in the most comfortable way two people communicate—honestly. For sharing his life with me for two years, I will always be indebted.

Andrew, on the other hand, was not as secure a personality, although he was a most vociferous storyteller. The Logo culture might have provided a solid platform for him to develop, had it entered Andrew's life at an earlier date. Unfortunately, the obstacles Andrew faced were too overwhelming for a ten year old child to conquer without serious intervention. Andrew will always remind me of the fact that I could have done more to intervene. My sense is that Andrew's strong will to come across as *an interesting personality*, a storyteller, will be his way out of the problematic life he will have to conquer.

The girl I got to know best at the Hennigan School was Mindy. Mindy was full of the devil, one could say. She sparkled when she spoke to me about boys, programming, boys, her family, boys, and how she got in and out of trouble with her mother and teacher. She often sat in the classroom while the other kids were at the computers in the pods because she had not done her homework the night before. Once, she told me that she was forced into lying because adults would not understand that going to a party the night before was more important than doing her homework. She told me about these and other decisions she was dealing with, with an air of confidence. Mindy was an expert on human relations—especially when it came to those with the opposite sex. She integrated these skills into her programming in Logo, never losing her focus on what was important to her and to her future.

Given the opportunity to be listened to and treated seriously, all children have interesting ideas about how things work, where ideas come from and how they as individuals fit into this scheme of things. Using video as a research tool enabled me not only to listen to their own answers to their own questions, but to watch the whole interaction over and over again. My hope was that what I learned from these children will help us better understand many other children.

5 The Empirical Mind of Josh

5.1 Meeting Josh

The following description is of a child who succeeded almost effortlessly in most respects. He was a good student, had many interests, and seemed to be the ideal child educators think all children should be. However, Josh was not deeply understood by his peers. Even his teachers and several Project Headlight researchers had mixed feelings about Josh; they thought he showed too little concern for the needs of other children. I documented this response of others in spite of the fact that my experience with Josh could not have been better. Josh was open, caring and showed great sensitivity to me. He brought me into his world without restrictions. He shared his thinking about his thinking with me and never limited our relationship. Josh and I were not child and adult, but rather two people who sought to reflect upon and experience moments of mutual concern together.

Most outstanding was Josh's curiosity about how the things he observed in the world around him worked. Whatever the circumstance, Josh was thinking about the nature of what caused things to move, where the beginning of an action is *located,* and how independent effort brings about great inventions and achievements. In the two years I spent with Josh, I never observed Josh's being bored. The nature of life and the experiences of his life were very serious matters; and Josh, especially in his play, was having what several of the Headlight children termed, *hard fun.*

5.1.1 In the Classroom

I first met Josh at the Hennigan School on a day when the fourth grade teacher, Joanne Ronkin, used carrots as a prop to help the children learn how to describe objects. Josh's classroom was typical of the Hennigan School: the clock hanging on the wall; the posters of children's work placed around the room;

the overhead florescent lighting; and the typical formica tables and chairs. The overall impression was one of brightness, color, and above all, order.

Ronkin sat at the head of a circle of tables; the children were comfortably scattered around the table, some sitting on chairs, others on tables. She was dressed very casually in a hot pink shirt and black corduroy pants. Most striking about her appearance was the wave of silver gray in her black hair matched with a youthful face, and a long chain of keys hanging around her neck, clanging whenever she moved. She communicated to the children with the air of confidence an experienced classroom teacher has.

An assortment of carrots were strewn on the table. Some were in a plastic bag. An assortment of small index cards were held in Ronkin's hands and she read the description of the carrots written on each card to the class. The children were very engaged, trying to match the carrot with the description. My overall impression was that this was one of those times in school that learning and fun were not mutually exclusive. Ronkin held a wad of paper in her hand. She read the text from one of these pages describing a carrot:

> *Ronkin:* The first thing we need to do is you need to check and see which of these carrots is ten inches long. And that will eliminate all the others. So, Tiffany, would you measure at this table; Latoyah, would you measure at the circular table; and Jose, would you check these carrots over here. Ten inches! This person was very specific, telling us things were three inches, were five inches away. Very specific in his description. And that's what you need. And it has black marks at the top. So, how many people think it's this one?

Ronkin held up one carrot, and the children hummed, "No" or "Maybe." Ronkin held up another, and the children again hummed, "No" or "Maybe." When she held up the third one, the children in unison answered, "Yes!"

> *Ronkin:* Whose carrot is this?
>
> *Josh:* It's mine.
>
> *Ronkin:* Is this your carrot?
>
> *Josh:* That's my carrot!"
>
> *Ronkin:* Excellent! Excellent description! Great carrot!

Josh had been sitting on a desk towards the back of the room. He had a thin lanky body with light brown straight hair and twinkly alert eyes. He squeezed his knee with both arms extended while Ronkin praised him for his excellent description. He then glanced furtively at the camera unconsciously pushing the sleeve of his shirt up.

This was the first time I videotaped Josh and his glance expressed both curiosity about my presence and a degree of uncomfortableness with being the focus of my video recording.

Josh called out to his classmates, "Did you see the little engravement?" (He meant, engraving, I believe.) Ronkin asked if he wanted to point it out to everyone, so Josh jumped from his place and excitedly walked toward his teacher who was holding the carrot lengthwise between her two hands.

> *Ronkin:* Was it from the top or the bottom you were talking about?
>
> *Josh:* From the bottom.
>
> *Ronkin:* That's the only thing I would have added to your description, but otherwise it was...
>
> *Josh:* Wait a minute, hold on! This *isn't* my carrot!
>
> *Ronkin:* That's not his carrot!

With the realization that the carrot he had thought was his wasn't his at all, Josh became very flustered. This reaction quickly led to embarrassment when the other children began to tease him for not knowing his carrot.

> *Josh:* It's not? Hold on.
>
> *Ronkin:* Wait a minute...
>
> *A child: (off camera, in a teasing voice)* I thought you knew your carrot, Josh!
>
> *Ronkin:* Josh insisted he knew his carrot. *(The children laugh while Josh looks at the carrot and the other carrots on the table.)*
>
> *Josh:* My carrot's not here!
>
> *Ronkin:* We have to call the FBI. I tell you what, check in this bag and see if someone else claimed your carrot.

This gentle mocking of Josh was very typical of what I observed over the next two years.

Following the carrot incident, Josh often approached me during my visits to the school asking, "Can I see the carrot video?" I would respond by trying to set up a time to do this, finally realizing that the banter was a way for Josh to begin our friendship.

5.2 Playing vs Building a Game

5.2.1 Josh and Joe: The Discussion

A predominant ingredient in Josh's relationships with other children was his metaphysical approach. Even when Josh did not ask questions about the source of movement, topics seemed to return to this issue. On one particular occasion, Josh was working alongside his regular computer buddy, Joe, who was determined to keep Josh in a long conversation about the nature of playing or making computer games.

Joe was also a pupil in Ronkin's class. He had short dark brown wavy hair and wore big tortoise brown thick lensed glasses. His dark eyes, round face, and smooth skin seemed to all shine when he spoke. Joe looked like the kind of intellectual child who would probably get beaten up after school by the tough guys, and sadly enough this was the case. The school bully, Chester, would pick on Joe in the school bus on the way home and Joe would combat with psychological warfare which resulted in his getting kicked under the bus seat.

Joe loved to talk. One day, Josh was trying to finish off a program he had been working on with Joe, while Joe was more interested in talking with me. The conversation began by my asking Josh and Joe why they so frequently made games while working at the computer. Josh answered me by saying, "Games are the best thing. It's, like....you play them; it's not just like seeing something or making a picture which is boring." Joe preferred making games rather than drawing pictures in Logo; his opinion was that playing a game is more fun than having to make it:

> *Joe:* Of all the things on computers, making the game is the boringest thing. But actually playing the game might be the funnest thing. That's what's bad about the games. If you wanna play, you gotta make it!

For Joe, the fun is when you control the game, not when you make it. Control is not achieved by creating but by manipulating. Joe is bored when he has to build something before he gets to play with it. Worse yet, is his having to watch someone else play without playing it himself.

> *Joe:* It's like somebody else makes this game so you don't have to work. See, it's boring when you make this; when you just make something and then you just .... You see, if you're moving, it, it's more fun 'cause you can control it. But, when somebody else [moves it, it's not fun]; it's better when somebody else makes it so you can move it, than when you...just get to watch.

At this particular juncture, Josh was listening to Joe, but only partially. He sat on his chair, eyes glued to the computer; when he eventually did respond, he described what he was doing in his game rather than participate in our discussion, not moving his eyes from the computer screen: "Say, like, I just made it, and it's hard to, like, find the keys. And so, you have to..." Joe, on the other hand, was more than ready to keep this topic of conversation going, and when I asked him a more specific question—"What is more fun, making the game or playing the game that you've made?"—he reinforced his earlier statement by saying that playing the game that he's made is his preference. It did not matter to Joe that he knew all the rules of the game that he made because"you're supposed to know all the rules."

> *Joe:* See, ... if you keep playing the game you get good at it. But the first time you play it, you'll know where the keys are, but you won't know exactly how to move it, 'cause when you make the game you just tell the computer when this happens, you're supposed to do this, but you don't play the game while you're making the game.

Joe's comment led me to ask him whether or not playing a game that he had made did not take away from the excitement. He answered in this way: "No, 'cause you could do it differently. Say, maybe go around that way, maybe go around that way, maybe go through a hole in the middle, next time you play... " Joe and Josh built their car game so that each time they played it, they could play it differently. (Not surprising, Josh compared the experience to playing a video game.)

In contrast to Joe's being pragmatic, Josh believed that a great sense of personal accomplishment is derived from building or constructing the game. Josh said: "Making it makes you feel like you achieved something. Just playing it, doesn't make you feel [like you achieved something]." In playing the game, even if it is the game that you made, the feeling of achievement is limited. The real challenge is in the constructing, the creating, or the building. Josh extends this theory of accomplishment by saying that "to make something you have to think of every little detail." The difference between Joe and Josh is parallel to a major issue in educational theory. The constructionist thinks of the parts that make up the whole, the instructionist thinks of the utility of the results.

5.2.2 Interpreting the Different Approaches to their Games

At least three levels of interpretation seem to be worth considering in the discussion between the two computer buddies. First, this interchange thickens the description of Josh as a person who is trying to understand what is hidden below the surface. The source of Josh's creativity comes from his preoccupation with how things happen. He could be satisfied with using the inventions that are made by others. But he is not. For Josh, achieving and creating are linked together. You achieve something by creating the thing that helps you explore the theories about which you are thinking.

Another level of interpreting this interchange is from the perspective of having a computer buddy, a friend, with whom to talk about important and maybe philosophical issues while working on a joint project. Enabling the growth of friendships while children work together is no small accomplishment within the school system; collaboration among children leads to cooperative rather than competitive behavior.[1] The collaborative work time between Josh and Joe, although not always the best model of cooperative play, does give the boys an opportunity to find out how to discuss what they are working on:

> *Joe:* Josh, what do you like better, making a game or playing it?
>
> *Josh:* Well, making it makes you feel like you achieved something. Just playing it, doesn't make you feel...

Joe: (interrupting Josh) Well, after you've made it and playing it, doesn't that make you feel like you've achieved something else; you've made a game that works?

Josh: Yeah.

Joe: I mean like, I could make a game that doesn't work and wouldn't feel like I achieved somethin'.

This particular incident demonstrates how within the context of their collaborations about programming, various related issues come up which also get talked about. Discussions tend to be not only about what is being produced but also *why* what is being produced is meaningful to each of them.

Regardless of the fact that Joe led this conversation (because Josh was programming while he was was talking), the dialogue demonstrates that children are able to discuss topics which they themselves recognize to be more serious than first might appear. Moreover, their interaction has a very definite pattern: Joe, having a less secure personality than Josh, usually checks out what Josh thinks, asks Josh what his opinion is, and then, usually decides to do what Josh wants to do. Josh, trusting his own opinion, will tell Joe without hesitation exactly what he thinks. What they both seem to recognize is that this relationship with someone different can be important for both of them.

(Once, when Josh saw that a dog Joe had designed in Logo—in the Logo Shapes Page—looked more like a telephone receiver than a dog, he teased Joe about it. They bantered back and forth, Josh casually leaning on his chair with his arms reaching out pointing at the monitor, until Joe made the changes which made the dog look more like a dog in the eyes of Josh. They seemed to enjoy the banter and the negotiating towards an end product.)

The third level of interpreting their interaction is the one which is most important to the overall theme of this dissertation. To restate a theoretical foundation of this dissertation, good descriptions are those which when *thick enough* (according to the Geertzian principle) will distinguish between *winks*, or other actions.[2] If the description is *thick enough*, the meaning of one wink as a parody and another as a twitch should be clear.

In this situation, two boys had been working side by side for over half a year building computer games (which either were integrated into to the school curriculum or were independent projects.)

Although the act of working on the same game appeared to be the same for each of the boys, it has a different meaning for each. Joe makes games, even though he finds it boring; he makes them so he can play them. Josh, on the other hand, makes games because he gets a feeling of accomplishment—an inner satisfaction—from the act of creation.

5.3 Cars, Gears, and Moving Things

As documented by the constructivists/constructionists, Dewey, Montessori, Piaget and Papert,[3] the work or play children do often reflects an inner need to find solutions to issues with which they are concerned. The fact that Josh and Joe built games with cars on their computers was not an arbitrary or merely a gender-based selection for the boys. Rather, they used cars and other constructions to reflect upon the nature of moving things.

> *Josh:* The first invention must have been [thought of by] a real real smart person. Like, it's amazing how many things we have, and how many things we do, and how many things we have. It's so amazing that we can have a car! Only the top auto mechanics know how a car works. All I know is there's a pedal and it moves. I don't know what happens, how everything moves. All I know is that there is a fan belt and a fan. D'you know how a car works? It's amazing that you can make a car move with just energy, not even energy; a liquid can make things move.

5.3.1 Objects "to Think With"

Josh's room at home was filled with posters. One poster was a photograph of a mother possum with her babies on her back; another, a photograph with a mother polar bear and her cub climbing big rocks. A third poster of a motorcyclist decked out in full motorcycle attire hung on the wall facing his bunk-beds. However, none of these posters were as special to Josh as his red Porsche poster and his newest acquisition, the black Lamborghini poster. "This is awesome. Check it out!" he said as he held the poster up for me to videotape.

Josh also had a soft red Lamborghini stuffed car. As he walked around the house, he held it close to his body clutching it with his left arm, caressing it as a child caresses his favorite transitional pillow or blanket. Cars were Josh's special objects.

Not only did most of his games in Logo have cars as the central object, he also thought about the origin of cars and "how someone could dream it up." *Dreaming up* meant inventing in Josh's language—a perfect expression for a child whose thinking about inventions were more connected with the role of imagination than with the mechanical structure, (although, as the following citation shows, his causal approach was obviously an important ingredient in his way of thinking.)

> *Josh:* Some things you can just dream up. Like when someone made an invention like a car. It probably came from the bicycle. They thought about a wheel. They thought about everything. To think about something [new?], you have to think about every detail.

Josh was convinced that simple things, like bikes, lead to complex things, like cars. Josh's theory was that someone first thought about a wheel, then came up with the idea of a bike, and then, finally, a car. Another view of how inventions happen was stimulated by Josh while Mario Bourgoin, a fellow researcher, worked on *Learning Constellations*. Bourgoin made the following annotation:

> 10/8/89 3:21 PM
>
> Mario O. Bourgoin
>
> JOSH TALKS ABOUT IMAGINATION
>
> My first reaction to Josh's comment about the source of the idea for cars is that it's wrong: cars were around way before bicycles. Yet I wonder what made him think that there was an order going from bicycles to cars.
>
> In my view of inventions, people do the complicated things first and then make them simpler as they understand them better. In this way, bicycles are a modern invention and cars are the more clunky cousins (though they've improved a lot since their beginnings).

Josh also believed that, in the process of creating something new, one had "to think about every detail." This statement seems to be in conflict with what Papert's view. Papert once told a group of teachers at a summer Logo workshop, "Don't worry about all the little finicky details to begin with; let's worry about that afterwards; but don't forget to worry about it; but don't let it bother you now."[4]

Papert was trying to solve a problem or, to be more accurate, he was trying to help others find strategies for solving problems; Josh was searching for questions to ask himself so he could find the answer which would lead him to the next interesting question. Both agree that paying attention to details is an essential part; they differ as to when they should pay attention to details. Josh thinks that in order to invent something new, one has to think about details, whereas Papert thinks that details should be addressed after a general systematic approach for investigation has been uncovered. Josh addresses the creative process as it exists while Papert addresses the search for a formula to explain the creative process. The difference is one of intention.

5.3.2 Thinking about Gears

Building with gears was a large part of the Headlight culture at the Hennigan. Using Lego bricks, wheels, gears, worms, and other parts, children built the things they wanted to build and learned to think about how these things work by building them. As Papert writes:

> We understand "constructionism" as including, but going beyond, what Piaget would call "constructivism." The word with the v expresses the theory that knowledge is built by the learner, not supplied by the teacher. The word with the n expresses the further idea that this happens especially felicitously when the learner is engaged in the construction of something external or at least sharable... a sand castle, a machine, a computer program, a book. This leads us to a model using a cycle of internalization of what is outside, then externalization of what is inside and so on.[5]

If the deeper levels of thinking underlying Logo find their roots in anything from Papert's past, it is recognized that they most likely stem from his childhood fascination of how gears work (which he discovered while playing underneath his father's cars). Gears were part of his "natural landscape, embedded in the culture around"[6] him. They were objects with which to turn his body while thinking about the laws governing their behavior. In *Mindstorms*, Papert speaks about this phase of his life in this manner:

> I became adept at turning wheels in my head and at making chains of cause and effect: "This turns this way so that must turn that way so..." I found particular pleasure in such systems as differential gear, which does not follow a simple linear chain of causality since the motion in the transmission shaft can be distributed in many different ways to the two wheels depending on what resistance they encounter. I remember quite vividly my excitement at discovering that a system could be lawful and comprehensible without being rigidly deterministic. [7]

Josh was also fascinated by how gears work. However, his interest stemmed from his love of expensive sports cars. Josh thought about gears and cars as a way of thinking about creative process. He was concerned with how gears work so that he could come close to understanding how someone "could dream that up."

> *Josh:* Gears are amazing! I don't know how anyone could dream that up. It's just the littler the circle you make, the faster you can go. And it goes lighter and lighter or harder and harder if you want. Like, one pedal if you have like a twelve speed bike, you put it on the twelfth gear and it just goes!

One "pedal" for Josh seems to mean one full rotation. Understanding his use of "lighter and lighter or harder and harder" is problematic. Does lighter mean easier? What does lighter mean when one is riding in the twelfth gear going very fast? Is it easier or just faster? My interpretation is that understood the basic premise that what is easier is using the appropriate gear in a given situation.

Josh continues this free flowing idea–making soliloquy, adding to the following to his theory about gears:

> *Josh:* One pedal! If you do one circle, it will go twice as far, than if you're in the first gear. Like, if you're in the first gear and you take a pedal, you only go one pedal. You have to keep on pedalling. But, if you're in twelfth gear, you take one pedal and you'd go five feet! It's just easier to do it.

From the above quotation, it seems that lighter and harder may refer to the force needed to pedal. He focused on the person–power effort required to move the system while pedalling.

> *Josh:* Like, when people [first] made bikes—when you pedal, they wouldn't make it so you just have the pedal attached to the bike. They have to make it so, when it could move, there'd be a chain in the back pulling the back wheel and the front wheel. And it wouldn't be just on the front wheel—like one up here and one back there and when you pedalled, it just moved the front wheel. That would hardly work.

In the above quote, we see how Josh presented his ideas about gears in the historical context. He intuitively seemed to recognize the wisdom of mechanical geniuses who knew that directly driven wheels would not turn as fast as chain linked wheels. From Josh's explanation, he demonstrated this application of the theory of mechanical advantage. He recognized the tradeoffs between gear size and distance travelled per pedal.

In short, Josh's ability to think through and verbalize how gears work does not come without experience with bikes and the environment within which to support this kind of thinking. Josh loved cycling. Coming home from school, when no snow covered the ground, was synonymous with getting on his bike to visit his neighborhood friends. His mother's being a teacher probably meant that he was encouraged to explore ideas; having three older siblings could have given Josh an opportunity to get answers or at least listen to conversations about related issues; and his dad, being a house painter, worked with his hands to change physical environments.

However, the most important influence was that Josh was at the end of a school year of working intensively with Lego bricks and gears, of programming in Logo, and of meeting MIT researchers who always enjoyed talking with children about how things work.

5.4 Movement and Thinking about Movement

5.4.1 Josh's Inventions

Building objects with Lego bricks and using Logo as the interface for sending commands to these objects was a common experience for Josh and his classmates. Josh 'learned' about the transfer of energy from one object to another by making this transference happen. He would connect an object—such as a car—to a wire which was connected into an interface box, and then write a range of commands in Logo for that car object to move, to wait for a few seconds, and then to turn to the right and move again. He experienced the meaning of sending messages and causing actions to be carried out. More than experiencing simple 'cause/effect, or input/output relationships, he made things move according to his own design.

Josh was exposed to playing with Lego bricks in a totally choice-driven manner; with Lego, there was no curriculum to follow, no rules, no grades and no expectations. From the beginning of his Lego experiences, Josh would approach these Lego workshops with wonder and excitement. At first, he built (what most children start off building in Lego)— his cars, which, I presume, were probably Lambourghinis and Porsches in his mind's eye. Within weeks, he was building more personal creations of moving things. For example, he built a room with a person who was propelled out of bed. He called it his *Alarm Clock Bed*. Josh's theory was that getting out of bed in the morning is usually a problematic event. Therefore, as a precaution against falling back to sleep, the little Lego person would be ejected from bed and propelled onto a conveyer belt taking him into the next room.

Another invention of Josh's was equally imaginative. He was fooling around with a Lego motor, pretending it was an electric shaver and rubbing his ten year old face—not finding any whiskers to remove. While shaving, he kept scrounging through a large bucket of Lego bricks, not seeming to be particularly inspired. With characteristic puttering, Josh put a wheel on the bottom of the motor, and held the Lego motor from its wire, allowing the motor to touch the table. The thing contorted in strange and unpredictable ways. When I asked Josh what it was, he told me it was an *Electronic Breakdancer*. He then proceeded to build a Lego discotheque for his dancer with strobe lights. He explained the disco with its lights to me in this way:

> *Josh:* See, I just made a light here. Like, there are these little blocks and he goes down [and] there is a wheel spinning on the motor; and all he does is, when he goes down, he goes wild.

Curiously, the *Breakdancer* remained a motor and a wheel. He never felt the compunction, as other children might have, to make the *Breakdancer* look like a person. The object stood for or represented a breakdancer; Josh was not interested in making the object look real, he was interested in what the object did.

Josh's work with Logo had the same imaginative flair. He redesigned the car game he and Joe had started a school term earlier, building a rather sophisticated interface for users, called *Obstacle Mania*. In *Obstacle Mania*, the computer screen was divided into two sections by a lime green line with a small opening. The user had to control the direction of the car cursor by hitting the L or the R key. L turned the car 15 degrees and moved it 5 steps forward to the left and R turned it 15 degrees and moved it 5 steps forward to the right. This is how he explained it to me:

> *Josh:* The only way you die is if your very middle hits. The only way you die is if, watch the screen, watch the screen: L, R, see, my bumper can hit; anything can hit except the very middle. See, only the very middle can make it die. 'cause, see, the very middle is the very middle of the turtle [cursor] and everything.

Josh makes it sound as if it is very hard "to die" in his game. Speaking from experience, I found it very easy "to die in his game"—the car exploding in vivid colors on the monitor. In fact, in many of Josh's creations in Logo there were dramatic events: explosion, fires, take offs or ejections from one place to another. His concern was with things that moved and changed. Ultimately, it is my interpretation, that he used these actions as objects to think about the nature of moving things—why and how energy is transformed from one thing to another to produce more powerful effects.

5.4.2 Thinking about Moving Things

The inventiveness embedded in Josh's constructions seemed to be without limits when his imagination was allowed full reign. More powerful, though, was when his thinking was given the same freedom.

On a sunny spring day Josh and I sat outside the school on a hill talking for about half an hour, he philosophized not only about gears and cars, but about the nature of energy. Needless to say, the conversation was never very far away from his favorite subject, moving things.

Josh examined the steps in a process of energy transferring from one object to another. While explaining how procedures in Logo work, or how information is stored on a disc, his body movement accentuated his amazement about this physical phenomena of energy transfer. He sat squatted with his left arm relaxing on his left knee. With his right hand, he squeezed the watch band on his left wrist and unconsciously flicked his fingers against the skin by his watch. He looked directly into my eyes, with his eyebrows raised. As he continued to talk, he moved his eyes away from me towards the open field and said:

> *Josh:* How can a disc hold information? How can it hold little words? Like, in the eighteen hundreds, things weren't as easy as they are now—cars; we have so many advanced new things—cars, video cameras, VCRs. It's amazing how people...Even computers. If you think about the Logo we do, FD has to be a procedure somewhere, right? And the things you put in a procedure has to be a procedure, right? And it just goes back to electronic pulses and micro-chips![8]

Josh did not stop at this level of explanation. He took the idea deeper. In other words, he tried to understand just what was happening at each step, "pushing the beginning back further and further" as Resnick says about Josh's thinking. These few words, "pushing the beginning back" seem to touch at the core of Josh's soliloquy because Josh was searching for the origin of energy. At one point he took his own theory to the ridiculous in order to make it clear to me why this process is so amazing, by saying, "How does an electronic pulse hold information? I mean, do you just stuff a word in it?" To quote him more fully, our conversation went like this:

Josh: [Y]ou'd have to meet a genius who knew how little electronic pulse travelled through computers, hit the microchip and it changed something around, and a word pops up. You press something and a letter comes. Now, how could they do that? I mean, you press a key and a letter comes.

Ricki: Are there any books which might help you find the answers?

Josh: Well, it would be impossible to explain. An electronic pulse comes and it holds the information. How does an electronic pulse hold information? I mean, do you just stuff a word in it? How can an electronic pulse hold it, go into a microchip and travel around a lot and pop up on a screen? Amazing!!

In the above citation, Josh introduced another element in his theory about energy here: information is converted to pulses of energy which are somehow held or stored in microchips, or, as he explains later, in CD's or in computer discs. In Josh's thinking, energy and information (similar to motion and particle) are almost interchangeable. Consider the way he connects movement and information in the following citation:

Ricki: What other kinds of things do you think about, Josh?

Josh: Mostly things that move. Like, how does a muscle move? Even if it is a muscle and it has strength and everything, how does it move? How does a disc contain information? How can it hold little words? Whoever came out with a disc is amazing! What about CDs—a laser reads these things. You can put it on the ground, step on it, and it won't do anything. The only way you can break it is if you split it in half or something. And it's amazing—a laser goes down onto a piece of metal and it makes sounds, makes music. A tape, a slit of paper, cellophane—it makes music. Isn't that amazing? If you look at cellophane, it's amazing that it can hold music. Even records, it's not like, I used to think that it was carved into it and when the needle went over it, it scratched out the sound. But how does it scratch out: Ahhhh? You can't. Like, how does a laser read off a CD? It's so amazing!

5.4.3 Reflecting upon Josh's Thinking about the Transfer of Energy

Josh is fascinated with thinking about where the source of the energy is. Uri Leron, of the Technion in Israel, believes that "Josh needs to locate the source of things in a place."[9] Certainly Josh's sense of wonder about how cellophane, records, CD's, and discs hold information supports Leron's analysis. What is curious to me is how Josh, after locating the source of an energy in a place, focuses on its release, what the object can do when acted upon. A laser reads the disc and music is created. A needle goes over the grooves in a record, and sounds are heard. "Amazing!"

Transfer of energy is not limited to mechanical objects in Josh's scheme of things. In the same conversation Josh showed an equal fascination about the speed of a fast ball thrown by Boston Red Sox pitcher, Roger Clemens:

> *Ricki:* What else do you think about Josh?
>
> *Josh:* Roger Clemens. Like, Roger Clemens can throw a fast ball, like, 95 miles an hour. Now the fastest person that ever ran, ran about fifteen miles an hour. And you can throw something ninety-five miles an hour. In just sixty minutes it would go ninety-five miles if it didn't, like, run out of power. That's how fast come people can throw.

This comparison shows two significant things about Josh's thinking. First, it shows how Josh is trying to understand how an object thrown by a person can go faster than the person her/himself; something happens to the ball which gives it the power to do that, but what? how? Second, and most important, this comparison shows that Josh's thinking is somewhat independent of the domain or the sophistication of the technology. His sense of wonder about the transfer of energy is shown whether speaking about baseballs, computers, CDs, records or tape decks. The point is that Josh used what he was exposed to in order to think about how things move and how energy is changed.

5.4.4 Thinking about Resistance, Recursion, and Perpetual Motion

Josh also thought about resistance and recursion although that's not what he called them. Later that same year when I was driving Josh home from school, he told me what he would buy his family and himself if he had lots of money.

For himself, he would buy two stores in a mall. One of these stores is called The *Enchanted Forest*. His favorite toy there was a little stuffed bear which could travel back and forth along a large string. As he described the toy, he kept repeating: "It doesn't need power."

> *Josh:* It doesn't need power. It doesn't need power. And this little guy is on his unicycle and it's a little bear. This little stuffed animal bear and it goes back and forth. It doesn't need any power, it just, like, put it one side and it keeps on rolling. Won't stop unless you stop it. You have to get it started, but it won't stop!

To think that Josh brings out a new twist on his amazement with moving objects while fantasizing on his owning a stuffed animal store highlights the pervasiveness of his theory making about energy. Moreover, Josh seems to expand his theory a step here. In this instance, Josh not only has to deal with the problem of why this bear travels "without power" but also how it keeps rolling without stopping on its own. He expects it to stop because resistance on objects moving is experienced in everyday life. You push something and it seems to run out of energy. But the bear keeps going until "You stop it." As I wrote in my notes in *Learning Constellations*:[10]

It seems that Josh is confronting several problems: perpetual motion, resistance, recursion, and how a small little effort can result in a big result. Resnick points out that Josh seems fascinated with "getting a lot for a little."[11] In the case of the toy, the object doesn't require very much energy but it keeps on going until it is stopped. Recursion works the same way: you write a little program and the thing keeps going. The example with Roger Clemens also seems to fit his theory: when you run, you put out a lot of energy, and when you throw a ball, it can go even faster. "Unexpected paradoxes, " Resnick, a researcher at MIT, calls it.

Josh used recursive commands in his programming of *Obstacle Mania* without too much trouble. What he may have realized, consciously or unconsciously, was that he was that his objects moved a lot from a seemingly small effort.

5.6 A Child's Model of Teaching and Learning

5.6.1 "Getting Ideas" and Imagination

That day on the hill, Josh and I began our talk by my asking him about whether or not there should be a curriculum in Logo. He vehemently responded that it would be "punishment" if there were a curriculum in Logo because it is important for children to follow the ideas they have—especially in Logo, he added.

> *Josh:* 'Cause, you see, no one thinks it's fun, if you're, like, drawing something and you want to do something else, and they're making you draw something that's like you don't want to do. And if you have another idea. Like, it would be like punishment for the kids who really don't like it.

Punishment, for Josh, was not being able to do what he wanted to do. If Josh wanted to follow through on his work, to develop his project or to finish his drawing, and "they" didn't let him do it, then, for Josh, he was being punished. Josh does not make the distinction most adults make between work and play.

Adults often punish children (or each other) by restricting their leisure time activities; they have lost the childhood understanding that work can be fun and that play is often very hard work. No wonder that Josh felt punished when anyone took away his freedom to express his own ideas in his own self-directed work activities.

Josh also believed that in all subjects only "teachers who don't know what they're talking about have to use curriculum; they don't have anything to teach without it." Teachers who don't want to use curriculum shouldn't have to use it. Josh's ideal school would be that half the school year children should be able to do whatever they want, and, as he says, " if you want the teacher to help you with ideas and everything, then you can ask her." According to his educational theory, teachers should not coerce children into doing things that they don't want to do; they should help children when the children ask for help; and most importantly, teachers should let children follow through on their ideas,

> *Josh:* [A teacher] should, like, make things, like, [so] that if you didn't want to do them, you didn't have to and you could just draw something. But if you did want to, you could. That's the way it should be.

> Because if you come up with a idea, and you really want to do it, you should be able to do it... If she gives you something and you can't think of anything, and you just want to [do what she gave you], then you can! That should be it: You should be able to do what you want, but do what she gives you if you want to.

Playing devil's advocate, I asked Josh what happens to children who don't have ideas for self-directed projects. He looked at me briefly, but with disdain, and said: "All kids have ideas...Even if you are a kid that comes off a [housing] project or something—which it doesn't really matter." If you're a child from a housing project, "you'd probably make two kids fighting, or something, 'cause that's what you see, that's everyday life." Then, he paused a second, and deepened the discussion immeasurably by saying,

> *Josh:* And that's what comes into your imagination. You get imagination just from facts that you see, things that you see; 'cause no one would have thought up the rainbow, if there had never been one. They would have *knew* there were colors, but they wouldn't have thought up the rainbow. People would have never got ideas, for things, if they had never...

seen them? experienced them? Is that how Josh would have concluded this thought had a new thought not come along? Josh, the empiricist philosophized about the nature of imagination.

5.6.2 Josh as Empiricist

The empiricist in Josh says that there is an objective external reality from which we derive our thoughts. We couldn't imagine something new, if we first didn't see "the facts." His example about the rainbow, in the last citation, is a bit weak, but it might have been strengthened if he had mentioned that stories, poems and paintings were created because people were inspired by looking at rainbows. However, I'm not sure that that's what Josh meant. "They would have knew there were colors, but they wouldn't have thought up the rainbow" seems to mean that even though all the colors of the rainbow exist, no one would have created a rainbow by just thinking 'Now, what should I do, with all these colors? I think I'll make this arc of many colors over the landscape on a sunny day with clouds in the sky.'

To make his ideas clearer, Josh provides a second and more explicit example:

> *Josh:* Well, people, like, get ideas but they have to get it from something. You see a rock, you might think of something carved out of it, or something. But you could never know if there were no rocks. You never think of rock, unless you were trying to think of something new. Like, [if] you were trying to think of a new substance or something. Most imagination; you see a car and an airplane, you put them together in a picture.

Josh's empiricism begins to mix with more rationalist thinking by mentioning that "you might never think of rock, unless you were trying to think of something new." Although seeing the rock might give you the idea to carve something on the rock, (Josh acknowledges that) the new thing you do to the rock is determined to some degree by internal human factors which may have nothing to do with the rock. This may be why Josh begins to play with the notion that if a person is trying to think of something new, or to invent something, then something else other than objective reality may be of concern.

When he concluded this round of thinking, however, he returned to his basic premise that most imagination is putting things that we see or experience together. In other words, when Josh had the opportunity to reflect on his own imagination processes, he understood them to be the putting of known things together in his own way.

5.7 Reflecting upon Inventions: Epistemology of Technology

Josh changed the subject from imagination to invention without much trouble. It isn't surprising that a child who thinks that imagination is a product of seeing things in the world would think that using the imagination is similar to inventing "things." Josh is a person very concerned with material things; "Like, it's amazing how many things we have, and how many things we do, and how many things we have."

5.7.1 Thinking about Inventions and Inventors

When he thinks about imagination, he thinks its role is to create new things, such as, cars, video cameras, VCRs, computers, and compact disks. His mind revels in the technological advances made in the last hundred years.

> Like, in the 1800's things weren't as easy as they are now. Cars, we have so many advanced new things: cars, video cameras, VCRs. It's amazing how people, even computers....

Neon Lights and Video Cameras

His connecting imagination and invention in this very concrete manner is made clear in his explanation of how inventors came up with the idea to use turn lights into neon lights used in signs. First, someone had to think really hard; then they had to use things that existed in the world around them; then they manipulated it in such a way that something new was invented. In a sense, this explanation differs to some extent from what he said earlier. Josh begins to emphasize the role of the person who is creating, rather than the existence of "facts that you see." This is his explanation of how neon signs and video cameras were invented:

> *Josh:* But, like, if you're really, if you're really, like, thinking real hard of something new, maybe, like inventions; they think real hard, and they use things that people have already come up with. Like the light bulb. People thought of it real hard and they came up with neon. Not neon, but, y'know, those lights that light up and are in different shape, to light up signs and everything... They just thought about the light bulb and they just put it in things.
> *Ricki:* How do you think they thought up a light bulb?
> *Josh: (ignoring my question)* And like when they made video cameras, like you're shooting me now. When they made them, they probably thought about cameras. You take a picture, each second, if you put them together, you make a video, a scene happening. That's how somebody discovered it!

As he described these inventions his whole body language changed. He moved from a squatting position to sitting up on his knees.

He turned his body to the camera and when he referred to the making of video cameras, he pointed at the camera (in a very similar way to how Papert pointed to the camera when he was being videotaped while talking about the role of filmmaking in our culture.)

What Josh was really talking about in the above quotation was not the making of video cameras, but the creation of the moving image—how many individual pictures with a small difference in movement placed one after the other and viewed quickly enough one after the other give the impression of movement. In fact, Josh had observed his sister who had been a member of an animation project carried out by Aaron Falbel,[12] a researcher from the MIT group who later went to live with the children and adults at Friskolen 70 in Denmark. Aaron had worked with a group of children in the Project Headlight school musical constructing a non-computer animation.

Obviously, Josh was also influenced by the fact that while he was telling me his theory about inventions, I was using one of these new inventions to record his thoughts. Given his exposure to the process, Josh's thinking about the moving image is not very surprising, yet, it is interesting to see how he incorporated the videomaking into thinking about the things he wanted to think about.

His rationale for the invention of the moving image is that the people who thought about it had to first think about camera, or the individual shots when shot "one second" apart would yield this impression. (One second apart would not yield this result, but the general idea is expressed rather well for a ten year old.)

To summarize, it was not uncommon for Josh to be logical, even if not totally accurate, in his theory about inventions. In his description of how cars were invented, he proposed that "some things you can just dream up" without seeing them in the real world first, "like, when someone made an invention like a car. It probably came from the bicycle. They thought about a wheel. They thought about everything." As mentioned earlier, Josh believed that to think up something, you have to think of every detail. And to do that you also had to think about the process involved in inventing.

Another of his qualifying comments is that inventors invented new things because they "thought it would be better if things were easier." Whether he means that life would be easier with new things or the things themselves would be easier to use is not important. What is important is that Josh thinks that easier, simpler, or "lighter" (as he said about gears) is better.

For a child who spent a fair amount of time at a computer, his conclusion is not surprising. The word computer scientists use for a very streamlined program which performs a complicated function for a seemingly little effort is "elegant." One is reminded of Josh's fascination with the toy bear on the unicycle going back and forth requiring no power.

5.7.2 Josh as Epistemologist

5.7.2.1 The Role of the Individual Genius

At first glance, Josh's theory of inventions and imagination did not seem to address the role of the individual inventor as much as the role of getting ideas from facts. Josh's theory was that everyone has ideas and everyone puts things together from the things that "you see in everyday life." However, Josh was in also in awe of the genius it must take to invent things which he thinks are "impossible to explain." To invent things as "impossible to explain" as Logo, he says, one would have to be a genius! Looking more closely at the whole of what he said about procedures in Logo, one finds that he finishes this exposé by directing the focus to the inventor.

> *Josh:* If you think about the Logo we do. FD is a procedure somewhere, right? And the things you put in a procedure have to be a procedure, right? And it just goes back to electronic pulses and micro-chips. And the only way you can make those is if you're a genius! You think you could make LogoWriter if you weren't a genius? The first invention must have been [thought of by] a real real smart person .

"The first invention" could mean the very first invention which did not exist before that time, such as some prehistoric tool. "The first invention" could also mean any first invention created throughout time. Josh is referring to the latter because he responds to my question, "how could you look for answers to some of your questions," by saying:

> *Josh:* First, you'd have to meet a genius who knew how little electronic pulse travelled through computers, hit the microchip and it changed something around, and a word pops up...

When I asked Josh if a book could help him understand how electronic pulses travelled through computers, or if he definitely needed a genius to explain it to him, he emphatically told me that it would be "impossible to explain."

Josh's theory is that geniuses are not only inventors but they are the only people who can explain inventions. This explanation seems perfectly reasonable given the fact that Josh himself was not only an inventor with Logo and Lego but also, an "explainer." Often, Josh would take the time to explain how his programs worked—many times without my asking him. He enjoyed explaining what he understood.

Within his first few months in Project Headlight, he explained how Repeat in Logo helped him build a square. He sat in front of his computer, and explained what to do in a style of talking which resembled the way code looks. (In fact, his explanation was so similar to code, that I have taken the liberty to position the lines to resembles code, or, for that matter, a haiku poem.)

If you want to make a square without saying
FD 5, RT 90, FD 5, RT 90, (etc),
you can say
Repeat 4 [Fd 50 RT 90].
So, it's gonna do this 4 times; it'll do it 4;
it'll do it: FD 50 RT 90,
FD 50 RT 90,
FD 50 RT 90,
FD 50 RT 90,
and it'll *obviously* make a square.
(italics and formatting mine.)

Josh employed three basic (teaching) techniques in his explanations. First, his use of body movements gave his explanations a dynamic kind of vitality. Each time he mentioned the turtle cursor making a turn and moving, he would hold his hand left in front of the monitor and bend it backwards,

following the movement of the turtle. Moreover, these gestures showed exactly what one could expect the turtle to do.

The second technique he used in explaining how the square was made was to actually do it while he was explaining. He typed in the instructions and demonstrated the way it works. And when he said the word "obviously," he hit the Enter key and the square instantaneously appeared.

The third technique was his sticking to the functionality rather than the generality. For example, when I asked Josh what a procedure is, he gave me instructions on what to do to execute a procedure and explained where it was executed. Instead of defining the nature of what a procedure is by what it does to the overall program, he told me how to make a procedure. And how to make it for Josh meant where to do it or where to place the commands. This is what he told me:

> *Josh:* [A] procedure is, like, when you make up [and] title something on the back flip side, and you write your commands on the flip side, and go to the flip side, and every time you type the word, you titled it, and press Enter and it'll do the things, the commands.[13]

(Interestingly enough, people who know what procedures are seem to think Josh's explanation is pretty good. Those who don't know, tend to still be puzzled.)

5.8 Interactions with Others

The following discussion is my retelling of the what Josh's sister, Anny, his mom, his classmates Joe, Tammy and Mindy and his teachers told me about Josh. The consistency of their remarks and their experience with him seem to draw a picture of a child with wonderful ideas who is not listening the opinions of others and is determined to do what he needs to do.

5.8.1 Sibling Rivalry in the Logo Culture

Anny, Josh's sister, was in the grade five class at the same school. In fact, the two classrooms shared the same computer pod and were almost adjacent classrooms. The friction and affection between them was often mixed.

A major source of contention for Josh was that Anny was the more experienced hacker—she had been part of Project Headlight for over a year before Josh came to this school.

Her opinion about Josh was that "he cares about other people, but what they have to say is not nearly as important as what he has to say." According to Anny, his parents remind him that if he doesn't "stop being bossy, he won't have any friends."

> *Anny:* His friends, around where we live, put up with that and so there's no way that she [Josh's mom] can emphasize more....to let them, [to] give a little respect to them, and, you know, let them say what they have to say.

The relationship between Anny and Josh appeared to contain many elements of competition. Josh, being a year and a half younger, came to the Hennigan a year after Anny's successful entrance into the Logo culture. Anny's dynamic personality and complete confidence in whatever she did made her quite a hit within in the Logo and Lego culture. She quickly became a superstar programmer and formed very close relationships with the MIT researchers.

It was a hot summer day and certain children were asked to come into school for a special Lego workshop. To keep Josh in his place, she once told him "Josh, we were the first class to experiment with Lego." She and Josh had been scrounging through a huge box of Lego bricks. Josh was excited about building something new. Anny was making sure Josh knew that this was not new for her by reminding Josh that her class was the first class to use Lego.

In the middle of grade five, Josh and Anny's parents agreed to send her, with a visiting researcher to Denmark to visit Falbel, the researcher at Friskolen 70. As can be imagined, Anny believed Josh to be extremely envious of her. She said she tried to discuss it with Josh, but that he would mumble a negative response, before he reluctantly agreed that it was fair that she got to go.

> *Anny:* I say, Josh, there are times when I'm jealous about you! Now I know you've never done, I mean, you've never gone to Europe or anything. But there are times you get all the attention and you don't realize it.
>
> *Ricki:* So, what did he say?
>
> *Anny:* He didn't say anything. He goes: 'Big deal!'
>
> *Ricki:* He doesn't really talk about how he feels?

Anny: He does when I'm not, like, if it's concerning me, he'll talk to somebody else about it, but not me.

Ricki: But he won't, sort of, say to you: 'Look, I feel jealous because you're getting to go on this trip and I don't get as much.'

Anny: When, once or twice he did. Well, I go *(meaning, "said")*, well I go, 'Come on, Josh! I mean, you know, would you rather me go [or nobody?]' And first he was more jealous than when I was leaving, 'cause, you know, I don't know why actually. But at first he was, like, I said, 'Well Josh, would you rather me go or nobody go and not see what it's like?' And he goes, 'Nobody.' But before I left, right before I left, a few days or so, he goes and started [quarrelling? being envious?] again and I said, 'Would you rather me go or nobody?' So he said, 'Well, you, I guess!'

Anny was hurt that Josh could not be happy for her opportunity; she could not understand why Josh acted this way. Upon examining her question"Would you rather me go or nobody?" Anny thinks this is the main concern: one goes or nobody. According to Anny, that was the only question worth asking, "me or nobody." In fact, Josh didn't even have a great urge to travel. While visiting him in his home, he once told me that if he had a choice between a sports car and a trip to Europe, he would take the car. For Josh, fair did not mean that if Anny went to Europe, so should he. It meant that if Anny got to travel then he should get something he wanted.

The scene which struck me as being the most revealing about their relationship was the one when Anny asked me to pretend that I knew a specific piece of code that she knew Josh desperately wanted and couldn't figure out for himself. Josh kept asking me if I knew it, and I kept telling him the truth—that I didn't know it. He thought I was kidding him, so he kept asking me, "Do you know it? Do you know it?" The more I protested, the more certain he was that I knew. Finally, Anny sauntered by, saying she would tell him the code, but for a price: He would have to get down on his knees, and tell everyone present that she was a better programmer than he was. He did it. He got down on his knees and said what she had demanded. Then she nonchalantly gave him the code.

In spite of the competition, Anny was very insightful about Josh's priorities. For example in kindergarten, she told me that Josh had been offered the opportunity to learn how to play the piano.

After only a few weeks, Anny told me, he realized that "he was missing his playtime and he didn't like that at all." So he quit. She added, "My mom said to him, 'Are you sure about this because you know this could last you a whole life-time,' and he said, 'No, I want my playtime!'" (What Anny doesn't mention is that she is an excellent young pianist and that might have affected Josh's decision.) Significant to this portrait of Josh, is that, at the age of 5, he was given the choice and he made the decision to maintain the amount of playtime he needed.

5.8.2 Joe's Playing Games *with* and Playing Games *on* Josh

What Anny said about Josh's not being interested in the opinions of others did seem to characterize, at least superficially, Josh's relationship with Joe. Often, Joe would almost beg Josh to listen to him. Once, Joe actually tried to take the keyboard off Josh's lap so he could show Josh what he wanted to do. He kept saying, "Please Josh, please."

Another time they were working on their car game—which came to be called *Obstacle Mania* the following school year. Both were explaining their game to me in detail. Joe got so excited explaining how the cars would move, that he stood in front of the monitor blocking Josh's view. Josh kept saying, "Joe, I can't see it! I can't see it, I can't see it, Joe." Then he grasped Joe's left arm and pulled Joe out of the way. While Joe continued explaining, Josh's eyes remained glued to the monitor. He was listening to Joe, but his focus clearly was on his work. He was with the computer in a very trance–like manner. Nevertheless, Joe was determined to both explain to me what they were trying to achieve as well as participate with Josh in his programming:

> *Joe:* We can make it so that when it hits the [wall], it goes off the road; it won't go back, it'll blow up. Josh, should we make it red and blue, this big explosion, red and yellow or something?
>
> *Josh:* No, just make it one color. Make it all yellow.
>
> *Joe:* Yellow
>
> *Josh:* Maybe red.
>
> *Joe:* Red or yellow.
>
> *Josh:* We'll see which looks the better. (Changing the subject) I'm gonna make him blow up. (Josh, typing furiously, makes noises like something is blowing up.)

Notice here how Joe suggested red and blue or red and yellow as the colors of the explosion. Then, Josh contradicted Josh and told Joe it should be one color only and that the one color should be yellow. So, Joe accepted Josh's alteration and agreed that yellow is O.K. Immediately, Josh changed his mind and suggested red as the best color for an explosion. Joe, placating Josh, agreed that red or yellow was fine with him. One would expect Josh to accept this finally, but he still doesn't. He said, "We'll see which looks the better." A logical idea given the nature of programming, but probably disconcerting to Joe who was agreeing with everything Josh suggested without getting any satisfaction that an agreement has been reached and that he had been part of the negotiation.

However, Joe had a way of getting back at Josh. He would play tricks on him. For instance, he would tell Josh that there was no homework when indeed there was. Apparently, Josh would call up Joe at night to ask Joe if Ronkin had assigned any homework.

> *Joe:* He calls for homework and Eric can't help him.
>
> *Eric:* No, I call him, he can't help me.
>
> *Joe:* So, see, Eric and Josh call each other first; then they both call me.
>
> *Ricki:* And you usually help them?
>
> *Joe:* I help Eric, but I don't help Josh.

Joe explained that he wouldn't help Josh because he thinks that "what he really wants to hear is, 'There is no homework.'

> *Joe:* He wants to hear the words, NO HOMEWORK, then, he won't do it. So, once I told him we had no homework and he had two pages in Math and he kills me the next day. I mean, I don't blame him.

When I asked Joe why he would want to play this trick on Josh he said that it was because Josh wasn't paying attention and didn't hear it in class, and then he adds with a little smile that shows his dimples, because "I just wanted to...I like playing practical jokes on Josh, 'cause he falls for almost everything."

To reword what Joe said about Josh's "falling for everything," one could say that Josh had a naive innocence which enabled him to immerse himself in what he was doing. As I wrote about this video chunk on 11/11/89 in *Learning Constellations:*

> *Ricki:* I think that what Joe says here about Josh's 'falling for almost anything' is very important in understanding Josh. Maybe Josh's ability to trust maintains his openness to 'falling for' new kinds of thinking. His honesty in responding to the world, his naivete, as one might call it, means that Josh has the ability to take in what people say without blocking the response.

5.8.3 Tammy's and Mindy's Perspective of Josh

Mindy once told me that Josh has a tendency to be contrary and stubborn. :

> *Mindy:* Him, him and Joe, yeah! They always TALK!! They sort of, like, they always make a struggle. Like, Mrs. Ronkin says something and they say something the opposite way. They say: 'But No!' And then when Mrs. Ronkin says: 'Let's go..' They say: 'No, I wanna finish it!' *(She whines, pretending to be them.)*

Mindy's imitation of Josh and his friend Joe was a small but complete snapshot observation about how Josh reacted to Ronkin during classroom hours. It also demonstrated the kind of teasing to which Josh was subjected by some of the children in his class. Mindy thinks his making demands of Ronkin is "making a struggle" and being difficult. However, in the same conversation, she also told me that she respected Josh for being imaginative. In her words: "Josh and Joe together have a big imagination." She also thought many of Josh's questions to be weird.

> *Mindy:* Josh, I think he's very weird. *(She laughs and waves to someone across the room.)* Because when my teacher, Mrs. Ronkin, talks to us, like, about stories and about our work, Josh always asks questions which are very stupid. *(She winks as she says the word, stupid.)*

Tammy overheard Mindy's comment, lifted her eyes from her notebook, and said, "They're good questions but they're hard to answer!"

From my interaction with Josh, I found that Tammy qualifying statement was a very precise description of Josh's style of asking questions. He asked many hard questions. On the day Josh and I went outside the school to talk on the hill, I thought I was going to interview Josh about curriculum in Logo. Had I only been interested in an answer, I would have missed the most important interview of my two and a half years at the Hennigan. Our conversation turned to important things which he wanted to talk about, things which other ten year old children may also be questioning. As Tammy said, his questions were hard to answer. However, luckily, Josh was not the least bit interested in my answers. His mind was able to flow uninterrupted for approximately twenty-five minutes. He was interested in his questions, his connections among questions, his sense of wonder about how things work.

5.8.4 Josh's Doing What he Wants to Do

Whether Josh was programming or building *Electronic Breakdancers* in Lego, or talking about horses for his 4H presentation, Josh's entire focus would be on the given subject. If Josh appeared to not be paying attention to a person, it was because he was so involved in what he was doing that he couldn't break the focus.

He is one of those children who succeed best when doing or thinking about one thing at a time. On the other hand, Josh also needs to do many diverse things. And as a colleague of mine pointed out, he gets very insulted if he is "left out of anything,"[14]

Josh loved to participate, enjoyed taking parts—lead parts if possible—in school musical productions, looked forward to getting home from school so he could play with his neighborhood friends, and spent vacations with cousins. Josh was very straightforward about how he felt and how he acted. He wasn't socialized into acting a certain way which may be more socially acceptable. Rather, *he calls it as he sees it,* to quote the baseball expression.

For example, on one glorious Autumn day, I went home with Josh. On the way, we stopped by to visit his father at the house he was painting. Josh held the camera and starting videotaping his dad.

Josh's dad smiled paternally and, lifting a finger, said, "Be a good boy, now." (I never thought of Josh as anything but a good boy, although not one who was good because he was told to be.) His mom was visiting his dad too, so Josh, Josh's mom and I hung around the family truck and talked.

Josh's mom was very concerned about how Josh treated his French teacher. She felt that whether or not a teacher was good, Josh should still treat her nicely, and, furthermore, he should do his French homework! Josh, on the other hand, saw no reason to be nice or to do his homework, as French was clearly becoming his least favorite subject. And thus, the two were in conflict.

Josh's mother, knowing she could set the rules, chose to punish Josh by taking away the privilege to do something he liked—watching television. Josh, believing he had been wronged by his mother's reaction, was taking this issue to its exaggerated conclusion—not watching TV is "the worst punishment imaginable!" The conversation went like this:

> *Josh's mom to Josh:* Did you tell Ricki about that little talk we had, about you and Miss F?
>
> *Josh to his mom:* Oh, my God!
>
> *Josh's mom:* I'm interested to hear what Ricki thinks.
>
> *Josh to Ricki:* You see, my mom won't let me get a bad mark in French, so I can't watch TV until the next marking period! Do you believe that? Isn't that the worst punishment imaginable?
>
> *Josh's mom to Ricki:* Josh should be a little more sensitive to her needs as a human being.

Once again, Josh was being described as someone who needs to be more sensitive to another human being's needs. Nonetheless, Josh still holds to his beliefs that this is an unfair punishment. Without hesitation, he confronts his mother by telling me how unfair he thinks this is.

5.8.5 Josh's sense of rules and cheating

Josh did not seem to have problems accepting that there were rules, but he didn't believe that rules were the necessary state of things, even of games. While Josh and Joe were building their car game, I asked the boys what the rules of their game were.

Josh explained to me that the game "doesn't have rules because you can't cheat." I think he meant rules are for protecting against cheating. His system is built on the premise that you can't cheat. Therefore, there is no need for rules. To be more exact, our conversation went like this:

> *Josh:* Well, this really doesn't have rules 'cause you can't cheat. You try and make it so that you can't cheat.
>
> *Joe:* I make my games so you can cheat if you want to!
>
> *Ricki:* You do?
>
> *Joe:* Then you can start, and you win.
>
> *Ricki:* What about you, Josh?
>
> *Josh:* On mine you can't cheat. No. Unless you stop the game.
>
> *Joe:* You can stop the game and go to the end and just type on the screen *I WIN*. That's cheating!
>
> *Josh:* But you don't really win, like on yours, you go zzzz 99 *I WIN*. But, like, mine can't cheat. Remember we were going to let [the car] go through the wall, but that would be cheating!

5.8.6 Teachers' Perspectives: Hitchhiker or Voyager?

5.8.6.1 Linda Moriarty's Perspective

Linda Moriarty, Josh's mathematics teacher, spent a day at the end of the school year viewing my video tapes of Josh and Andrew. While viewing Josh, her eyes glowed as she sat with her arms resting neatly in front of her. She was wearing a plain cream shirt and grey cotton pants. A bracelet and a ring on each finger were her only jewelry that day. When we began our conversation, Moriarty sat in quiet awe. As the conversation continued, showed more expression. Resting her elbows calmly on the arms of the chair, she would raise her hands up and softly move them as she spoke. She made circles with her hands and the circles got bigger as her thoughts about Josh developed. It was as if she she were lifting an intangible object higher and higher. Her fingers, sometimes posed like a dancers, were open but not spread out. Her hands would open and close gently; sometimes they would meet for a moment in front of her and then spread out again.

Moriarty would also make circles in front of her as if she were describing an object rolling or reaching up. When speaking about Josh, her arm gestures moved up and in as though she were holding an invisible balloon.

The relationship between what Moriarty was saying at the time and what she was doing with her body to express herself seems to indicate that she viewed Josh as someone reaching higher and higher, connecting and then moving out from the center to find new levels of understanding. About this thinking, she says that "there weren't bounds about it; he was just free thinking, pulling in all the stuff that's impacted on him in life, but pulling it all together." Her in/out gestures suggest that she appreciated how Josh brought the outside world into his life and then went looking for the next thought, or, as she says, "he's constantly assimilating all that into understanding." Her gestures also indicate that a sense of continuity, of "pulling it all together." In fact, to a degree Moriarty through her spending the time to listen to Josh begins to reflect on her own life. When she ends the following (abridged) reaction to watching the video tapes, she says, "how often do we...have a chance to keep reflecting on things." In reading her own words, I think it is not misinterpreting her to say that she is also enjoying the opportunity to reflect on something for an uninterrupted time about a subject in which she is very interested—the thinking of a child.

> *Moriarty:* That's what you want all people to have, that sense of wonderment, sense of excitement, sense of curiosity, sense of interest; understanding [how to] piece things together. And it's almost like, there weren't bounds about it; he was just free thinking, pulling in all the stuff that's impacted on him in life, but pulling it all together.
>
> Now he might talk in three years from now entirely differently, but he's constantly assimilating all that into [his] understanding. And all our living is about understanding our life and environment and getting involved in it. And that's what you want all kids to have. And I thought, 'Wow, I'd love to feel that all kids could be as expressive and as open and feeling [about] the world instead of [just] chunking things into compartments and keeping them there.' ...
>
> I was just fascinated by the amount that he thought; first of all about things and how things are in the world, and people verses how things are in the world.

> And again, the power of the human mind appreciating, the power and the uniqueness of the mind and what it can do, and what it is capable of doing, yet the need for all these [technological?] things.
>
> *Ricki:* And, you know, he's nine years old.
>
> *Moriarty:* Nine years old, that was incredible! That's what you hope adults begin to think— a lot of adults don't (think like that). And yet, this kid is nine and already just thinking in those terms ... I just loved the way he paused. It's just like more and more ideas kept occurring to him and more ideas about it. It's almost like, maybe, I don't know, he must in bits and pieces be able to reflect on this but [your] just doing this [listening, videotaping, talking?] with him was wonderful because it really gave him a chance to reflect, and he really started and it just kept going, and going and going and he got on a real thing. And how often do we...have a chance to keep reflecting on things? (my editing)

From this inspired reaction, two ideas emerge about Josh's thinking process which are worth making explicit. The first is related to Moriarty's noticing that Josh's pauses were very significant. In fact, she connects his pauses with the fact that "more and more ideas kept occurring to him." Giving Josh the opportunity to generate ideas for an uninterrupted period of time is what she saw as "wonderful, because it really gave him a chance to reflect." What she is saying is that the pauses of children are thinking times, or times of reflection, so that the next connecting idea can come along. The "going and going and going" of Josh's thinking was what "fascinated" her because she felt she could see the "power and the uniqueness of the mind, and what it can do, and what it is capable of doing." She saw in Josh's thinking not only the capacity of the mind to exercise its power and uniqueness, but also the potential of the mind "understanding our life and environment and getting involved in it."

Moriarty's second idea is that Josh's style of thinking was characterized by an ability to integrate many things "instead of chunking things into compartments and keeping them there." In the interdisciplinary world facing many children, adults often question how children will organize their world around them if not by the defined and accepted categories which have existed for generations. How can children learn Math if not in a Math class?[14] How can children learn physics, biology, languages, if they are not sitting in a class finding out how to chunk the "things into compartments?"

Listening to the way Josh brought many subjects together under a somewhat thematic philosophical approach about the transfer of energy helped her to rethink the kind of thinking that many children are capable of doing at age nine and ten. She didn't go as far as question the role of curriculum in the schools, as Josh had done. But she did come to grips with the need to pay more attention to how children make these links of what may seem to be unrelated subjects in a manner which demonstrates a more global than local understanding. Moriarty captured the essence of Josh's thinking in her sensitivity to his bringing "bits and pieces" into a unified framework for investigation.

5.8.6.2 Joanne Ronkin's Perspective

To balance Moriarty's exuberant reaction to Josh (after she had viewed his soliloquy), one should include the perspective of Josh's classroom teacher, Ronkin, who spent six to seven classroom hours a day with Josh for two years. As can be expected, her opinion of Josh was very different; she had the task of maintaining the group identity. Ronkin was a teacher who adhered closely to the curriculum, adding her ideas to the existing guidelines and innovating her approach to make the curriculum come more alive. For Ronkin, who was trying to fulfill the goals of the regular curriculum, the advanced work for this class and her own innovations in Logo, an individual child with very interesting ideas could be more a bother than an asset.

As the carrot story (which introduces Josh at the beginning of this chapter) showed, Ronkin enjoyed treating Josh in a light-hearted manner—for example, the time she suggested he contact the FBI to find out what happened to his carrot.

Josh had an average relationship with Ronkin. She helped Josh solve problems on many projects, but I never witnessed her encouraging him. Perhaps she felt that Josh needed no encouragement to express himself.

Maybe she was uncomfortable with me or with my having a camera. Although her descriptions of Josh seemed accurate, I sensed that she and I differed greatly in how we interpreted a similar set of 'facts' about his thinking. At a presentation of my research about Josh, she described him as a child who is not interested in the ideas of others because he thinks he has the best ideas.

Then she adds, "And unfortunately he does!" (Ronkin had just finished watching about twenty minutes of Josh's soliloquy when she said this.)

> *Ronkin:* Josh hitchhikes on his own ideas. The problem with Josh is he thinks he has the best ideas, and many times, unfortunately he does, and it's a real problem to have him listen to what other people have to say because he doesn't always think they're quite as worthwhile.

However powerful this hitchhiking characteristic was in keeping Josh from being overwhelmed by the pressure of schooling, it did not endear Josh to Ronkin. Moreover, the above quote contains three examples of her negative or at least ambiguous approach towards Josh's thinking. First of all, the term hitchhiking connotes a free ride to many different places. It also connotes a lack of direction or goal. Josh's thinking may be characterized by the ability to visit many diverse domains, but Josh worked hard for his journeys. Moreover, even when Joe and Josh collaborated on an idea, Josh was very focused on what he was doing, he directed these ideas whenever possible, and he usually arrived at a predetermined destination.

The second example is that she sees Josh's soliloquy and reacts by saying, "the problem with Josh is... " Then she restates the same word, problem, again but in a slightly different context, "it's a real problem to have him listen..." In this context it seems that it is also her problem to get Josh to listen to the opinion of others.

The third example of her attitude towards Josh having ideas (which was mentioned above) is her use of the word, "unfortunately." At a time when most teachers are trying to encourage children to have the best ideas they can have, Ronkin was worried that Josh's having the best ideas presents a problem because he was not willing to listen to the ideas of others.

Is Josh the hitchhiker, as Ronkin says he is, "hitchhiking on his own ideas?" In a presentation of my videotapes of Josh in the summer of 1987, a researcher viewing the above video sequence suggested that Josh gets new ideas as he asks questions. He starts asking one question which takes him to thinking about the next question. As she states in her own words:

> What was interesting is *to hear his thoughts;* how one thought tripped the next, tripped the next, and, to me, that's the part that was interesting. It was interesting to follow the way he thought about these things; how one [thing] *tripped* the next.[15] *(my italics added)*

Closing Remarks

In concluding this chapter on Josh, I would like to address my personal relationship with Josh and how I understand the significance of his participation within the Logo Culture at Project Headlight.

Throughout this case study, the most consistent assessment of Josh's relationships was that he did not care about the opinion of other people. My own experience of Josh was somewhat different. Being my friend and a participant in my study, Josh showed more than an average level of interest in my opinion and my life. He asked many things about me and I answered him as I would have answered anyone I had gotten to know and care about. Moreover, he shared his thinking with me for two years. What greater gift could I have received? Josh's gift was given with trust and honesty. I don't think that Josh ever tried to be anything he is not; Josh did not aim to please adults by telling them what they wanted to hear.

Josh's sense of his own destiny and his straightforward mannerisms may be what prevented others from seeing him as a person who was concerned about the opinions of others. It may be that Josh was not overly concerned with others to the extent that he was willing to bend to others' opinions. He certainly had no fear of the opinions of teachers, his parents, his sister or his friends. He definitely didn't 'play the game' of doing things so he will be liked as a person.

From my annotations in *Learning Constellations,* I responded to what Anny had said about Josh by adding my surprise that Josh is being perceived by others—his teacher, his sister and maybe even his parents—as not being able to listen to others and being bossy. I recalled the day when we spoke together on the hill outside the school. I was reflecting upon how I kept trying to answer his questions, but he wouldn't listen to my direct responses. However, this did not insult me. It inspired me.

11/13/89

I did *not* feel the least bit excluded from our conversation. In fact, I felt that my presence contributed to his being able to trip on his thoughts. I felt that I was part of something very precious and that he gave me something very precious. Maybe that is the role of inspirational people. They share with us the way they think and we receive the inspiration for our own thinking...Josh is immersed in his curiosity to find out how things we see in our everyday world actually happen—things like cars, CDs, record players, video cameras, neon, and things like the source of imagination. One might say that this is his full time job, a job Josh does exclude others from participating in with him, if they are interested in doing so.

If Josh was described in this case study as not always listening to others, of not doing what others want him to do, or not being what others want him to be, then I would like to reflect one final time on the conversation I had with him that sunny Spring day on the hill overlooking the playground and upon his participation in the Logo culture.

Josh was able to speak about procedures in ways most children do not. In class, Josh made procedures giving him a chance to experience moving things. He also had many opportunities to explain his programing which gave him a chance to begin conceptualizing how they worked. Most important, Josh had the encouragement of reflecting upon the origin of energy, imagining the stream and flow of movements upon other movements. As he put it: "FD has to be a procedure somewhere, right? And the things you put in a procedure has to be a procedure, right? And it just goes back to electronic pulses and microchips!" Josh traced the route of electronic pulses through microchips in order to find the source of the energy flow which enables words to pop up on the screen by pushing a key. This gave Josh a glimpse at the power of creation.

Josh is like an inventor who is not only building new technological devices, but who is also rethinking the nature of energy which runs throughout all life. Hopefully, Josh will cherish that life and build a world which is safe for him, his friends and his children. As he so powerfully concluded our talk on the hill:

Josh: You know what's even more amazing? Nuclear things! An atom bomb could be as big as that rock right there. And you'd drop it on this country, it would blow up half this country. That little thing!

> Well, it's little compared to half this country. It could blow up half this country if it were an atom bomb! That little bit might just take up just the amount of space I'm sitting on and it would blow up half this country. It's scary!! If people never came up with nuclear things, they wouldn't have atom bombs.

To conclude, the Logo culture provided Josh with the opportunity to deepen his empirical style of thinking. It gave him a larger repertoire of mental models to build with and to think about. Moreover, it gave him the experience of experimenting with the process of moving things with which he was so fascinated. The pervasiveness of Josh's empirical thinking about moving things will be one of the topics of discussion in the conclusion of this dissertation.

6 The Narrative Mind of Andrew

> The viewer is reminded... that in the end we have only what is inside ourselves to contemplate; each of us has a story that contains our answers to the old existential questions.[1] —*Robert Coles*

6.1 The Beginning

The following case study should not be read as a complete picture of Andrew, but rather as an introduction to data which requires a psychoanalytical or psychological analysis in conjunction with the ethnographic and epistemological one which follows. In other words, this case study may be the example of why it is so important for collaboration[2] among a team of researchers with different perspectives to work on the same data, to build layers of interpretations, and to reach conclusions which could be helpful to other children who find themselves working through related issues. The issues about which Andrew was so confused—issues about fantasy and reality—will need to be addressed if we plan on providing technologically advanced learning environments for a diverse population of children. Andrew, the subject of this chapter, tells us about his inner conflicts partially overcoming them by relating vivid and structurally coherent stories. Perhaps, the words of Robert Coles, describing (his mentor) Dr. Ludwig's advice, seem the most appropriate way to think about Andrew's stories. Coles writes:

> Dr. Ludwig urged us to let the story itself be the discovery...He urged me to be a good listener in the special way a story requires; note the manner of presentation: the development of the plot, character; the addition of new dramatic sequences; the emphasis accorded to one figure or another in the recital; and the degree of enthusiasm, of coherence, the narrator gives to his or her account. [He said:] 'Their story, yours, mine—it's what we all carry with us on the trip we take, and we owe it to each other to respect our stories and learn from them.'

> Such a respect for the narrative as everyone's rock-bottom capacity, but also as the universal gift, to be shared with others, seemed altogether fitting.[3]

6.1.1 Introducing Andrew

When I met Andrew, he was a grade–four pupil who could make up complicated stories by linking diverse segments of other stories he had heard or read in a unique, if not integrated, manner. The story I am about to tell is of a child whose strengths in the narrative mode of thinking[5] did not fit into the traditional classroom environment. My hypothesis is that had Andrew had a longer and earlier exposure to the Logo constructionist culture and a greater opportunity to integrate his imaginative creations into constructions that were his own, he may have had a chance at not being suspended from school.

Like other children in the classrooms of inner–city schools, Andrew was struggling to distinguish between fantasy and lies. Oddly, we encourage children to make up stories and yet we punish them for making up stories, expecting children to be able to distinguish between when it is O.K. to tell made–up things and when it is not. Our message to children—that to gain our approval, they have to tell us only the kind of make–believe we want to hear—may need to be re-examined. Many children at risk are children who are still flexible enough to discover their own reality, a reality which could contribute to our civilization instead of undermining it. For Andrew, unfortunately, certain less flexible patterns had already taken hold.

Andrew was nine years old when I first met him. He was an active child who moved fast—especially in class, where he would squirm on his chair as if it were slippery. When he spoke, he used grammatically correct sentences. His diction was dramatic and clear. He knew how to emphasize a phrase and to pace his speech with just the right amount of pauses so the listener could follow his ideas. Conversations with Andrew were always experiences of hearing his thinking. Often he would tell his stories in intricate detail—using the exact time of the event. This use of dates and times struck me as curious. Why did a young child feel he had to be that precise? Was he used to being cross-examined?

Andrew had an average build and an excellent posture. His curly black hair was cut short and neat, and often his clothes were a bit too grown up compared with other children's.

On regular school days, he wore his shirts tucked in his pants with a belt. If he wore a sweatshirt to school, the collar of his shirt would be neatly sticking out. He also wore shirts with collars under his assortment of well-designed sweaters; and clean white running shoes. On special occasions, such as the yearly 4H Presentation,[6] Andrew would be especially decked out—wearing his pink cotton shirt with a black bow tie and black pants. However, Andrew's commanding presence was not determined by his clothing.

Andrew had a special aura about him which others found either very attractive or very unattractive. His persistence with adults when he wanted things done his way tended to distance him from those very persons with whom he most wanted contact. Children tended to respond quite similarly: some, like Mark and José, thought Andrew "dangerous" and wanted to be his friend so they could experience the forbidden fruits of getting into trouble; others avoided him thinking him too straightforward for their gentler sensibilities. Few, if any, of these 'friendships' with other children or adults seemed to give Andrew a positive feeling about himself during grade four.

Andrew's most special ability was to tell stories. He could make them up in an instant, "without missing a beat," as his home room teacher, Linda Moriarty would say. My favorite story about Andrew's making up stories is one I did not have the opportunity to observe. However, it seems to represent the essence of his personal struggle to gain recognition as a person. Moriarty told me that a storyteller had come to the class one day. The storyteller told the children how some famous people had gotten their names. Then she asked the children how they got their names. This is how she described it to me:

> *Moriarty:* So, Andrew, hand waving madly, said, 'Oh, I was named after a famous basketball player.' And [then] he named the basketball player, and [said], 'because I'm good at basketball.'
>
> So, one of the kids said, 'Well how did your mother know that you were so good at basketball when you were just born?'
>
> *(Moriarty clicks her fingers in the air.)* Without missing a beat, he said, 'Oh, well, I wasn't named Andrew until I was five.'
>
> So they said, 'Well, what was your name [those first five years]?'
>
> And he said, 'They just called me Baby A.'

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>
> *(Moriarty clicks her fingers in the air.)* Without missing a beat, he said, 'Oh, well, I wasn't named Andrew until I was five.'
>
> So they said, 'Well, what was your name [those first five years]?'
>
> And he said, 'They just called me Baby A.'

> For five years of his life! And he just shot this out—no smile on his face, complete, you know, God's truth stuff. That was the most hysterical thing. But that is Andrew!

This little story about a child begging for recognition is tenderly tragic. At first one laughs at his first getting caught in a lie and then at having the imagination to follow through with a possible explanation. Then the question hits: Why did Andrew feel he had to impress his classmates by being named after someone famous? And why, for example, did Andrew name his dog, Scott Lincoln, after Abraham Lincoln?

6.1.2 Andrew Meeting the Computer Culture: the Memory Bank

> A memory is, of course, a story, an aspect of experience that lives in a particular mind. . . A memory is an event endowed with the subjectivity of our imaginative life.[7]
>
> —*Robert Coles*

When I first met Andrew, he told me he wasn't really "a whiz at the computer." He also told me that he and his dad had gone to the Computer Museum to try out the different kind of computers and that he preferred the IBM to the Macintosh because IBM computers don't tell you, "I don't know how to." This struck me as odd since the Logo he was using on the IBM computers at the school often gave responses such as "I don't know how to."

Andrew also told me he was learning about different aspects of the computer, things like memory banks. He had very personal 'theories' about what memory banks were. He said they were like regular banks "where you keep memories." According to Andrew, the memory in memory bank is similar to the word "remember"—for the obvious reason that people remember things in their mind:

> *Andrew:* So, memory, like, it's like remember, but mem-or-y. Like, your mind, you remember everything in your mind. And then when somebody... tells you what to do, like, with the Logo computer or something, you put FD [and] it knows [what to do]! You see, you put it on a side. ...You have to use what ***he*** knows, like FD, RT, and LT, because those are the only things he really knows what to do.

Ricki: What do you mean he [or it] ?

Andrew: The turtle.

When Andrew used the word, "memory," and related it to the word "remember," it seemed that what was inanimate began to take on animate features.[8] He also changed the "it" to "he" in the above quotation. This is not unusual given the nature of Logo which promotes children's identification with the moving cursor by calling it a turtle. What is unique is how Andrew articulates a very basic programming rule that the computer will only respond to what it has been programmed to know: "You have to use what he knows, like FD, RT, and LT." This means that when Andrew uses the computer, he knew that he must use the 'language' which it has been programmed to understand. Moreover, as Andrew points out, the commands have to be written in a certain place, the flip side, for executing those commands, something Josh also pointed out as being important.

As Andrew continued to speak about memory banks and remembering, he personalized what he was saying by adding:

> *Andrew:* Like, say, I told you something, you will remember it; like kids, they always do this. You tell them one thing, you forget, and then you go ask the kid and he knows everything you said. Not one single thing he doesn't know. It's about a year. For about a year he knows that.

The notion that children remember what you told them (like a personal memory bank), whereas adults forget struck me as a very autobiographical statement on Andrew's part. It suggested that, for Andrew, adults don't seem to remember what he said. He, on the other hand, (like other children) remembers everything that was said to him "for about a year." When I responded to his answer and asked, "What about the computer? How long can the computer remember?" Andrew looked at me and said quite confidently, "Well, that's a long.... I think that's pretty long." Trying to understand if Andrew was anthropomorphizing[9] the computer, I pursued his evasive answer and asked, "About a year? About that same amount of time, or more, or less?" Andrew, less confidently answered, "Two years maybe."

My final question in this conversation[10] was whether or not he thought that the memory in the human mind and the memory in the computer work the same way. His response was that it did, because, "you see, humans made the computer." Unlike Josh who believes that only geniuses know how computers work, Andrew has much less awe of computers because computers were made by humans and therefore what happens in the computer is just like what happens in every human mind. (Unlike Josh, the notion of genius does not enter into his theory.)

6.1.3 Andrew's Gestures

Throughout this discussion, Andrew gestured according to what he was saying. For example, he touched his forehead when he told me that memory is like "remember." And when he said "You remember everything in your mind," both hands touched his temples several times. As he described what to do with in Logo, his fingers start typing as if he were sitting at the keyboard.

However, what was most characteristic of his gestural language was when he spoke about what happens when an adult tells a child something and then forgets. His left hand remained almost motionless with the palm open and facing up; the right hand, stiffened in a straightened position with the palm perpendicular to the other hand, moved up and down hitting the left hand at a 90 degree angle. To close this gesture, Andrew's right index finger met his left palm and the palm closed around the finger. When he finished his explanation, he pulled his hands behind him and swayed back and forth with his whole upper torso.

The striking gesture with the hands reminded me of a decisive adult instructing a child on what had to be done. The swaying gesture seemed to be more characteristic of any child responding to what a punitive adult instructs as the child hides his guilty hands behind his back and sways in a reconciliatory manner. But, before the interpretation grows *too thick*, let us return to the story about Andrew by telling one of Andrew's stories.

6.2 Putting the Pieces Together: Untruth and the Narrative

> Both literary and moral feigning depend on the author's ability to reshape (in Latin, *fingere*, whence "fiction") his own thoughts of untruth, which in the Middle Ages is called narration. Only when I have gotten used to thinking as the silent tracing of words on the parchment of my memory, can I detach thought from speech and contra-dict it. A full-blown lie presupposes a self that thinks before it says what it has thought. Only when memory is perceived as a text can thought become a material to be shaped, reshaped and transformed. Only a self that has thought what it does say, can say something that it does not think. Neither such a thought as distinct from speech, nor such a thinking self as distinct from the speaker can exist without speech having been transmorgrified and frozen into thought that is stored in the literal memory.[11] —*Ivan Illich and Barry Sanders*

Andrew could not only make up wonderful stories but he could also recount both how he got the ideas for his stories and how he put the ideas together. Moreover, he could discuss the delicate role between fantasy and reality by pointing out the distinction between lying and fantasy:

> *Andrew:* Well, fantasy, it's, it's not lies but it's, like, let's see, they make it up out of the head. Realistic or real, reality, means that it's real or, like, it's happening in the world today.
> *Ricki:* And what do you think [you're doing] when you do something with the computer? Do you think that what you're building is something real or something out of fantasy?
> *Andrew:* Well, I'll try and make it look real, like it is in the real world. Or sometimes I would write a story on a computer —a fantasy story or something like that.

Andrew's working out this delicate balance between fantasy/lies and reality/truth was particularly interesting to me from two separate points of view—that of the educator and that of the filmmaker. As an educator, I question whether or not narrative thinking which emphasizes the use of fantasy[12] is at risk in a technocentric society.

Many educators question whether or not children will lose their ability to enter into the imaginative world of fantasy because it is not valued to the same degree as the more concrete technological world is. Will adults encourage children to create their stories, extending the oral and literary tradition of reflecting upon the human experience or will the race for excellence in science supersede the humanities.

To a certain degree, the filmmaker's perspective also addresses this delicate balance, but for different reasons. Whether the story is fiction or non-fiction, films are stories about human experience and are represented through the eye of the filmmaker. Andrew's conflict between fantasy and lies, and between reality and truth is at the heart of the epistemological problem concerning the nature of the recorded moving image.[13] No matter how realistic the recorded event is, the story is told by the filmmaker. Even the most realistic documentary is still a result of someone's point of view about the facts.[14] This means that the filmmaker is always having to question whether or not what he is representing in his version is close enough to reality to make sense for viewers. In fact, even the most avant garde filmmakers, whose moving images are far from being realistic, want their ambiguous message to be taken as representing a genuine reflection of their perspective of reality. Even the most make–believe fantasy has to ring true to our sense of reality, and yet, there is no escape from the fact that the moment we create, we recreate reality.

6.2.1 "The Boy Who Could Fly" or *Where the Monsters Are*

Andrew told me that when he worked on the computer, he used it mostly as a word processor (or as Illich would call it, a text composer) for writing stories. He told me that he got his ideas for the stories he had written while working on the computer on a project his teacher initiated. In fact, Linda Moriarty's class was working on a constellation project where the children "drew" or programmed the different constellations on the computer, so it seemed more than reasonable to assume that Andrew wrote this story while he and his classmates were programming their constellation project.

> *Andrew:* Well, when I was working on my solar system, then I said [to myself], 'Something would be a good story. Mrs. Moriarty wouldn't mind if I just jived up a little stuff for the computer.'

> So I go and I turned, flipped the page [in Logo Writer] and I start writing a story. And then I'd look back and say, 'Which planet should I choose, for the last,' and I'd go, 'How about the white planet. Pluto would be good.' And so I put Pluto on, and then I put Jupiter and the Sun.

Accepting Andrew's explanation as to how he got inspired, I found his story about the boy who could fly a perfect example of how children generate their own ideas while working at the computer. (Little did I know then that the real story about Andrew was still many layers below the surface.)

> *Ricki:* Could you tell me about one of your stories?
> *Andrew:* I made one up about the boy who could fly. And I said, one day he was walking to his grandmother/father's house and his grandmother's. He was walking there after school to give them berries and a lot of stuff. . . .[H]e was trying to walk up the stairs; he was just walking on air and he was calling his grandfather, yelling. He finally touched the ceiling and fell down, and finally his grandfather came. His grandfather didn't believe a word he said that he flew. And he said, 'Grandfather you have to believe me, I flew, I flew.'

The above story starts off with the classical plot of the fairy tale: a child is wandering by himself or herself on the way to see a loved one. The situation is quite normal but the expectation is that the normalcy will be intruded upon by some event. Almost reminiscent of Little Red Riding Hood on her way to her grandmother's, Andrew is bringing berries to his grandfather's (or grandmother's—at first, he's not certain if he wants the other character to be male or female.)

The theme is clearly established in these opening lines. The story is about a child who wants to be believed in for his special abilities and yet who knows that he will be thought of as a liar. "Grandfather you have to believe me, I flew, I flew." Moreover, the special trait of our hero is that he can fly, a trait anyone would have difficulty believing. Predictably, at first, our hero flies only when his grandfather is not there; when the old man appears, he is no longer in this altered state.

Andrew continues telling his story changing the scene. The grandfather and the boy are walking to the store when the boy starts flying. The flying which Andrew describes seems to be more like a lifting off rather than a soaring. And when the boy reaches outer space, Andrew solves the problem of too little oxygen in space by having the hero put his hand to cover his mouth. In other words, Andrew's hero is very fixed in the concerns of the earth bound. He could have easily continued the story with no reference to the earthly restraints. But Andrew has to justify his position in terms of the earthly reality. Here is his description of the scene:

> *Andrew:* [O]ne day his grandfather was walking to the store. [H]e held his grandson's hand and suddenly he let his grandson loose and his grandson went flying into the air. He said, 'Where are you going? What do you have on you? Why are you flying for?'
> He said, 'This is what I told you, grandpa,' and he started flying up and up. He was in space in about five hours. He was in space. [H]e couldn't breathe that much so he needed a face mask or something. So he couldn't have anything. He used his hand to cover his mouth.

Notice how Andrew makes reference to the time: "He was in space in about five hours." And when he continues the next scene, he once again establishes a time frame:

> *Andrew:* He floated a long long time. He was there for about half a year. He met these creatures on Mars. They were scary . He got new clothing that they got from Mars. [H]e floats off into another planet, Jupiter, where he meets these monsters that are hairy and they're scary—well, it rhymes. They had big claws. They try to sink their claws into him until he flies away. Then, finally, he reaches the Sun. These fire monsters with big big long teeth with fire hanging out of them blow fire out of them. They burn ... everything he has on, all his clothes. So he runs around naked in the sky and he then finally he looks at Pluto and he says, 'Na, I shouldn't try it because it might be another monster.' But he has nowhere else to go, so he goes to Pluto. He finds new clothing. [T]hey're very friendly there and it is very cold.

This escape to "where the constellation monsters are" echoes the children's story about Max in Maurice Sendak's *Where the Wild Things Are,*[15] Max was a young boy who was told by his mother that he was a "wild thing" for "making mischief" around the house in his wolf suit. She sends him to bed without supper. Lying in bed (sleeping?) he is brought to a place where all the wild things live. In fact, Max (like Andrew) has to travel through time, "through night and day and in and out of weeks and almost over a year," until he reaches his wild things. At first, Sendak's Max was quite frightened as the monsters "roared their terrible roars and gnashed their terrible teeth and rolled their terrible eyes and showed their terrible claws." But eventually Max tamed them all by staring into their eyes without blinking, and they made him the king of the wild things. After a wild rumpus, he decided to give up being king of the wild things because (he smelled something good to eat) and wished to be "where someone loved him best of all." So he hopped on his private boat, and sailed "back over a year and in and out of weeks, and through a day" until he arrived "into the night of his very own room where he found his supper waiting for him" on the table by his bed, "and it was still hot."

The comparisons with Andrew's stories are obvious. Andrew, like Max, longed to be special in some mischievous way. He had to take himself very far away to a strange space with monsters in order to come back to his home. In both stories, the sense of time passing is also significant, however, in Andrew's story the time is like a location—it fixes the event, whereas in the Sendak story time is ethereal—it creates an imaginative flow of events. Another similarity between the two stories is that both are very solution-oriented. In *Where the Wild Things Are,* Sendak gives Max the chance to resolve his animal instincts. Max takes himself to a place where he can tame his inner beast and decide when he is ready to return from the.wilderness of his soul. Andrew's story has elements of deeper frustration. Instead of having the monsters believe in the boy and make him the hero, they try to sink their claws into him and they burn off his clothes leaving him vulnerable to the elements in space. Moreover, the boy has to travel from planet to planet in the story until he finds his way home again. The story reminds one of the type of frustration dream where one is repeatedly brought back to the same place incapable of resolving the conflict. Andrew's boy who could fly finally returns to earth safely after the inhabitants of Pluto befriend him, and he finds new clothes so he doesn't become "the first human icicle."

The friendly inhabitants direct his journey back to Earth and he returns to his grandfathers house, safely and with credibility.

6.2.1.1 Getting the Ideas for *The Boy Who Could Fly*

> *Ricki:* So, as you were working on the computer and you were working on the planets, you would get the idea....
> *Andrew:* Yeah. This is what I'm trying to do. I'm trying to get one hot [planet], one hot, one medium—like cold and hot, and one cold—one cold planet. The sun is hot and Pluto is cold; Jupiter is both.

The day Andrew told me his story *The Boy Who Could Fly,* we were sitting in the pods while his classmates were working on their constellation project. It seemed reasonable that this story emerged while Andrew was learning how to program constellations in Logo. However, six months later in an interview with Moriarty in my office, she told me that she had never seen one word of this story on print, neither on the computer nor in his journal.

> *Moriarty:* Now, is he saying that he wrote this story [shakes her head]? [He] did not write one word. It's the first time, the first time [I've heard] this story. It's not that he didn't have any ideas about them, but this story is being mostly made up as he's going along. He writes, he writes some interesting stuff, Ricki. It's just that it's hard for him to write.

Another incident reinforced what Moriarty had told me. An undergraduate student at MIT, looking through my data, found a striking similarity between Andrew's story and a children's movie which she had seen. The movie is actually called, *The Boy Who Could Fly.* (In fact, renting the movie and watching it made me question whether or not Andrew had also seen this movie.) In the movie, the boy was a rather obsessed young adolescent who lived with his uncle. A new girl neighbor moved into the house next door and became psychically close to the boy by watching him pretend to be a bird. She actually begins to believe he can fly when she is injured and experiences his flying from his window to visit her. Unlike the boy in Andrew's story, this boy never flies very high or visits monsters. He just hangs around the town.

What seems to be happening is that Andrew has an ability to join bits and pieces of stories together and maintain the consistency of one story. The question is, does he integrate them and make them his own? The stories are pieced together without seams, seamlessly, as one says in the world of interactive videodisc environments. However, an element of separate chunks placed side by side seems to describe them more than the feeling of an integrated story, a story where Andrew shows how he has appropriated the chunks and made them his own creation. Another of Andrew's stories called *The The Sheep and the Goat and the Duck* may illustrate this point more clearly.

6.2.2 "The Sheep and the Goat (... and the Duck)"

The following spring Andrew and I sat in Turtle Cove to have our talk. It had become increasingly difficult to videotape Andrew in the pods or in his classroom. Moriarty was concerned that my focusing attention on Andrew could be disruptive for the other children. This resulted in our meeting less regularly and our having to find quiet private places to talk about what was happening in his mental life. We sat in the barren room by the big table and caught up on the few weeks which had passed since our last serious talk. I asked him if he had been writing any stories and he told me about the goat, the sheep, the duck, the owl, the shark and the hunter.

6.2.2.1 The Story

Although Andrew told me the story in one sequence, it seems to divide quite well into four acts or scenes with a preface, our conversation:

> **PREFACE**
>
> *Andrew:* Now **I'm trying to make up a new story.** This time it might be a whole, might be three pages, yeah, three pages worth of it. It's going to be a book."
>
> *Ricki:* About what?"
>
> *Andrew:* The goat and the sheep."
>
> *Ricki:* You want to tell me about it?"

Andrew: Not too much, because **I wrote it like the beginning of April before school vacation,** and **it's about a duck; his name was Alfred** and his friend the goat; his name was Freddy.

ACT 1

Andrew: So I have a goat. So the goat goes one day to the supermarket, gets some hay, and he meets the duck there getting a swimsuit. And so they talk on the way home. Then **the duck didn't know that she was pregnant**. Her stomach—she began to hurt and hurt. She thought she was eating a lot and that's what made her fat; so he said we'd better see the doctor about this.

Act II

Andrew: So he takes her to the doctor, Doctor Owl. Her doctor tells her that she's pregnant. She has a fit! And finally, while she's having a fit, the baby comes out—wide awake, three little babies, three little ducklings. Both of them were pretty, you could say. One of them was the ugliest duckling you ever saw in your life.

Act III

Andrew: So one day, the girls and their mother were going out to take a swim. A shark came. The ugly duckling was on the beach putting sand on him. The shark came after the mother and ducklings. The ugly duckling grabs a rock, runs out in the water, hits the shark [and] gets his family back in safety. They're still calling him ugly. They still think he's not very brave. They just keep saying, 'he's lucky, he's lucky.'

Act IV

Andrew: So another time when they were about to get shot by a hunter, flying in the air; the hunter was shooting bullets; the ugly duckling didn't [fly], he always wanted to play; he didn't want to learn how to fly, so he didn't. So he had to stay on the ground. He sees the hunter; he goes over and bites the hunter and his family gets away safely. And now they're starting to be convinced that the ugly duckling is brave, and it doesn't matter if he's ugly or not. It just matters how he acts, how he acts, what's his personality. And THE END (May,1987). (Structural breakdown into Acts is mine. Andrew told it to me as a whole unit.)

At least three aspects of this story are worth a close examination in getting to understand the thinking of Andrew through his storytelling: the structure of the overall story, the attention to detail, and the content itself.

6.2.2.2 The Structure of the Story

Structurally, the story has an introduction (Act 1), a problem to resolve (Act ll), a first attempt to resolve the problem through an active event (Act lll), and a resolution—a happy fairy tale ending (Act IV). Each section unintentionally begins with the word, "So," because Andrew punctuates his pauses with that word. It is Andrew's clue to the listener that s/he should expect a change. (Maybe the "so" also gives Andrew a chance to think of the next scene.)

In the introductory Act l, the main characters are introduced. The goat, who was previously the sheep, meets the duck (who was previously a male named Freddy) at the supermarket. The goat is the male and the duck is now female. The female duck is buying a swimsuit. On the way home, she realizes that she is pregnant. The male goat suggests she come to his doctor.

In the next scene or Act ll, the problem emerges or, rather, is born. The duck has three little ducklings and two, the female ducklings, are pretty; but one, the male, is "the ugliest duckling you ever saw in your life." Here, Andrew states the problem of the story: how will the ugly duckling gain acceptance from the others.

In Act lll, the ugly duckling has his first opportunity to resolve his not being appreciated by his family. He saves his mother and the girl ducklings from a shark. This act or scene has action but not resolution—after being saved, his mother and sisters think he was just lucky. The resolution comes in Act IV when he saves his family from being shot by the hunter. This time his family realizes that it was no accident; the ugly duckling is worth their respect. They are "starting to be convinced" that he is brave and that what really matters is not how someone looks but rather how they act, "what's his personality."

6.2.2.3 Attention to Details Which Keeps Changing

What is so remarkable about this story is that it is structurally so strong and complete in every part. Moreover, Andrew is making it up as he goes along. Notice how at first Andrew tells me "I'm trying to make up a new story" and then, when I ask him to tell me about this new story, he tells me he already wrote it, in April, to be exact.

Once again, Andrew is very specific about the time as well as about the size: the story "might be a whole, might be three pages—Yeah, three pages worth, of it. It's going to be a book."

The story itself is a tribute to details within an organized whole. Andrew has introduced many characters who all have active roles in keeping the plot moving. He also assigns a gender to many of the characters. In fact, the story partially revolves around a gender issue—the mother duck gets pregnant and "has a fit." Although we don't know the gender of the hunter, the shark, and the owl, it is not hard to speculate that they are all male as those needing to be saved are all female—the mother and the girl ducks! And the ugly duckling is male. He, the ugly duckling (which could be Andrew), of course, saves the females from the predators and gains their approval at the same time.

Another example of Andrew's attention to detail is his inclusion of details which don't enhance the plot, but enrich the context. The ugly duckling who didn't go off with his mother and sisters is lolling about on the beach throwing sand on himself! Consciously or not, Andrew has built drama into the plot with these details; it is just at the moment of seeming peacefulness that the shark comes along.

6.2.2.4 Meaning and Origin

> Insofar as we account for our own actions and for the human events that occur around us principally in terms of narrative, story, drama, it is conceivable that our sensitivity to narrative provides the major link between our own sense of self and our sense of others in the social world around us. The common coin nay be provided by the forms of narrative that the culture offers us. Again, life could be said to imitate art.[16] —*Jerome Bruner*

Linking Stories Together....

Not only does life imitate art as Bruner suggests, but art is often the mirror of the inner life. If we agree that our stories reflect what we experience, then several significant features emerge while looking closely at *The Sheep and the Goat (and the Duck)*. The first feature is the most obvious: this story is extremely similar to *The Ugly Duckling*. In fact, when I asked Andrew how he got the idea for this story, he told me he put two stories together, *Two Friends* and *The Ugly Duckling*. As he explained to me that same day in Turtle Cove,

> *Andrew:* Well, I started to think that I should make a book. And I had no ideas at first. So, I thought of something; I looked at a story, *The Ugly Duckling*. I got part of it from there, and I got part of it from *Two Friends*, a book that just came out. And I saw the duckling and the goat. And the name, it was *Two Friends* and not *Duckling and Goat; Two Friends'* and like that. So I decided I'd make my own title, and I used each. I used half from *The Ugly Duckling* and it was half from *The Two Friends*. So I did, and that's how my story turned out.

Notice how once again Andrew pays attention to exact amounts—"I used half from *The Ugly Duckling* and it was half from *The Two Friend*." One also has to remember that, based both on what Moriarty later told me and on how Andrew keeps changing the details about the story, this story is probably being made up by Andrew on the spot! So, when I ask Andrew why his story is more than a combination of the two stories, his response is very interesting. He returns to his position that he had had a plan for the story and had made decisions along the way, meaning that he was not making this up on the spot but that it was a product he had already produced. (In case this is not completely clear, I want to remind the reader that I am not judging whether the story was made up before or on the spot. What is interesting is how Andrew responds to me, an adult, in such a way that he believes I will be more interested if indeed he had written this previously. Even if that was true for me at the time, it is not true for me now. And what is so fascinating is how much Andrew is trying to please me by telling me what he thinks I want to hear. He is also very good at doing this.) He told me:

> *Andrew:* Oh, because I made a little change in it. . . In *Two Friends*, the lady does not get pregnant and she has the Doctor Owl. She's not pregnant; she's just fat. So I decided I should change it and, 'cause I couldn't think of any way to put the ugly duckling in it. So I started thinking that maybe she was pregnant and she had another ugly duckling. And that's what I think's unique about it.

This example of Andrew's ability to find a way to explain how, in spite of the fact that his story is so similar to other stories, it is still unique to him is comparable to the Baby A story told at the beginning of this chapter.

Andrew has the ability to make his stories come out "realistic" even when he is 'caught' in the act of making up a story at that moment.

Autobiographical Theme

The second outstanding feature of the story is its autobiographical theme that the hero's saving others will win him the approval he is so anxiously awaiting. Andrew's main character is put in the position where he must fight the shark and the hunter. Fighting off the bad guys provides a way for Andrew's duckling to overcome his rejection. His family no longer sees him as being ugly; they begin to understand his brave personality through the way he acts. One is reminded of what Josh said: Ideas come from things that you experience. If you see people fighting, that's what you put in your picture. One can only speculate about Andrew experiences as an inner-city child which make him feel that he has to win the admiration of others by fighting. As Moriarty said when she had just finished watching this chunk.

> *Moriarty:* That is so autobiographical to me, Ricki.
>
> *Ricki:* How is it autobiographical?
>
> *Moriarty:* I just feel a little bit now; you know, this could be very carried away or something, but I just feel that he is, trying to be important and, special. I don't know if it's brave or whatever; and he has such a reputation with his mother and with people of not being credible—you know, making up stories, doing all this stuff and he is bit by bit changing. But it's being accepted by his family; like, doing something special for the family and saving them or helping them and I think that's important. But getting recognized for that. He doesn't feel he's recognized for anything . He is talented, he is special but his environment is not, it's not... He's not getting re-enforced at all. He's not fitting into the standard school environment because his writing skills and his behavior kinds of stuff are not the norm.

6.3 Andrew's Character: "It's Good to be Bad"

The fact that Andrew had family problems was no secret to Moriarty or to the school counsellor. Not unusual for inner-city children, his mother and father were no longer living together. His mother was very young (from what Moriarty told me) and she was quite conscientious about her appearance and her language abilities. She regularly came to parent-teacher evenings concerned with how Andrew was doing—parents of the other children had been complaining about Andrew's influence on their children. Moriarty made me aware of the mother's feeling that Andrew was a bit too much for her to deal with. Therefore, it did not surprize Moriarty, the school counsellor, nor myself to find out that Andrew was moved to a foster home later that year.

Moriarty had also had her share of difficulties with Andrew. She told me he had threatened José with the blade from a pair of scissors, and had been suspended from school. Apparently, he told Ebonique that he was being sent to jail. When I asked Moriarty why he had said this, she became rather reflective and said, "That's what suspension was, that's what suspension was for him—to stay out of school for the day. It just dawned on me now." My explanation is that Andrew's sense of drama took over and exaggerated the situation. Going to jail is more romantic to a ten year old than being suspended from school for bad behavior. However, when one considers the circumstances, he could have perceived the situation as one in which he was accused, found guilty and made to serve his punishment away from the society of other children.

Andrew was no foreigner to punishment. One of Moriarty's strongest criticisms about his mother's disciplinary behavior was that Andrew would be grounded for very long periods, so long in fact that Andrew would forget why he was being punished. Unlike Josh, whose worst punishment was not being able to watch TV, Andrew was used to long periods of being kept in the house away from his friends and outdoor activities.

Once Andrew told me that he thought it was good to be bad. That you could learn from being bad. His buddy, Mark, was there at the time and he agreed with Andrew that Andrew knew how to be bad. Mark was the studious type who never got into trouble, but loved the excitement of being with a child who did. Although Andrew told me this as a teasing joke to grab my attention, the element of disclosure was there. For Andrew, being bad gave him the attention he needed, the attention he wasn't getting by being good.

Moreover, he seemed quite philosophical about the whole matter equating being bad with how one can actually learn from one's mistakes.

> *Andrew:* Well, I think it's good for me to learn from bad experiences. I think it's good to be bad. I think it's good to be bad because you can learn from your mistakes.

Joe and Josh once told me about their experience with Andrew. It was a brief discussion but seemed to reinforce the overall picture:

> *Josh:* Andrew! He went to my old school.
> *Ricki:* Was he a good student?
> *Joe:* NO! He was bad!
> *Ricki:* C'mon.
> *Joe:* He's still bad. He goes around the bus beating kids up. So kids have to gang up on him.
> *Ricki:* No! Does he really do that?
> *Joe:* Yeah! Except, there's this one kid in the back, Chester.
> *Ricki:* Uh-huh.
> *Joe:* Andrew is scared to come in the back of the bus when Chester is there because Chester does not like Andrew! Chester doesn't like anybody.

6.3.1 Andrew and His Classmates

On one of several occasions, I videotaped Andrew's classroom learning how to move their Lego creations using Logo commands on their computers. The only adults in the room were Mitch Resnick, another MIT researcher, and myself. Resnick was sitting at one of the class computers facilitating the children's projects and I was walking around the classroom, videotaping and talking with the children. The children did not perceive us as being in charge of their behavior. (On the supervisor scale we would have rated somewhere under the substitute teachers!) Resnick was helping the children connect their constructions to the computer and I was the "participant recorder."

In other words, we were not threatening to any of the children and they responded to our informal approach by working, playing and talking in a very casual manner.

The LEGO/Logo experience in the Hennigan School classroom could be described in the following way: children sitting alone or together working on projects they initiated; hundreds of red, blue and yellow Lego bricks spread out on tables placed in no special order; and the characteristic soft hum or buzz of activity.

Andrew was working with two other boys. Uncharacteristically, he was dressed sloppily in an oversized white shirt, shirttails hanging out. As he put Lego bricks together to build his car, he was talking about one of the teachers to José and Paul: "Yeah, and she has a voice like a mountain lion." The boys laughed at what Andrew said, and they all continued talking and working.

Minutes later, Andrew was hanging around the computer where Resnick was helping the children attach their constructions to wires which were connected to the computer ports. Tammy was typing in the Logo commands which would make her car move. Andrew just hung around waiting for his turn at the computer.

To get Resnick's attention, Andrew put his creature on the floor where Resnick's legs were sure to present an obstacle. Then Andrew said to Resnick, "Move those long legs of yours, Mitch. Mitch, I need that space." Resnick, very calmly and considerately, reminded Andrew that he would have to wait his turn, "Well, Tammy just started, [she was] first." Not producing the results he wanted, Andrew came up with a reason for his request and said, "I just need to get my wiring." Resnick responded to the literal question and gave Andrew the wire, "Here's your wire. Let Tammy finish first." Andrew whining, said, "Please, please let me go real quick." And Resnick continued working with the next children in turn, Rachel and Ebonique. Resnick's voice remained calm, but the tone of frustration with the child who was whining and out of turn began to appear in his voice: "When they're finished O.K?" Then he turned to Rachel and Ebonique and said, "Is it working? Is it working differently than you thought it was going to?"

At this point, Andrew changed his tactics. Knowing Timmy, a very frail sensitive child covered in freckles, was next in line, Andrew said to him, "Let me be after them, O.K?" But Timmy chose not to answer Andrew.

Resnick, wanting to be fair to all the children, began to limit the amount of time each child had at the computer so that everyone would have an opportunity to finish. He cut the session with Rachel and Ebonique short explaining that they could write the other program later so that he could give someone else a turn. But, Andrew, not aware of Resnick's gesture said, "Now can you hurry up, please?"

Suddenly, one of the children called out that everybody had to go—Andrew's frustration peaked.

> *Child:* Everybody, gotta go now.
>
> *Andrew:* O.K. C'mon, c'mon, real quick! Please!!!
>
> *Rachel:* We have to go to [practice for] the *Wizard of Oz.*
>
> *Resnick:* O.K. Great.
>
> *Andrew:* Real quick please, please, please Resnick.
>
> *Resnick: (to Rachel)* Yeah, we'll do it again later.
>
> *Child:* We gotta go now. It's a quarter to 12. We gotta go.
>
> *Andrew:* I don't care.
>
> *Resnick:* There are a few people ahead of you.
>
> *Andrew:* Timmy said I can get, Timmy said I can get in front of him. He said I could. Didn't you?
>
> *Timmy: (no answer)*
>
> *Resnick: (in deep voice)* Timmy's been waiting for a while.

Andrew now waited very anxiously. Although Resnick's comments remained very matter of fact, his voice showed a growing irritation toward the impatient child who had tried to go before Timmy without Timmy's consent. Resnick proceeded to help Timmy to understand the problem he was having in getting his wheels to turn. Resnick continued his excellent explanation to Timmy and Andrew continued to wait:

> *Resnick:* What makes you think something is wrong? You just have the feeling?
>
> *Timmy:* Yeah.
>
> *Resnick:* O.K. Let's have a look. If we get the motor to turn, what's going to happen? So when you turn the motor on, this starts spinning. Is that going to make the car go?
>
> *Mark:* No, because it's not connected to the steering wheel.

> *Resnick:* Somehow we want to make the wheels turn, O.K? So, the computer can turn on the motor. Once the motor is on, we need the wheels to turn. I mean, you could just put a rubber band between here and here, and then when the motor turns, the motor will make the rubber band turn, and the rubber band will make this [wheel] turn. And then the wheels will turn and the car will move. Does that seem like it will make sense, like it will work?

The class ended and Andrew was still waiting for his turn.

The above incident is characteristic of how Andrew managed to get adults frustrated. Also characteristic is how adults respond to the the conflict between being fair to everyone on the one hand and meeting the special needs of individual children on the other. Andrew clearly did everything to get on the nerves of any adult. He lied, he was a touch abusive (by poking fun at Resnick's long legs), and he nagged relentlessly. Nevertheless, the class ended and Andrew did not get to try out his creature.[18]

6.3.2 Admiring Famous People

Once a year, the children prepare a presentation on a topic of their choice. An adjudicator from the 4H Club comes to evaluate the children's presentations, giving them all ribbons and recommending some of them for the large state competition. Every child gets a ribbon, but the air of the competition is pervasive in the classroom. The evaluation stresses only the positive aspects of their talks with suggestions for better presentations—both in terms of content and style.

In Moriarty's class the topics fell into these categories: their pets, a sport or hobby they enjoyed, and a favorite person or event. The gender lines were fairly traditional. Several of the girls did in-depth presentations on looking after babies; a few of the boys explained aspects of baseball, football, or hockey. Pets were the exception—boys and girls both brought in an assortment of animals who did not seem particularly pleased at being in the center of a group of children.

The children had made large posters with the various topics they would cover during the course of their talk. Many of the children brought in props to

illustrate what they were presenting. For example, Mark brought in a hard disk from a computer. Andrew didn't have any props but he did have a poster which was mucked up because, he explained, his dog, Scott Lincoln, had walked all over it with his new booties Andrew's mother had given him! In spite of the mucked up poster, Andrew presented his research about Abraham Lincoln in a most dignified manner.

He stood at the front of the class in his pink shirt, black bow tie and black pants. His posture was straight. He looked around the room as he spoke, but, characteristically, his eyes wandered up to the side as if to 'find' the next part of his talk. (This gesture reminded me of a person who thought that the words would be written up there like cue cards.) As he spoke, he would hold onto the back of the chair in front of him, swaying with the chair from time to time. His shoulders also shimmied slightly. He didn't have any notes in front of him. He spoke without any hesitation.

The following is an excerpt of several sections of his presentation:

> *Andrew:* Abraham Lincoln in some ways was not very very nice. He was a great man as everybody says and he was smart and honest. Most of Lincoln's life he'd read books on presidents and things about history. Lincoln's father taught Lincoln to be honest and taught him to respect people. Lincoln's mother taught Lincoln how to read and his father would often help him to get firewood for the house.
>
> Lincoln fought seven wars. He fought one against the British, but people don't know why, because he sold the Black people to the British for six thousand dollars. When Lincoln came to rescue the [Black] people, the people thought Lincoln was crazy because he had gave them to the other people. But still, Lincoln rescued his men, and his men offered that they would help Lincoln fight against the other wars . . .
>
> My opinion of Lincoln. Well, I say that Lincoln was a great man because I saw his wisdom and the way he acted to his people.
>
> And here's my summary: Something happened yet last night to my summary poster. Because I left it there, and my dog, also called Scott Lincoln, came in and he walked over everything with his new booties my mother gave him.
>
> I first talked about his Introduction; Lincoln's racism; his honesty; his life; how he became famous. Are there any questions? José?
>
> *José:* How old was Lincoln when he died?
>
> *Andrew:* He was close to seventy or sixty-five.

Once again, one can be impressed with Andrew's sense of the story. In spite of the lack of content, Andrew's storytelling skills seem to prick one's interest. As with *The Sheep and the Goat and the Duck* story, the aspects of the story which Andrew highlights tend to reflect Andrew's life. For example: "Lincoln's mother taught Lincoln how to read." According to Moriarty, Andrew's mother regularly spent time helping Andrew with his homework. For his mother, it was very important that Andrew did well in school.

The plot also has an almost identical objective of his *The Sheep and the Goat and the Duck* story: to convince the listener that the hero is "smart and honest" by describing some event wherein the hero can prove that " the way he acted" was special. In the *The Sheep and the Goat and the Duck* story, Andrew used the ugly duckling story to show that what is important in life is not how one appears but how one acts.[19]

A clue to whether or not Andrew was making up things in his usual extemporaneous manner as he was telling the story is his answer to José's question about how old Lincoln was when he died. Andrew returned to the pattern of being overly specific and said that "He was close to seventy, or sixty-five." If he had known the answer, it seems probable that he would have said, the lower number first and then the higher, as is the convention of the English language. But Andrew chooses the higher number and then goes lower, so I presume that he is making this up as he goes along.

Moriarty's perspective on watching Andrew's presentation on video is that he is moving "into the real world but he's still so needy to be paid attention [to] for his strengths." She also noticed that Andrew seems to think that what Andrew chooses to tell and what he chooses to not tell reflect some deeper aspect about Andrew's perspective, although she doesn't seem to be able to articulate what that is. Her final comment in the following transcript emphasizes two things. The first is that Andrew has a style of telling stories that supersedes the text of the story. The second is that it shows how a teacher committed to the school curriculum can step out of her role as the disseminator of information and reflect on other aspects of the child's learning.

Moriarty: He is getting more into the real world but he's still so needy to be paid attention [to] for his strengths; and his strengths are so wonderful. When he got up at that presentation he knew nothing about Abe Lincoln, or something about him. [But] some of the major things [he didn't know.]

Ricki: What did he forget?

Moriarty: You know, nothing about the slavery issue of the civil war—except that Abe Lincoln was a racist. He did know that, which is true. So it's interesting what he chose out of his reading to recall and remember about him.

Ricki: But he did do a beautiful presentation.

Moriarty: It was. Who cared what the content was? It was so wonderful.

6.4 The Plot *Thickens*

As the plot thickens, so to say, Moriarty begins to become a principal character or, more formally, one could say she becomes one of the subjects. She also becomes more researcher than teacher as she tries to articulate what was happening to Andrew in those last few months of grade four. In other words, roles begin to shift.

6.4.1 Moriarty as Informant

When Moriarty walked into my office to watch video and talk about Andrew and Josh, neither of us realized that we would both change our perspectives about Andrew dramatically. I thought Andrew only a victim of institutionalization who was not being given the opportunity to express his kind of intelligence; Moriarty thought Andrew a disruptive irritating child who constantly lied to her and fought with the other children. The result was not simply that our watching video together reconciled these positions. Instead, the experience of watching and talking to each other brought about a common ground upon which we could build a picture of who Andrew was at that time and place.

Being confronted with the fact that many of Andrew's stories were being made up on the spot, I had to question the nature of the data I was collecting. What did it mean if what was being told to a me was a lie? How could I build a

theory about Andrew's thinking if the stories he had told me had never been written anywhere. Working with Moriarty reaffirmed the importance of having a range of people (who had been in the same environment) watch and interpret the data.

Most important to the discussion at hand is that what was interesting to me about Andrew began to shift from storywriting to storytelling. Whether or not Andrew had composed these stories at an earlier date, had written them on the computer, or had taken parts of stories from other stories which he heard was not the issue. The issue was that Andrew's stories helped me draw a picture about who he was at that time and place.

Besides telling me about his stories *he had written on the computer,* Andrew told me about many other things he was experiencing in school. And my being part of this Logo culture, I naturally asked him about his experiences with programming in Logo. One afternoon in Turtle Cove, he told me that he was doing research about the computer. He sat turned to the side on the green plastic chair. His right arm was casually draped over the chair back. His left hand with a pencil between fingers waved in the air as he spoke. His voice was relaxed and like velvet to the ear.

> *Andrew:* This time I'm thinking about the computer. I'm starting to get research on it and, since I'm doing that, I'm developing my, you know, just getting more and more and more information every time I do research. And plus I know a little about computers myself.
>
> *Ricki:* Where do you do your research?
>
> *Andrew:* I do it either at home, or in the library or else I do it here in school at my free time.

When I asked him about his research, he told me that it was on the hard disc.

> *Ricki:* So what kind of things are you learning ?
>
> *Andrew:* I'm learning about the hard disc, how round and how hard it is. And sometimes it says that it's so solid that if you had the hardest head in the world you couldn't break it. And I'm learning about the floppy disc and how it works. What it's made up of—microchips. And how you use it in a computer.

Typically Andrew ended this phrase with his eyes looking up to the left, a signal that he was looking for the next thing he wanted to talk about. This gesture is also a signal that Andrew had not done research on the hard disc. Moriarty once again helped open the picture. She asked me when this chunk of video had been shot, "Was it around the 4H Presentation time?" When I checked my dates on the original videotape rushes, the dates corresponded to a time not long after the 4H presentations. Having videotaped the presentations of each of the children, it was easy enough to find the presentation by Mark about the computer. Mark had brought in a hard disc to show the children. Andrew, the friend Mark had chosen to help hold his poster while he talked, was standing behind Mark gazing at the hard disc. Andrew was clearly watching what Mark was doing very closely. And hard discs are definitely hard.

Moriarty's observation about Andrew's understanding of computers was that Andrew had "big chunks of stuff" from other children which he couldn't work with himself because they were just bits and pieces from other programs. Since many of the children shared their programs, it was not uncommon for children not to be the creator of each part of their project. But with Andrew, who liked to roam around the pod looking for ideas, it seemed that the parts that he had taken from others were not functioning together as an integrated whole. As a teacher who spent much of her time working with individual children, Moriarty would walk around the pods helping children with their programming difficulties. Often I observed her trying to work with Andrew and getting frustrated. When other children would call for help, she seemed relieved to have to leave. Andrew's bits and pieces often remained bits and pieces because, as she said, "he confuses himself. " This is her description of what working with Andrew was like:

> *Moriarty:* His program so confused me Ricki. I didn't know where to start with him. I mean, when I worked with him, some pieces he would grab from other kids, some he would do himself. I didn't have a length of time. I couldn't sort out where he was at, so I found it very hard to work with him at the computers. I didn't know what to grab onto with him, so I think that's part of it. Well, I found that sometimes with the computer he would be engaged and a lot of times just not. But he'd have so much there. But he confuses himself.

And that's where it's hard because he has a whole block of stuff that he got from someone and doesn't really understand that much, so it's hard to fill in at that point with him (Summer, 1987).

On one occasion, Moriarty was sitting on the chair beside Andrew trying to help him get his program to work. He was working on the Software Design Project which Idit Harel, another member of the MIT research team, had initiated with the children and teachers. The children were to design a program which would help younger children learn fractions. Because the project's duration was approximately four months, Andrew had no choice but to continue developing his program. In an interview with Andrew near the beginning of the project, he told me he found the fractions project very boring because he "already learned fractions" in his previous school. However, as time went on and he discovered he could use the program as a vehicle to say nasty things to potential users, he found the project more to his liking.

Moriarty had come to help him because Andrew had decided to modify Logo! He wanted to get the computer to send a specific message to the user if the user typed in anything other than one third, the correct answer to the question in his program. Instead of using the command called "IFELSE" which would instruct the computer to recognize the input by the user which was incorrect, Andrew deduced that there could be a command called, IF*WRONG*, a logical assumption—if the answer is wrong, then tell the user the following statement. Moriarty, a proficient Logo facilitator, noticed the problem immediately.

Moriarty: Oh, I see what you did. You can't [say that]. Logo doesn't know, IFWRONG. What it knows instead is a command called IFELSE, alright ? And then, what IFELSE does is— it takes three inputs, O.K? The first one is the condition, the thing that you want to be true, O.K ? Now, that fraction was 2/3, so what you want to be true is for the person to write in two thirds.

Andrew: No. One third.

Moriarty: I thought you shaded in two thirds (in his graphic representation of an object divided into parts)?

Andrew: No, it was three things and I shaded in one. (Spring, 1987.)

Throughout this instruction, Andrew was very silent. He sat quietly and stiffly, listening to his teacher while she deleted and typed her corrections onto his program. Uncharacteristically, Andrew's voice was very meek when he told Moriarty that the shaded part of his graphic representation was one third and not two thirds. Nevertheless, he did have the courage to point this out to Moriarty, a person whom he obviously perceived as the authority.

Another child called to Moriarty for help. She said she would return when she finished helping the other child. Andrew sat glued to his chair for about ten minutes continuing to debug his program. He had the glazed look one often sees on children's or adults' faces as they work at the computer. The computer time ended and the children had to return to their class. Moriarty had not returned, but Andrew had continued to work on his own.

6.4.2 Reflecting upon Andrew

The type of questions the participant observer tends not to ask of the members of the culture is the prescription global one, such as: "Do you think that there's a way in which the computer can bridge the gap between reality and fantasy? And if so, how? And if not, why?" Nevertheless, sitting with Moriarty watching hours of tapes of Andrew provided a context wherein that question seemed appropriate. Having reached an understanding of each other's concerns about and actions toward Andrew, Moriarty and I found ourselves reflecting on what could make Andrew's life in his classroom more successful during the following school year. (Although both cognizant of the fact that she would not be teaching at the Hennigan the following year, we believed that we could provide the incoming teacher with valuable insights about Andrew.) The interview with Moriarty (where I asked her questions for information only) ended and, after I asked the prescriptive global question mentioned above, we began to converse very informally.

> *Moriarty:* Well, I think one thing with the computer that he's learned [is that] all the dribs and drabs and messing around was not really getting him any place in building a program. And it wasn't until really the last couple of months when a couple of the things he did, **almost on his own,** started to work for him that he realized—

As Moriarty started to speak of Andrew, she spoke with few gestures. Her eyes seemed to be looking for a way to address the issue. Her shoulder lifted ever so slightly and she nodded her head softly and blinked her eyes as in deep thought as she listened to my response to her thoughts.

> *Ricki:* [Do] you remember how you told me about his fractions project—how he gets pieces from here and pieces from there, it's similar to how he builds his stories!
>
> *Moriarty:* That's right.
>
> *Ricki:* It just occurred to me now.
>
> *Moriarty:* And how he knew almost everything even in classroom discussions. You can see he takes some of what's happening, but he hasn't.... It's a different... He takes it and builds it into something different. He's not following the thread of things.

As Moriarty describes Andrew in the classroom taking "some of what's happening," her left hand moves from side to side across her body as if she were describing an object or a person moving from one side of the room to another. Then, when she says that "he hasn't," she doesn't finish her sentence, but both her hands make a circle in front of her and she intertwines her fingers together at the end of the thought. It seems what she means from this gesture is that Andrew doesn't bring things together.

Continuing her flow of ideas, she adds that "It's a different. He takes and builds it into something different. He's not following the thread of things." What is different? Is it the way he takes in what he hears in the classroom discussions? And why is building something different problematic? Because he's not following the thread of things? The image of the thread appropriately describes the delicate balance for Andrew between maintaining his unique way of thinking and being able to follow the conversations of others.

As Moriarty described Andrew's "taking and building," each of her arms lift and make opposing circles in front of her. As she described his not following the thread of things, once again, her left arm moved in a similar side to side gesture as if she is showing Andrew's moving from thing to thing without wholeness.

6.5 Finding a Conclusion

Stepping out of my role as an observer and, uncharacteristically, into the role of a behavioral psychologist, I began to speculate on what could help Andrew bring these bits and pieces together. To my present chagrin, I suggested that what Andrew needs is an opportunity to work intensively with the same material, even if it is not originally his own, so that eventually he appropriates the pieces and makes them part of his own psyche.

> *Ricki:* It would almost be like you would have to have him do this story again—
>
> *Moriarty:* Yes.
>
> *Ricki:* Let's hear this story again—
>
> Moriarty: Yeah. *(Nodding)*
>
> *Ricki:* Let's hear that same story again—
>
> Moriarty: Hmm-hmm. *(Nodding)*
>
> *Ricki:* The same thing [might apply to working with the computer.] I wonder, if he were doing the computer program—I wonder if [when] he kept [repeating what he was doing] each time, he would [eventually] bring it more and more into his world. *(Moriarty nods throughout, eyes very bright and open, touching her hair with her right hand.)*
>
> *Moriarty:* That's right. And then he'd be—
>
> *Ricki:* He'd have to take control over his stories until he made it enough him that it was his own.
>
> *Moriarty:* That it was his own story.
>
> *Ricki:* Because, now it's pieces of other people's stuff without being anything of his own in it.
>
> *Moriarty:* Yup. And because it is pieces and [because] there's not a wholeness in it for him, he couldn't, he probably couldn't repeat that...
>
> You're right, until then [there won't be a wholeness] and then it's a thing—that this is his story, and he has to plan and he knows what it is.

The above conversation shows the dramatic shift from my trying to illicit responses to brainstorming with one of the members of the culture I am studying. However, as discussed earlier, in terms of the Logo culture at the school, I was also a member. What I find difficult and almost painful in this instance is to analyze my role in the context of the child and the teacher.

How could I remain the observing participant when a child was at risk? And yet, what right did I have to try to intervene in this situation on behalf of the child? As a researcher, my role was to observe, participate, and report. However, the model our group had chosen was facilitators and interventionists. Intervention was as acceptable as it was unavoidable. Moreover, with a camera on my arm, I knew I was affecting the culture.

Nonetheless, knowing that the overall environment was not addressing Andrew's struggle for acknowledgement, I was compelled to look for ways to change this before he slipped through the cracks. Reaching this point of understanding with Andrew's homeroom teacher was a breakthrough for Andrew's chances at becoming integrated into the inner working of the classroom. In the above excerpt, she and I entered into each other's sentences. Although my thoughts carved out the trail, our words overlapped and connections not possible throughout the school year now became possible. Her index finger rested on her chin, her eyes became hopeful and for the first time in our many talks about Andrew throughout the school year, she began to refer to him as fascinating. By the end of our talk, she told me, "He fascinates me," and then added, "He's a very interesting kid. Again, you know, the classroom doesn't allow for that. "

Getting to this point of rethinking Andrew as a fascinating and interesting child, Moriarty continued the theme of Andrew's appropriation of his seemingly discrete chunks of knowledge. She became more and more animated while she spoke about Andrew's developing more competence in Logo and more confidence in himself by putting his personality into his programs—having the responses in his fraction project name-call the users of his program.

> *Moriarty:* Yeah, and the same with the computer thing. I think that this fascinated him when—particularly the TALK, he liked that.
> We did some list processing and that's when [working on the computer] really grabbed him. While he did some word processing and he could then have the computer respond to the user; and it was Andrew! You know, the name-calling and stuff like that. He loved doing that, and he did some modifications. He was so amused when I sat down next to him and I said: 'Andrew!' *(in a humorously reprimanding voice)*

I would say, 'How could you!' and you know, he got a little silly. And [then] he made some change, keeping [the name-calling] there and [he] put something that wasn't quite so name calling in it.

Ricki: But in a way that [name-calling] was making it his own!

Moriarty: That's right—that was his; and he, then, got much more involved with the computer and worked [for] longer periods of time; so he was really sitting through some problem solving stuff with it. Now that was very good. That, to me, was a major growth for him. He stayed with something and followed the same strand long enough to come to sort of a conclusion. He didn't leap into something else immediately, and so he that he was working on solving a bug in a specific program that he wanted to work and that he had planned the way he wanted it to work.

One cannot but wonder at our expectations on children.

Another Beginning for Andrew...

7 The Social Mind of Mindy

> Women's lives have always been grounded in the physical by the rhythms of their bodies and the giving and receiving of tokens of love.[1]
>
> —*Mary Catherine Bateson*

7.1 "Making" Girls

7.1.1 Introducing Mindy

Mindy had a way of engaging me in conversation. Maybe it was how her big round eyes would grab your glance and then diagonally look up to the right or left. Maybe her exaggerated gestures—her winks, her shrugging shoulders with her upturned face, or her hand resting on her hip—signalled her wondrous range of emotional responses which included intrigue, joy, desire, anger, frustration, sadness and embarrassment. Or maybe it was simply her warm responsive nature which made it so easy to spend time with her. Whatever the combination of interpersonal skills, Mindy was a joy to listen to. More than Josh or Andrew, Mindy could and would share intimacies with me about how she understood herself and those around her. Mindy was the only child in my study who did not need stories or objects to reflect upon the nature of life. Her own life and fantasies were the stuff of her inventions.

Mindy often had her nails painted red and wore frilly clothes to school. On regular school days, it was not unusual to see Mindy wearing an off-white satin dress, white lace stockings, and white dress shoes. I often asked myself whether or not Mindy chose to wear this dress to school, whether it was hers or an older cousin's old "going out" clothes (which needed to be worn before she grew out of them), or, whether she was expected to look like a pretty little girl to please her family. (I suspect that the reason will become clearer as her story is told.)

When I asked Mindy what she liked doing on the computer, she first mentioned how she liked "discoverin' stuff" and playing.

However, as she caught herself saying the word "playing," she nodded her head from side to side wistfully. Watching this gesture and hearing her say the word "playing" gave me the clue to pursue her notion of play a bit further. For Mindy, playing on the computer meant making, or programming, girls:

> *Ricki*: What do you like doing on the computer?
>
> *Mindy:* I like discoverin'stuff. And I like playing.
>
> *Ricki:* You like playing?
>
> *Mindy:* Yeah! That should be the first thing I should say.
>
> *Ricki:* What kind of things do you play on the computer?
>
> *Mindy:* I play games, and **I make, like, girls. I love making girls—on paper, on computer, on cardboard, on chalk, on anything, chalkboard!**

Indeed, one of Mindy's favorite Logo projects was a graphic illustration of a girl in a dress with a bright yellow triangle as the skirt.

In retrospect, I now ask myself what could have happened to Mindy if she had been able to develop her interest in "making girls" to an extent where her girl/boy skills became the guiding force in a class project? What would happen to many young girls who are physically experiencing strong hormonal changes in grades four, five and six, if they could use their skills of understanding people to follow their interests within a curriculum? It seems quite obvious that the existing grade four learning modules on insects, explorers and the planets may not hold as much excitement for the budding young woman more interested in the social dimension of human discovery and learning as might a module in psychology and human development.

7.1.2 Wanting a Space of Her Own

One cold February morning, Mindy and I were sitting on the floor near a muraled wall outside her classroom. She sat leaning to one side, her head tilted towards me and resting on her shoulder. The substitute teacher was not particularly concerned about what Mindy was doing, so we had the rare opportunity of just letting the conversation move to where it moved. The mood between us was very casual and the pace very slow in spite of the fact that, all around us, the room was filled with the movement and excitement of twenty or more children at the computers.

The moment which stands out as being most characteristic of Mindy's approach to life was when she said the following:

> ***Mindy:*** **Well, when I grow up, if I get married, this is what I want my husband to be: I want him to be helpful, loving, and I want him to be understanding. Like, if I date someone else, he won't get all huffy and puffy. And, if he dates someone else, it's O.K. by me.**

Mindy's father had just remarried a woman from Haiti. At the time of this interview, Mindy had just returned from a three week trip in Haiti where she had attended the wedding and celebrations. (Her having missed three weeks of school work did not make Mindy's teacher, Joanne Ronkin, very pleased; Mindy was already "behind" in her studies.) Her father's bride and a brother remained in Haiti; Mindy, her other brothers and her father returned. The bride and brother would be joining the family soon.

Mindy lived with her mom. She visited her father "once in a while." At first when she told me about this arrangement, she said, "I go over to my father's house every weekend. Well, every other, every next weekend" and then under her breath, added, "once in a while."

Mindy also travelled with her mom. The previous summer she had gone to Mobile to her grandfather's funeral. All the cousins, aunts and uncles were there and Mindy spoke very animatedly about the relationships among her family members. One story which seemed to be significant for her was the time her grandmother threw her grandfather out of the house after a big fight. He had been coming home drunk on a regular basis. Grandmother told him he couldn't come back until he was sober. When I asked what happened after the fight, Mindy's face softened into a female romantic swoon and she told me that he just stopped drinking and they became "all lovey-dovey" again.

Mindy has four brothers, two older—one sixteen and one eighteen years old—and two younger—one five and one seven years old. The oldest one, Jamaal, was eighteen at that time and was already in trouble with the law. What concerned Mindy was the fact that he was dating a "girl" who was older than he was. The young woman wanted to marry Jamaal. Mindy thought that Jamaal shouldn't really marry a girl who is older than the boy. She strongly believed that the husband should be older than the wife. When I told her that my husband was younger than me, she giggled her self–conscious Mindy giggle

and went on to tell me about the room she was going to have in the new house of her father and his bride, mistakenly referred to by Mindy as her mother-in-law!

> *Mindy:* And my father's gonna buy us a new house; I'm having my own room; my brother's gonna have his own room and my father and my, uhmm, mother-in-law are gonna have their room.
> *Ricki:* And who do you share a room with now?
> *Mindy:* My brother. I'm getting my own room within my house too.

Having a room of her own was as wonderful a thought to think about for Mindy as dreaming about owning a Lamborghini was for Josh. Her room was to be a place where she would be able to have talks with her girlfriends, have sleep–overs and spend time doing what she wanted to do.

7.1.3 Wanting Advice from an Older Sister

Mindy spoke about getting a computer and a television in her new room. (I never could determine whether or not this was fantasy or something that was about to happen.) She often spoke of television as if it were a mesmerizing or hypnotic experience for her: "See, when I look at the TV, it's like, a deep spell or something." Her favorite television character was Christy from a program called *Three's Company*.

> *Mindy:* I'm not lazy [to do my homework] , but—
> *Ricki:* [You'd] rather do something else?
> *Mindy:* **No, but when I take one glance at the TV, I just—it hypnotizes me.**
> *Ricki:* Mmm, you love television!
> *Mindy:* Yup!
> *Ricki:* What are your favorite programs?
> *Mindy:* On TV?
> *Ricki:* Yeah.
> *Mindy:* Well, when I was, like, last year, I liked *Shirley and Laverne;* that was my favorite one. And uhmm, [now, I like] *Three's Company.*
> *Ricki:* I like *Three's Company,* too.

Mindy: I like the way, I like Christy's personality. Yeah, the way she laughs, it's so funny. And I like *Different Strokes, Silver Spoons,* oh, and *Give me a Break.*

Three's Company is a situation-comedy about two women and one man who are friends and share an apartment. Christy is played by the traditional good-natured dizzy blonde who is always getting herself into sexually difficult situations. Being naive and sensitive, she is constantly needing the protection of her house-mates, each with their stereotype. The program pivots around the breaking of the taboo of an unmarried male living with two females. Week after week, Christy escapes being sexually compromised in spite of her coquetries and whiny naiveté. All three young adults reflect the values of the White main-stream youth culture.

(It did not surprise me that Mindy chose an older yet obviously young female as her favorite television character, although it did surprise me, at the time, that she chose such a stereotypical model.)

Mindy often spoke to me about her desire to have an older sister and of her need to give and to receive advice.

Mindy: I really want a sister.

Ricki: You want a sister.

Mindy: Yeah!

Ricki: I'll be your sister!

Mindy: (giggling) A baby sister!

Ricki: A baby sister.

Mindy: (nodding) So, when she gets older, if she's having boy problems—

Ricki: She can come to you?

Mindy: Yep!

Ricki: (laughing with Mindy)

Mindy: Well, actually, I want a big sister, so I can come to her with boy problems.

Ricki: And?

Mindy: So now, I want a baby sister, 'cause it's too late to have a big sister.

Ricki: Well, what kind of boy problems would you want to talk about if you had a big sister?

Mindy: Well, like troublemakers!

Ricki: Yeah.

Mindy: And the boys I like.

Ricki: Do you need some advice?

Mindy: Yeah...

Ricki: About the boys you like?

Mindy: Yeah. **Well, actually I can get my own advice. I just ask myself, 'what should I do?'and then I just do it?**

Ricki: Does that work for you?

Mindy: Yeah. *(A long pause here.)* And it turns out to be, that the boy that I like, likes me.

Ricki: Yes?

Mindy: Yes. **Almost every time; all the time.**

Ricki: So, do you have someone you really like now?

Mindy: Yeah. His name is James.

Ricki: James? That's a great name.

Mindy: Actually I have three [boyfriends].

Ricki: Three?

Mindy: Three. *(giggles)* James, Henry and Jimmy. And that's all.

Ricki: Mmm!

Mindy: They're cute. Nice personalities.

As one can see, Mindy does not lack confidence in solving problems with boys and yet she recognizes the need for help. In the beginning of this interchange, I offer to be an older friend, a sister, but I do not meet her requirements. Kindly, she tells me she meant a younger sister, so she could give advice. Then, she returns to her reason for wanting a sister—wanting a female to work out issues related to sexuality. A mother, a teacher or a researcher is not a viable female friend according to Mindy. Her conclusion is simple: "Well, actually I can get my own advice. *I just ask myself, 'What should I do?'and then, I just do it?"* Whether or not this is the best solution for Mindy's working out her problems with boys, at least she has figured out how to cope. Being the only young female in a one-parent household of brothers, Mindy gives herself advice.

7.2 Girls and Boys

Scoring well on aptitude tests, Mindy was in the grade four Advanced Work class. In class, she watched everyone very closely. She would focus intensely on

each movement in the classroom, her eyes moving from child to child. She seemed to be watching and gathering information with each quick turn of her body. Her eyes rarely rested for a moment (although she was not hyperactive in any sense). Her theatrical movements could create the perfect effect at a moment's notice.

In one of our conversations in the classroom, during an independent work period, she maintained a conversation with me while simultaneously responding to a number of contextual events within the classroom: her teacher's comments in another part of the room; what was happening within different groups of children; and what was happening in her immediate vicinity. She had, what is called, peripheral vision.

(My camera was placed on a table beside me, quite close to her, while we talked. In foreground of the frame is Mindy, in her off-white satin dress and the white line of a bra strap on her shoulder showing; in the background are Tammy and Moses, each at their own desk.)

We were discussing many things that day—boys, stories and computers. Our first discussion was about Josh and Joe and her reactions to how they worked together. Mindy was a good informant about Josh and Joe because she spent a lot of her time interacting with them in the computer pods. For more than half a year, Mindy sat to Josh's left and often engaged Joe, who sat on Josh's right, in conversations to tease Josh. This day in the classroom she was telling me about Josh and Joe's style of working together. She told me how she thought Josh was weird because he asks so many questions: "Josh, I think he's very weird." Her voice was a bit whiny as if she were imitating Josh, and, as she spoke to me, her eyes caught the look from a classmate and she waved her fingers across the room. She switched her attention back to me and told me how when her teacher, Ronkin, talks to them about their work, Josh asks questions which are very stupid.

What is so remarkable about her reflections on Josh and Joe is not what she says about them, but what is shows about the relationship between boys and girls. Josh and Joe were not stupid, as Mindy suggests, but just not interested in the things that Mindy was interested in. In spite of all the hours the three children spent sitting together in the computer pods, neither Josh nor Joe acknowledged Mindy's presence while they worked on their exploding cars and airplanes. Usually, the boys ignored her, provoking Mindy to tease them;

sometimes, they allowed themselves to pay attention to her teasing and seemed to enjoy it.

7.2.1 The Meaning of Mindy's *Winks*

As Mindy spoke about Josh and Joe, she moved her eyes with great expression. They opened and closed in semi-winks throughout this scene.

Two things seem to be suggested from her winks. The winks seem to *help* her think, in the same way that tightening the face in a squint seems to help a person do something difficult. Mindy seemed to be closing her eyes to find her thoughts deep inside herself. The winks also communicate a sense of commraderie with me. It is *as if* she is sharing something private. In fact, Mindy was not sharing confidences in secret; we were in the middle of the classroom and Tammy and Moses heard every word. However, the feeling of intimacy and conspiring are present in this gesture.

Throughout this last year, Mindy's gestures have been the source of many of my discussions with persons working on *Learning Constellations*. Perhaps the most powerful moment on my videodiscs is when Mindy tells me how Josh and Joe have a big imagination but she has a wild imagination. On print these words seem so ordinary. But on video, the moment is electric. The way she says the "B" in big imagination is so breathy and heavy, and the smile and accompanying wink as she describes her "wild imagination" capture a moment of intense self-worth. Mindy is confident in this aspect of her life.

7.2.2 Overcoming Being Put-Down by Her Classmates

Tammy did not agree with Mindy's interpretation about Josh's asking stupid questions and she was not shy about telling Mindy so. She interrupted the conversation between Mindy and myself to say, "Uh, uh! They're good questions, but they're hard to answer." Mindy turned dramatically and yet good-heartedly lifting her eyes in a wide open stare as if to tell her to stop interfering with her conversation with me.

Meanwhile, Moses jumped into the scene and looked right into the lens of the camera to tell me that Mindy lives in a Housing Project: "She lives in a Housing Project!"

Mindy remained calm and did not respond at all. In fact, I have examined this segment of video many times trying to understand how Mindy remained so calm while a classmate of the same ethnic background used her living in a housing project as a weapon. My interpretation is that Mindy, being a good observer of human nature, did not take Moses too seriously. Moses was a child whom Mindy would have named a "troublemaker." She had probably heard him say this kind of class-related put-down many times before—as I had. Another interpretation is that, Mindy was enjoying being the center of the camera's and my attention and was probably more interested in her being appreciated by me than put down by Moses. The third interpreting is that Mindy was too proud to admit that she was the subject of discrimination.[2] Denial?

Mindy just continued our conversation as if nothing at all had happened. She told me about Josh and Joe, how they always talk in class and wanted to do the opposite of what their teacher, Ronkin, wanted them to do. She stayed right with me—her eyes metaphorically *holding* the camera.

> *Mindy:* Him, him and Joe, yeah! They always TALK!! They sort of, like, they always make a struggle. Like, Mrs. Ronkin says something and they say something the opposite way. They say: 'But No!'And then when Mrs. Ronkin says: 'Let's go..'They say: 'No, I wanna finish it!'*(She whines, pretending to be them.)*

When comparing herself to how Josh and Joe do things, she pointed out that they can do things which she can't do, like making the computer make sounds and doing animation, "making things move." But as impressed with what Josh and Joe do, she was very confident about what she could do well on the computer—make pictures of girls!

Continuing to be interrupted by Tammy and Moses, Mindy began to show more of her disapproval by her even more exaggerated manner of turning her whole body around and giving her nasty stare to both of them. Then, Mindy's composure returned and she quite matter of a factly explained to me:

> *Mindy:* [Josh and Joe] like make things...They make things move...In the computer they make sounds. But I just like making, like, pictures and writing procedures. Yeah, I love writing procedures. Yup, 'cause it's like I'm inventing something.

Mindy told me this with confidence and a sense of enjoyment about her own way of looking at the world.

7.2.3 Mindy's Teasing Josh

As mentioned earlier, Mindy had very definite feelings towards Josh. For most of the school year, she sat within two or three chairs of Josh and Joe in the computer pods. Mindy would tease Josh to get his attention, making fun of his Logo grasshopper-shaped figure, provoking him by telling him that "Joe is magnificent" and encouraging the kinds of fights that often occur between nine year old girls and boys. During one particular occasion, she sat in the chair beside Josh in the computer pods, with her hair held up in a big red plastic clip and her right arm leaning over the side of her chair. Her fingers were moving emphatically with every word and her dark brown eyes were rolling up to the ceiling for emphasis.

> *Ricki to Mindy:* I want to hear why you think that Joe is so magnificent.
> *Mindy to Ricki:* 'Cause he's.....
> *Josh to Ricki:* Who? Who? Who's so magnificent?
> *Mindy to Josh:* Notchu! *(She means, not you!) (All four of us giggle at the way she says this, including herself.)* Joe!
> *Ricki to Mindy:* Josh is too.
> *Josh to Mindy:* Joe is magnificent?
> *Mindy to Josh:* I don't like you!You just want me to like you, but you're too ugly, and you have a hard head, with your Pinnochio nose.
> *Ricki to Mindy:* O.K. So, tell me about Joe's program.
> *Mindy to Ricki:* He's the one who taught Josh everything he knows.
> *Josh to Joe:* C'mon, I taught Joe everything. C'mon, Joe, admit it, Joe, just say it. Who taught you how to do the airport? Who did most of the airport? *(Joe continues working, not paying much attention to this whole interaction.)*
> *Mindy to Ricki:* Josh wanted Joe to help him do the grasshopper.
> *Josh to Mindy and Ricki:* Oooo, ooo, it was the best file he ever did. And I did most of it!

Whether Josh was the better programmer of Joe was is not as significant as the fact that Josh took her so seriously. Mindy, unlike anyone else that I observed in contact with Josh, knew how to get his feathers unruffled.

Nevertheless, Mindy was a keen observer of others and she knew what was going on within relationships. Joe often had very good ideas which seemed to be Josh's. As in the above incident, Joe often helped Josh figure out what to do and Josh probably didn't realize the extent to which Joe contributed to their mutual projects. Josh's focus was so goal directed that he just didn't see that others were part of the process. Mindy did.

7.3 "New Inventions"

> *Mindy:* I just like making, like, pictures and writing procedures. Yeah, I love writing procedures. Yup, 'cause it's like I'm inventing something.

7.3.1 Dolls and Girls as *People to Think With*

Women from the age of young childhood, knowing they will probably become mothers, never question their ability to make girls (and boys). Our dolls are our first babies and we are guided by our mothers and sometimes our fathers how to hold the doll, how to put it to bed, how to change its clothes and how to talk to it. The culture of the female child and her dolls is as powerful and enculturated as are the toy soldiers and guns boys are expected to become engaged with. Not surprisingly, boys become stimulated by their toys which have the power of detachment and girls become domesticated by theirs which offer the comfort of attachment.[3] Many things have changed over the years and the biggest change is that liberated girls play with cars, trucks and airplanes and liberated boys cuddle dolls. (Or, rather, liberated parents encourage their children to explore a range of activities.) What has not been adequately addressed is the way in which girls (and boys) bring these relationships with their dolls (and "girls" as Mindy would say) into a larger context of their interpersonal skills.

I mention these issues because Mindy was very attached to her make-believe girls, her dreams of having a sister and of becoming a teenager. (As a

female who, for many years, has tried to help young children extend their repertoire of things to think with and expectations to fantasize about, it was often difficult for me to become engaged in Mindy's fantasies. However, working with *Learning Constellations* gave me the opportunity of seeing Mindy closer to how Mindy sees Mindy and not as I would like to see girls combatting stereotypes.)

7.3.2 Mindy's Making Girls on the Computer

Mindy told me she loved writing procedures. Her procedures were pieces of graphic representations which when assembled became girls. For Mindy, this was inventing. Then she clarified why this was inventing.

> *Mindy:* Like, when you make a picture, you're not sure how it's gonna come out; you're not sure it's gonna come out like you want it to come out, and if it doesn't, you kinda like it. Yeah, and you sort of say—it's a new invention!

A new invention is a new way of looking at what you did. For Mindy, the end product does not have to be a perfect match with what she has in her mind while she is programming. Instead, she is open to the possibility of a new creation. It may not "come out as you want it to come out" but you like it, she says.[4]

One of the times we sat together at the computer, I remember Mindy becoming very animated about showing me one of the girls she had "invented." She looked at me and asked, "Wanna see?" I told her I did and then she turned the event into a surprise. She put her hands over the computer monitor as if to hide the surprise. I was told to close my eyes and she would make magic on the computer monitor. "Here it goes," she told me with a song in her voice:

> *Mindy:* Wanna see it? Close your eyes first. O.K. I'll turn it on. Here it goes. This is what I have so far....*(A graphic drawing of a girl appears on the monitor.)* See, I'm making the hair on the shapes page and the other foot on shapes page. I made this on shapes page *(pointing to part of the girl)*; this on shapes page *(pointing to another part)*; and I'm going to make the lips on shapes page and the hair and the hands and the feet.

When she started showing me her girl, she sat by the computer munching on a wad of gum and holding the computer with both arms. It was an affectionate and proud gesture. Even when she pointed at the monitor to the places that had been built on the shapes page, she still kept one hand touching the side of the computer.

7.3.4 Mindy's Story about Girls: *Princess Alice and the Unknown Rabbit*

Unlike Andrew who made up stories that were probably never written down, when I asked Mindy if she had any stories, she took out a pile of papers and began to read me one. Nonetheless, Andrew's and Mindy's stories are quite similar in a certain respect; both are autobiographical.

As in other domains, Mindy's concern was with a girl. This time the girl was called Princess Alice. The story starts with one objective, to find a wife for the king whose queen has died and ends by finding a prince for Alice. Somehow a rabbit and a witch have a role in this story but we are not told about it. In fact, after listening to the video many times, I am quite convinced that the story was started on paper but never completed. Let's listen to how she told me the story and try to place ourselves in the classroom with Tammy, Moses and Mindy.

> Mindy: [Title:] Alice and the Unknown Rabbit, written by me, pictures by me. [Dedicated to:] my friend, Reshiah, my friend Clea and my father. [The story:] Alice and the Unknown Rabbit. The first chapter is on page 2. It's called, *The Day the Queen Died*. Sad! *(Mindy pouts and lifts her eyes.)*
>
> *Ricki:* Why is it sad?
>
> *Mindy:* Because she was so young. *(Squinches her face up in a question.)* **I think she [Alice] was about ten.** Yeah, *(confidently)* she was ten. Alice, her mother was the queen that died. **And then, her father has to get a new queen. To do all the chores.**
>
> *Tammy:* The queen doesn't do chores.
>
> *Mindy: (looking around as if to say, 'it's my story, don't bother me!')*
>
> *Tammy:* Never mind. *(deciding not to interfere)*
>
> *Mindy:* Then the witch....

(Tammy interrupts again and Mindy gives her a strong but humorous look of disapproval.)

Mindy: Then on chapter 12, the witch. Then on chapter 18 is the Rabbit and the Prince. **See, that's what I like—friends.** *(Moses in the background is muttering and complaining.)* Mindy ignores it.

Mindy: **That's how she met the prince and they got married. The 20th Chapter is *The Happy Marriage.***

Perhaps this is a good place to note why comparing Andrew's ornate and structurally sophisticated stories to Mindy's will not lead us to understanding the wonderful range of children's skills. Mindy is not an outstanding storyteller nor is she very talented at making up interesting stories. Her skill is in working out problems in human relations. What concerns Mindy is how does a young girl respond to a situation where the old queen is no longer around? How does she come to terms with a father who is looking for a new queen. What does she understand about the roles of men and women in relationships? And how does she begin to find her own way of finding a prince with witches and other obstacles to contend with? And who can be trusted other than rabbits?

Mindy's story raises many questions which directly relate to the context of her complicated life and she is very seriously thinking about these things whether in a casual conversation with me on the floor, sitting at the computer, or thinking about stories to write. The issues are the same whatever the domain. Moreover, these social issues overpower other concerns that the school curriculum demands of her. She doesn't deal with unrelated issues very well. As a consequence, Mindy was failing grade four.

7.4 Being "Kept Back": From the Advanced Work Class to Failing

Mindy was notorious for not getting her homework done. Often I would observe Mindy sitting very distractedly in an empty classroom while the other children were in the computer pods. Mindy was stoic about her punishment and never complained to me. She would tell me that she had not done her homework, so she had to stay in the classroom and finish it. Knowing that these were the consequences of her actions did not deter Mindy from going to parties or watching television when she had homework to do.

Even when she told me about her trip to Haiti for her father's wedding, she seemed to know that there was a price to pay for not following the rules. As she told me, "I went to Haiti for twenty–one days, and my teacher got maaaaad!" Her eyes rolled and her whole face moved softly with her eyes, emphatically expressing how Ronkin got angry with her. When I asked her why Ronkin "got mad," she told me, "'Cause, I missed out on all my work. She told me to start working on this term, the third term; so, I'll be caught up on that; and I don't want to be kept back." Never having heard the phrase "kept back" and knowing Mindy was a very alert and bright young girl, I must have seemed very shocked:

> *Ricki:* What would being 'kept back' mean?
>
> *Mindy:* You have to stay in the same grade.
>
> *Ricki:* Oh, that would be, you mean...fail?
>
> *Mindy:* Yeah.
>
> *Ricki:* That would be a drag!
>
> *Mindy:* Yeah, I know! So, I have two report cards more to improve and I'm going to improve.

At this point, Mindy's eyes opened very wide and her face became very resolute. Although we were both sitting on the floor and she was not much shorter than me, her eyes looked up at me sincerely. This is not to say that the gesture convinced me that Mindy would in fact change her ways, but it did show me how sad Mindy was that she might not pass into grade five.

I pursued the issue: "So, what are the chances of your failing?" She paused and said in a singing voice, "Well—ummmm, sort of." And then, her tone of voice began to change. A curtain came down between us. She tried to lighten the issue by using a humorous singing voice so that I would not really know how upset she was. Unfortunately, I didn't pick up the clues at the time and I continued to ask her how she felt and if she was upset. She smirked a tiny almost naughty smirk and very rhythmically said/sang to me:

> *Mindy:* Let's put it this way, I had seven F's and seven D's, and three A's, the rest B's and S's.
>
> *Ricki:* What were your A's in?

Mindy: I forgot. I just took a glance at it. And my mother got it and she signed it and gave it to my teacher. And my mother's gonna be here on Open Night, I mean, Open House and they're gonna talk!

7.5 Telling the Truth or Lying

Before concluding this portrait of Mindy, I would like to present another facet of her personality which might help to focus the discussion in the closing comments. What I will do is let Mindy do most of the "talking" (since that is what she is so very good at doing.)

Knowing Mindy preferred being with other people and watching television to doing homework, I once presented a scenario for her to react to:

Ricki: Well, let's say, you came to school and hadn't done any of your homework, because you had decided that you wanted to watch TV all night, and somebody asks you, 'Why didn't you do your homework?'
Mindy: Why didn't I do my homework? Well, I would tell the truth. But some people would say, 'Well, I don't have any homework. My teacher was absent so we had a substitute.'

When I phrased the question, I thought that Mindy would tell me about how she would react to her teacher. Instead, she either misunderstood me or turned the question around to tell me what she would tell her mom or dad.

Ricki: And what would you tell your teacher the next day, why you didn't do your homework?
Mindy: I'd tell her that... the other person would tell her that she left it at home or he..
Ricki: Right.
Mindy: See, when I look at the TV, it's like, a deep spell or something.
Ricki: You become mesmerized?
Mindy: Yeah!
Ricki: ...or hypnotized?

Mindy: Yeah. And then the shows over and I say, "Do I have homework?" and I say, "Yeah." And I go, "Oh, no! I'm gonna get in big trouble." The next day, I go to my teacher and tell her I forgot to do my homework, and teacher goes, and there's a field trip coming up, "I'm just going to forget about you, your going on the field trip, or forget about your grades." That's what she really does.

Ricki: Do you think that's fair?

Mindy: Well, yeah! I mean, if you're gonna forget about your homework, well then she can forget about, like, what's important to you. *(She is implying that homework is important to Ronkin.)*

Ricki: It's a dilemma.

Mindy: (nods)

Ricki: I mean, sometimes it might be worth taking the risk of, let's say, telling the truth.

Mindy: Yeah! Like, you wanted to go to the party and you have to do your homework before you go to the party. You have TONS of homework, and then you tell your mother you don't have any homework, so she lets you go to the party. Sometimes you feel all guilty and you come back and tell her, "I had homework, I'm sorry, but I just had to go to that party, it was real important to me."

Ricki: So how do you make these decisions about what's most important? Will it bother you if you're going to fail this [school] year?

Mindy: Yeah!! *(nods)* 'Cause I dream of being a teenager! Like, in the eighth grade. I always dream of that. Every dream I have, I'm a teenager, like, 17, 18 or 19 years old. And I go on dates. And I dream of a prom. Like, when I go to High School, am I gonna have dances or proms. I always dream of that. And when I grow up, I want to be famous.

Ricki: You once told me about that.

Mindy: I want to be a singer!

Another conversation, the one about marriage provides us with an even deeper or thicker understanding of how Mindy tries to work out how to be who she is, do what she needs to do, and to come to terms with others view her priorities. The parts of this conversation I find the most provocative are those that illustrate how she integrates personal challenges.

Ricki: How will you know who to marry?

Mindy: I'll try a couple of dates. Until I see how he really; until I really know him. Yeah, like, if I ask him to baby-sit, see how he reacts on the children; say if he's going to be coming back. See, if he's O.K. when he comes back.

Ricki: If he keeps his word?

Mindy: Yeah. Honesty.

Ricki: So, that is the most important thing [for you]?

Mindy: (She nods her head.)

Ricki: How do you deal with it when people you love are not always honest all the time?

Mindy: Well, I try to make them understand that, like, if you're not honest, you go to stealing and if you go to stealing you'll go to drugs, and if you go to drugs, you'll die.

If you lie, you'll steal, if you steal, you'll go to jail and if you go into drugs, or commit suicide, then you die.

Ricki: So, how could you help someone who is a thief, or who...

Mindy: Lies?

Ricki: Or who lies! Everybody lies a little bit, right?

Mindy: Yeah! Not big lies! Like a whole pack of lies, just one little bit.

Ricki: Sometimes one lie leads to another...

Mindy: And then the other leads to another and then it becomes a pack of lies! *(She nods.)*

Ricki: It's hard to be honest.

Mindy: I know, like if you get into trouble, you're thinking of a way to get out of this; and then the next time you get in trouble, like, every day and then you have to come up with another lies.

Closing Comments

Before concluding Mindy's story, I need to explain what a challenge Mindy was for me as a researcher who believes herself to be of the feminist persuasion. When I left Israel to come to study with Papert, I was committed to *"proving* that girls, and especially girls from the non–mainstream non–White culture, could do as well as or better than White boys on the computer."

What I did not understand about my own objective was that I was applying the white male standard of what doing well in science, mathematics or history is. Imagine my initial delight when I started videotaping Kathy, a very quick-minded mathematically inclined ten year old Black girl who was a "dynamite" programmer! Kathy worked intensely and competently at the computer. Often, as I videotaped her, she would be so engaged in working out a computer bug, that she did not notice my sitting beside her. When we spoke, she spoke in her jive inflection which seemed to direct the movement of my camera. There were moments when the sound of her voice made my camera dance with glee.

Another girl named Debby in the same class also caught my attention while shooting Lego workshops because, in spite of her social problems, she was beginning to blossom within the Logo culture. Harel's research study[10] indicated that by appropriating mathematical fraction concepts, Debby was beginning to find her place in her community. In other words, research showed that Kathy and Debby, through programming in Logo, were gaining more confidence in themselves as independent members of their community.

The problem I was struggling with was how to "get a handle" on the development of a girl with excellent social skills like Mindy who was mostly interested in thinking about boys (and drawing girls) and who, as a result, was not doing very well in school. In fact, I believe that I did not focus my attention and the attention of the camera on Mindy as much as I did on Josh and Andrew because I was still evaluating success in the traditionally male way. Only after spending the past two years in data selection and analysis while working with the videodiscs have I begun to realize that what was happening to Mindy and what has been happening for generations to many young girls who approach puberty is that they "drop out" of being smart—they lose in sports to make the boys look better and they feign behavior which will help them achieve male and older female approval, at the expense of their intellectual needs.

Certainly one might say that I did not need to study Mindy to learn these things. I could have thought deeply about Melanie, my own childhood friend from Winnipeg, Canada. Melanie was considered among the smartest pupils in the school until grade five. Suddenly, she were demoted into the "dumb" all girls class.

Ironically, the girls who thought most about boys were separated from the boys who were busy studying advanced Mathematics and Introductory Physics. Only after Melanie's divorce in her early thirties did she remember that she once loved learning new things. A socially skilled observer, Melanie became a successful school psychologist and continued to pursue advanced degrees.

Working with the videodisc data of Mindy flooded my memory of Melanie and the girls of my childhood, who, like me, had to come to terms with not having our interpersonal skills recognized as being very interesting, even by our women teachers. Working on the video data of Mindy has taught me compassion instead of anger, which was my earlier, more activist, response to female subjugation through gender role stereotyping. Instead of trying to remake Mindy into a male scientist or to prove that Mindy and other girls can be as good as boys in the sciences, I have begun to see the value of the female voice in working out very complicated human dramas. Some may contend that these dramas are not the stuff of scientific investigation. It will be my contention, that until we begin to accept the interpersonal skills of persons whose main focus is the lives of human beings, we will never begin to reach below the tip of the iceberg at solving the fundamental balance between humankind and science. As Bateson so elegantly states:

> The need to sustain human growth should be a matter of concern for the entire society, even more fundamental than the problem of sustaining productivity. This, surely, is the deepest sense of homemaking, whether in a factory or a college of a household. For all of us, continuing development depends upon nurture and guidance long after the years of formal education, just as it depends on seeing others ahead on the road with whom it is possible to identify. A special effort is needed when doubts have been deeply implanted during the years of growing up or when some fact of difference raises barriers or undermines those identifications, but all of us are at risk, no only through childhood but through all the unfolding experiences of life that present new problems and require new learning. Education, whether for success or failure, is never finished. Building and sustaining the settings in which individuals can grow and unfold, not "kept in their place" but empowered to become all they can be, is not only the task of parents and teachers, but the basis of management and political leadership—and simple friendship.[5]

In thinking about Mindy's dreams, her aspirations and her fantasies, I ask the reader to question the nature of our biases about home and family and to consider the notion of honest human relationships as being an essential ingredient of the growth of an intellectual scientific and humanistic community.

PART IV

CONCLUSIONS

8 Conclusions

8.1 Integrating Epistemology and Multimedia Ethnography

The conclusions I draw from this study integrate two domains, children's epistemologies and multimedia video ethnography. The focus of this discussion is on how one domain enriches the other when the two are intimately interwoven.

As an overview, I would argue that my research extends and deepens existing research on children's thinking styles. In presenting these conclusions, I address the use of my video research and computer-based application as a viable ethnographic research approach.

It is my hope that the nature of my conclusions will contribute to a deepening of the discourse among researchers about the rigor of qualitative research techniques in the light of new technologies. I address what rigor means in when doing multimedia ethnography and what the advantages and disadvantages of this methodology were for me. To accomplish this I ask why this method was necessary to build my case studies of the three children and to come to a deeper understanding of the implication of these results for future educational developments.

8.1.1 Pervasiveness of Thinking Styles and the School Curriculum

Building portraits from the extensive video data of these three children resulted in the emergence of three dominant thinking styles—the empirical, narrative, and social/interpersonal. I am not suggesting that the styles I uncovered represent the full gamut of thinking styles. I *do* propose that within the situations I encountered these children (*in situ* and on video), their preferred and dominant style was pervasive. What I elucidate is that their success and/or failure are linked to how their styles enabled them to appropriate their experiences. Josh's empirical thinking style matched the accepted approach within most of the existing curriculum; he did not have problems in appropriating.

Andrew's narrative style was not a match; he did not appropriate as well. Mindy appropriated her experiences, but her appropriation was not thought to be a contribution to the way subjects are discussed in schools.

I propose that children would better appropriate their experiences if, first, they could do so within their styles, and, second, if their style were welcomed.

I am certainly *not* claiming that all children with narrative and social/interpersonal styles will encounter problems, nor that curriculum developers believe that the empirical style of thinking is the superior style for doing *all* subjects in the school curriculum. Instead, I show, through my detailed case studies, that two of the three children did not have an opportunity to think about a given school subject in their style in order to succeed within the traditional school curriculum. They did not have the chance to become engaged in what they were doing because their individual styles were not welcomed.

According to my argument, learning environments—such as this particular Logo constructionist culture at the Hennigan School—is a beginning of fundamental changes in thinking about how to open many subjects within the curriculum to diverse styles of thinkers. Papert has often claimed this; my study provides new evidence.

8.2 Contributions of Video-Based Research

My goal in designing *Learning Constellations* was to have an open-ended research environment which maintained the integrity of the original source material. I hope this study will contribute to the existing literature on video-based research environments through my use of Geertz's notion of thick descriptions as a conceptual framework for reflecting upon how the researcher can trust conclusions from video–based research data. "Reflecting upon thick descriptions" while I collected video data, made selections, and built case studies provided me with a language with which to discuss issues related to the bias and interference created by the participant recorder upon the culture being studied.

This study showed that listening to what children wanted to tell me, while I was videotaping our conversations, has contributed to what we know about children's thinking. Using both *Learning Constellations* for gaining access to research data, for building links and for annotating, is an efficient

method for making discoveries. *Learning Constellations* is an effective prototype for the exploration of the video data.

What I claim is that, by using this intimate method of recording responses on video, the children become co-directors of the videomaking—affecting the style of my videomaking. I also propose that through working with the video data intensively on *Learning Constellation,* the children's styles of thinking affected the genre of the case studies.

8.2.1 Style of Child Affecting the Reporting of the Data

This brings us to the growing relationship between the video participant recorder and the persons s/he is studying.

It is inevitable that the researcher and the subject become interwoven in an ethnographic research process. Being open to the children, I was influenced by them as I edited the video or wrote the case studies. After spending time with Josh, I would start using his favorite grade five exclamation, "amazing." There were times when the sadness I felt about Andrew's situation brought out my anger toward an institution which did not encourage teachers to listen to the stories of children as clues to who they are and what they need. I was also affected by Mindy's infectious enthusiasm and playfulness in spite of her many personal challenges, and I believe my video portraits and case studies reflect this.

I propose that the genre of each of the three case studies reflects the effect that the children's individual style had on my portrayal of them. Josh's case study is mechanistic in a playful manner. It moves to many subjects and links diverse topics—"hitchhiking" as Ronkin might say. It tries to suggest causes and effects. Andrew's case study reads like a story; it has a beginning, character development, a plot and a sad ending. It suggests rather than instructs. Mindy's case study is conversational and talky—as were my interactions with her. It weaves situations together in the patchwork–quilt style Bateson writes about in *Composing A Life.* The point I am making is that the genre of the case studies is a result of my technique of collecting the video data in a personal and informal way, and a result of living with my data for four years, and then having it accessible to me through *Learning Constellations.*

8.2.2 Communication and Discovery as Less Distinct Research Pursuits

I also contend that this multimedia video ethnographic tool can be used for enabling the researcher to make discoveries about her/his data and to communicate with users who become part of the research process. Inevitably, the process of discovery and communication become less distinct. Communication with users is integrated into the discovery of the data analysis and discoveries in the analysis of the data are integrated within the communication.

While working with teachers on *Learning Constellations,* I have been encouraged to find that my original hypotheses that this could be a valuable tool for teachers was in fact not just a dream. This is what Hansen, the California teacher who worked on *Learning Constellations,* wrote:

> As I viewed the material on the laser discs, in a non-sequential way, I was guided by topics at first, then I "hooked in" to a particular child, and followed that child. I found myself reacting and analyzing quite independently from any of the suggested cues of the producer of the program. Then I thought, "Hot damn, this *is* a valuable tool." Yes, it has been structured with the premises, biases, and foci of one observer, but I am not limited or controlled by the structure inherent in *Learning Constellations*. I can choose my own non-orbital course, looping back, making lunar landings on many moons, and speeding light years beyond where the mission command center thought I was going!
>
> The analogy works because the ability of each viewer to pilot the craft is made possible by the branching nature of HyperCard. Layered on top of this are *Learning Constellation's* interactive aspects of adding observations through the notebook and suggesting alternative routes by developing a constellation.
>
> The material, the hours of film, has been edited. Yet, it seems that the individual chunks maintain their integrity. They are whole bites. This dedication to "purity" is essential if video is to be a valid research method. (Also, the entire raw material must be preserved and made accessible to other serious researchers who might, someday, find meaningful segments from the tape on the figurative "cutting room floor".)

This citation encourages me that my multimedia video-based ethnographic research environment can be appropriated by others to make their own discoveries. A conclusion I draw from what this comment and many others by her is that users of the system have an opportunity to get close to the selected video data of the children in a manner which is akin to "being in the culture," that is, as an ethnographer.

8.3 Unexpected Findings

8.3.1 *Learning Constellations* to Support Research Activities

I had no doubts about Josh's notion of the origin of moving things being interesting to the scientific community—even if he was a bit precocious for his grade four environment. Josh's way of looking for causal connections and the origin of energy, as shown in my linear video *The Growth of A Culture,* has captured the imagination of hundreds of viewers around the world over the last three years.

However, what I did not expect was his and other children's thinking style would be pervasive in many domains. As mentioned in my chapter on methodology, working with the video data of Josh on *Learning Constellations* brought me to this discovery. One could argue that another "better" researcher would not have needed video and *Learning Constellations* in order to have found pervasiveness in Josh's thinking style. My response to this argument is that it seems fruitless to speculate on what another researcher would have found had s/he used other quantitative or non-video-based qualitative methods. However, I can respond to the fact that I do not think that I could have found this and other findings without this method. There are several reasons for this.

First, being human, I cannot observe, participate in meaningful conversations, write notes, notice a full range of ambience in the environment, and reflect upon it—all at the same time. I am not only referring to my personal mood that day which makes me responsive or not responsive, but, moreso, I am referring to what I am capable of doing well at any given moment in time. My limitation is to think deeply about one thing at at time while having control over tools which have become familiar.

Knowing that I was videotaping these conversations with children and knowing that I would design a multimedia tool to access my data at a later date gave me the opportunity to respond as fully as I could to the child while I was recording.

My second reason for using my methodology, which I now call an advantage to this method, is related to the first. When my tools were audio-tape recorders and fieldnotes, my results tended to be thin anecdotal descriptions of what was happening. The audio-tapes and fieldnotes of Shannon, the first child I studied, did not encourage me to "get to know" Shannon. With Josh, Mindy and Andrew, I was able to "be with them" on tape over a four–year period. I would be inspired to return to see them and find out more. Transcribing my hours of audio-tape was an uninteresting ordeal, whereas transcribing the video on the videodiscs brought me to look more closely at not only what the children were saying, but what they meant when they said things. Very often, their gestures—which I could see on video or videodisc—lead me to the meaning.

A third reason for why I believe I was able to reach new findings in my data with *Star Notes* and *Learning Constellations* was that it enabled me to repetitively plod through the data, to check out my intuitions with my colleagues at MIT and the school in order to rethink the meaning of what I was seeing, and to annotate my reactions while watching even tiny slices of video. I do not think I would have been able to "know" Josh or Andrew through Linda Moriarty's "eyes" had I not been able to slow the motion of the video, watch it many times while speculating upon the meaning of her gestures. This fine-grained analysis took time and patience but brought me closer to those I studied.

8.3.2 The Rights of Students with Diverse Thinking Styles

I would like to discuss this issue of pervasiveness a bit further. My initial assumption was that a person would probably be more empirical in some situations, and more social or narrative in others. I had accepted the standards which dictate that a given way of thinking is superior, or at least, easier, in a certain domain. A good example of how we need to question these assumptions is when we consider how left–handed children were treated.

Once, being a left–handed person was thought to show an intellectually inferior mind and a deviant nature. They were scolded, slapped, and retrained so that they would write with the "right" hand. In fact, only when research about the dual nature of the two hemispheres of the brain was released—the right side of the brain controlling the more artistic and emotive functions, the left the more logical functions—did traditionalists put into question their old assumptions and agree that left-handedness merely reflects a more dominant right hemisphere.

Another assumption is that the student is expected to be more empirical when studying science and more narrative when studying literature. Style is usually linked with the style of the discipline. What is hard for educators to deal with is that children may have diverse thinking styles that do not match the accepted style of learning a given subject. When this happens, learners either adjust their personal style to fit the accepted one, suppress their own style and adopt the external accepted style, or they lose interest in the subject. My concern is that when children compromise their individual style, they forfeit the opportunity to develop a strong sense of who they are as unique individuals. They are told that who they are and how they think about things is not valuable. Unfortunately, succeeding in the traditional school system usually means abdicating one's unique style.

8.3.3 Girls Don't *Have* to Think like Boys

Mindy was my greatest and most recent surprise. In fact, my data, although robust, was not collected with the purpose of writing a case study on Mindy. Mindy provided insights about Josh and Joe and was delightful to talk with. Moreover, she seemed to need the time we spent together.

Ironically, my original hope (when I first arrived at MIT) was to show that girls could think just as *scientifically* as boys. I did not word it quite so simply, but in back of my mind, I was looking for a girl like Kathy who excelled in her mathematical thinking.

I came to examine Mindy's ideas closely through sharing my video data of her with others and speaking about her to others. Suddenly, I was flooded with memories of the many girls I had known who dropped out of science courses when I was in elementary school.

I began to look more closely at the data and think more deeply about what had happened to many of my seemingly bright grade four friends who suddenly started failing or were put in to "slow" classes.

What I now put into question is accepting a traditionally male model for success in the sciences or in life. Girls or boys who are social interpersonal thinkers should not be coerced into thinking in an empirical or any other way. Good science projects need children who can figure out what the social implications of a problem are.

Mindy and other social interpersonal thinkers could have had a chance to succeed in the sciences if she chose to do so through integrating their sensitivity to human behavior in her science projects. The contextual is very important to her. Relationships with people are her entry point into the world of conceptualizing about deeper thoughts. She needs opportunities to explore diverse social relationships, to be part of a community of thinkers, to be able to relate to her subject of inquiry, to try on many roles which challenge and support her/him, to give advice and to get advice, and to challenge assumptions, if necessary.

The importance is not whether the social interpersonal thinker is a boy or a girl, but rather that learners with a social/interpersonal style should not be penalized as not being as serious or capable. In the spirit of Fox Keller who describes Barbara McLintock's relationship with the organisms she studied, I suggest that the scientific world will need people who can build good connections to solve many of the coming global problems. Children like Mindy and Andrew, who daily confront issues of facing alternative family arrangements, are gaining experience in facing challenges. The question is: how do we help many diverse children face the challenge of their lives and succeed in their own terms?

8.4 Closing Statement

Opening Subjects within the Curriculum to Diverse Styles of Thinkers

In schools, subjects are compartmentalized and thinking about those subjects is fixed. Most educators want children to think about a given subject in a distinct way. Teachers are often educated in teacher's colleges to teach each subject in its own language.

They are not taught: to encourage social and interpersonal thinkers to think about history in that style; to invite narrative thinkers to build narratives about Currie, Euclid and Newton; or, to promote empirical thinkers to think about to our understanding of behavior. Yet, this is precisely what is happening and what has been happening in scholarship in many academic settings around the world. People are beginning to question the traditional approaches to scholarship. Studies *are* being developed around intellectual issues rather than disciplines. Tuchman wrote scholarly works in her personal style, giving us rich insights into the lives and conditions of people in fourteenth century Europe. Psychology has moved closer to computational models. Scholarly books and films about the lives of Weiner, von Neumann, and of Weisskopf and Bohr provide us more complete pictures of the discovery process. Yet, students have to get accepted at universities to consider approaching a subject from their preferred style.

Is opening the curriculum possible in consider our schools? Could Mindy, Josh, and Andrew have benefitted from a more "open curriculum." Are there others out there, being "kept back," or expelled from schools who could have their chance if educators simply encouraged diverse styles? How can *all* styles can contribute to any subject.

In a time of national concern over educational issues, it seems timely to propose that the preferred styles of persons do not block them from full participation within the educational system. We can no longer expect all our children to think the same way about the many school subjects. Although I am not devaluing the effect of a multitude of factors such as size of classrooms, salaries of teachers, introduction of higher technology, etc, I suspect that addressing these factors will not make fundamental changes in the solving the crisis in the schools today—unless more attention is paid to incorporating the diverse thinking styles of all children so all children have the choice to participate fully in their learning.

My study suggests that many children who are presently rejected from the educational system could participate fully if educators changed their way of thinking about what needs to be learned and how it is made available to learners.

Post Scripts

The conclusions of this study should not be interpreted as suggesting that by using multimedia video ethnography children as a research tool to explore children's thinking styles, children—like Andrew and Mindy—are going to be protected from the trials and tribulations of growing up in a rough inner–city school environment. Nor is this study to be interpreted as providing prescriptions for successful appropriation.

What I aimed at accomplishing was to find yet another important piece in a difficult puzzle about children's thinking styles by using video and videodisc technology. If other topics were illuminated along the way for my readers, I am content.

In the coming year, *Learning Constellations* will move into its next generation as a base technology for providing students with an opportunity to appropriate their own video footage. It will also be used as a tool for encouraging teachers to reflect upon what happens in their own schools. The coming project will be initiated at the Gardiner Academy in San José, California. It will provide opportunities for teachers to use the *Learning Constellations* video data for discussing topics ranging from how we create alternative learning environments to how children perceive adults who are responsible for facilitating children's learning.

NOTES

Notes

Introduction

1 Papert, 1990
2 See Piaget on accommodation and assimilation in Grubner, 1977; Papert on appropriation, 1980; and Turkle, 1983 on appropriation.
3 Bruner, 1986; Coles, 1989
4 See Appendix 1 for list of projects associated with Project Headlight.
5 Bateson, 1984:202
6 The technical obstacle to overcome in editing was that I had to learn how to operate the equipment as well as to become familiar with the basic analogue and digital video signals of the editing process. This particular phase renewed my interest in waves, and I took a course at the Media Laboratory called Digital Video to gain more understanding about how light travels through the camera lens and gets recorded, how we can transfer that signal to monitors and the difference between an analogue signal and a digital one. Moreover I became technically proficient in setting up facilities to do 1/2" to 3/4" videotape transfers, 3/4" to 3/4" editing and finally 3/4" to 1" transfers so I could edit on 1" to produce the videodisc. In retrospect, I cannot say that this phase was as simple for me as I now write about it. In fact, the machines would break down; I would break the control track and ruin my master tape after months of work on one seventeen minute video production called *The Growth of a Culture*; or I would find that the crucial link between one scene and another was missing. Endless time-consuming details which a person who is not experienced in what I began to pejoratively call, videoland, would never imagine possible. Nevertheless, the real joy of those years in the dark editing grottos with monitors, video decks, and the control deck was the immediacy and closeness I experienced with the endless recorded moments with children.
7 *Star Notes* HyperCard tools were designed by Orni Mester and myself; built by Hans Peter Broadma, student at the MIT Media Lab. Orni Mester, a filmmaker from Brazil, assisted in the design, selection and categorization of the video segments. As mentioned in Methodology, Orni Mester's never having visited the Hennigan School was a great asset in the selection of data. Her eyes were fresh. Moreover, the video was exciting to her in spite of the fact that she did not have the original experience. This encouraged me to find out what it is that speaks to viewers about my footage.
8 The first context in which I heard this term was in a class called *Digital Video* taught by Andrew Lippman of the *Movies of the Future Group*, MIT Media Lab. Edith Ackermann, of the MIT Media Lab, uses this term with less technical implication to address epistemological issues. *Content-granularity* is a term I coined to integrate Geertz's thick description for addressing issues related to the meaning of the event, the content or story behind the event.
9 Rogers, 1961
10 Bateson, 1984:203
11 Discussion with Davenport in June, 1990.
12 Moore, 1989
13 See Turkle, 1984; Gilligan, 1982; Shapiro, 1965
14 Keller, 1983; Papert, 1990
15 Leacock, Richard, 1975
16 See Goldman Segall, 1989e. It is also possible to view Papert by using *Learning Constellations*. This citation is an excerpt from a talk Papert gave at the "Education for the 21st Century Conference" in Cambridge, Massachusetts, in October of 1987.
17 ibid.
18 ibid.

19 Geertz, 1973
20 Ryle, 1971
21 Geertz, 1973:24
22 Can someone who does not have the "remembered stuff" edit the footage in ways which are ethnographically sound? What would happen if I took Margaret Mead's fieldnotes and built my descriptions of Samoa from them? Do we think about field-notes as being fundamentally different from video notes? If so, why? If not, then what could I contribute to Mead's interpretations about Samoa by working not from her descriptions, but from her raw data?
23 Geertz, 1973:5

1 Video Ethnography Perspective

1 Geertz, 1973:22
2 Bateson, 1984:24–25
3 Goldman Segall, 1989
4 Leacock, 1961
5 See Heider, 1983
6 Goldman Segall, 1987b
7 See Heider, 1983
8 ibid.
9 Marshall
10 Kate Higginson, a thirteen year old visitor from Kingston, Ontario made this comment after viewing the movie.
11 Geertz, 1973:24
12 ibid.:24
13 ibid.:27
14 ibid.:29
15 ibid.:198
16 Geertz, 1973:28
17 Illich, 1973:22
18 ibid.:10
19 See 3.4.3 in Chapter 3 for overview of the system.
20 Yankelovich, N., Landow G., and Heywood, P. (1987)
21 Davenport, 1987
22 Gerstein, 1986b
23 Sasnet, 1987
24 Gerstein, 1986a

2 Epistemological Perspective

1 See Kogan, 1983
2 Recently, I have discussed this issue with teachers. Many of those whom I have spoken with have confirmed that this statement accurately reflects how they have been taught to teach. Over the coming year, I hope to research and then report my findings about this subject.
3 An example of this can be seen in modern-day Iran. When Salman Rashdie criticizes the basis of the teachings of Mohammed in his more recent book, "The Satanic Verses," Khomenie called for his death.
4 To emphasize how the traditionally hierarchical paradigm for thinking has changed, imagine a clergyman from the pre-Enlightenment reading Carol Gilligan's book, *In a Different Voice*. Gilligan, in breaking away from the theories of her former mentor, Lawrence Kohlberg, constructs a non-hierarchical model for moral thinking stemming from her interest in "the

interaction of experience and thought, in the different voices and the dialogues to which they give rise, in the way we listen to ourselves and to others, and in the stories we tell about our lives." (p.173) A major component of Gilligan's theory is that for centuries the interpretation of moral and ethical behavior was based on a stage-like model for thinking about the moral development. What Gilligan would have us consider is the significance of what is traditionally viewed as the voice of women. An approach wherein being in connection with others, having ethical ties based on care and concern, and making decisions according to a deep relationship to the situation are given the same weight in importance as responsibility, obligation, and self-sacrifice. Most relevant to this dissertation is Gilligan's concern with the ethic of care based on the premise of no-one being hurt.

5 Sampson, 1986:27
6 ibid.:27
7 Freud, 1952
8 Erikson, 1950
9 Grubner and Voneche, 1977
10 Gilligan, 1982
11 Illich and Sanders, 1989
12 ibid.:4
13 ibid.:4
14 See *A Feeling for the Organism* by Fox Keller (1983) about the life of geneticist, Barbara McLintock.
15 Fox Keller, 1985:7
16 Turkle and Papert, 1990
17 Turkle, 1984
18 Turkle and Papert, 1990
19 Motherwell, 1987
20 Ackermann, 1990
21 Globerson and Zelniker, 1987
22 Turkle and Papert, 1990:352–353
23 ibid.:372
24 ibid.:372
25 To understand Papert and Turkle more fully, see Shapiro, 1965; Gilligan, 1982; and Fox Keller, 1985
26 Illich, 1973:87
27 Wittgenstein, 1961:149
28 Polkinghorne, 1984:13
29 Illich, 1973:87
30 Polkinghorne, 1984:13
31 Gardner, 1985
32 Polkinghorne,1984:148
33 Gardner, 1985
34 Polkinghorne, 1984:1
35 ibid.:p2
36 Jacob, 1987:12
37 Polkinghorne, 1984:167

3 Method of Multimedia Video Ethnography

1 See Tobin, 1989:5
2 ibid.:p4
3 Bateson, 1984:198

4 ibid.;198

5 Within the following years at the school, money was stolen from my purse twice, and, my car was vandalized.

6 Temaner and Quinn, 1973

7 Bateson, 1984:202

8 Polkinghorne, 1984:8

9 ibid.:8–9

10 From 1972–1978 I worked in the Fraser Valley coordinating the training of daycare supervisors and the establishment of daycare centers on Native Peoples' communities, in Dutch Reform and German Mennonite community centers. Throughout that period, I observed my adult students in their practicum placements. From 1979–1985, while living in Israel, I had the opportunity of teaching children in grades five to eleven, visiting children on Kfar Blum, a kibbutz in the Hula Valley, and teaching private groups of immigrant children.

11 In the early 1970's, I had experience as an assistant video cameraperson, editor and producer to a young filmmaker. The weight of the equipment and the difficulty of hand slicing of editing the video were deterrents in my making it a professional activity.

12 Temaner and Quinn, 1973:57

13 Bateson, 1984:201

14 Piaget, 1927

15 Piaget, 1927

16 This seems to conform with the studies concerning the smiling responses of infants to the parent; a built-in survival mechanism protecting the child from alienation from its caregiver.

17 Coles, 1989

18 Young, 1973:65

19 Turkle and Papert, 1990 commenting on a term coined by Levi–Stauss.

20 See chapter 5 for detailed description of this interaction between Josh and Joe.

21 See Introduction for more explanation of this issue.

22 The teachers in *Project Mindstorm* at the Gardiner Academy are implementing a video program of study for their elementary school age children. As their consultant, I will help the teachers in working with the children's video footage and modify *Learning Constellations* to create a children's video tool.

23 In demonstrating *Learning Constellations* to an Interactive Cinema class, a student named Piotr Jastrzebeski helped me to clarify this issue by asking why performance is interpreted negatively.

24 To illustrate this point, a group of girls in CC's class ran up to me in the playground at the end of the first year of my research study. They had decided that my husband and I were to come with them on a graduation camping trip. How could I refuse such an offer, especially considering my limited knowledge of camping and my husband's discomfort with nature? The point is that not only were Avner and I invited, but so was the camera. The end of this story is that graduation parties took up most of the the following month and neither Avner nor I were ever confronted with how to "supervise" twenty-five ten year olds on an excursion into the woods of New Hampshire.

25 Leacock, 1986

26 See Heider, 1983 and Schneider, 1990 for more in-depth analysis. Heider is the most authoritative writer on this subject due to his exceptional ethnographic experience with Gardiner. He analyses how the sequencing of events in a sequence does not necessarily have to be the only way to describe an event accurately. He focuses on the message rather than on chronological ordering.

27 Greenfield, 1990:2–4

28 See Falbel, 1989 for discussion of work and play in the school environment.

29 Leacock, 1986

30 Parry, 1979

31 Nina Hasin spent a year working on a video rap piece about the Boston Transit Orange Line closing down. The music was rap beat and the street kids who rapped created the music for the closing of the line. Another piece I admired was called *Stella Maris* by Clea Waite.
Nude women drifted in the water while irises around them; a soft voice and flute music reminded the senses of the goddesses who had passed before them. Edited in black and white, the grey tones of the women's bodies blended into the water while they twisted and turned, their long black hair drifting with their undulations. In complete contrast with *Stella Maris* was Corrado Gianbalvo's interest in himself as the subject of his video. He filmed himself in the shower, getting dressed and then walking in the streets of Boston telling people he was the son of a very rich man. His conversations with alcoholic street people got the students and faculty livid with anger. He seemed to mock the homeless through his naiveté not his intention. By the end of the class, he managed to present a quite reasonable version of this same work. The products of collaboration, even if it is sometimes unwanted, can be growth and change.
32 In *The Growth of a Culture,* children explain their culture by the things they do and the things they say. The opening shots are of girls running out of the school at recess time. They are leaping in the air. They reach the pavement and start playing skip rope, making big circles with ropes. They count in twos; they take turns; they co-ordinate their actions; and mostly, they stand around talking to each other, braiding each other's hair and generally watching each other and themselves.

These first images of the girls playing skip rope outdoors reflect what follows in this mini-movie about the Logo culture. First of all, the girls start the action. They are outdoors and running to do what they want to do. They play in groups. They laugh and touch each other. Different girls do different things. One girls grooms another. Others jump. Some watch and wait. What they play focuses on the making of circles—skip rope and braiding. They use their bodies within the moving circles.

To me, these are the elements underlying Papert's Logo culture. Girls run to do it; it is done in groups; there is plenty of time to reflect, to watch others and to laugh; different children do different kinds of things; they use their bodies to understand how a turtle cursor moves on the screen; and they are inside and involved in the making of circles.
33 As mentioned earlier, *Star Notes* was designed by Orni Mester and myself and built by Hans Peter Broadma in the Fall of 1988. Broadma was also developing building the HyperCard tools for *Elastic Charles* that same fall.
34 Lampert and Ball, 7/12/90 draft.
35 Josh could make fun of his punishment, speak sarcastically and almost humorously about it. Andrew didn't speak about it; his mother informed the teacher. And Mindy's attitude was philosophical—if her teacher couldn't understand that going to a party was more important and it made her teacher feel better to punish her, then she would accept the punishment and stay in the classroom. No fuss or bother for Mindy. She knew the rules and would accept the consequences.
36 Orni Mester's approach to this was somewhat similar but had a different slant from mine. She wanted to use random access as a means of showing how the impressions one forms about a child are influenced by what data is presented *first*. For example, Josh is a child who appears to be "on top of the world." Most of the footage I have of Josh is when he is "in charge of" his own learning and either doing it or telling me about it. If you first *meet* Josh while he is outdoors talking about electrons in microchips, you would from an impression that he is a very powerful child. Orni Mester likes to introduce Josh with a video clip of his talk in front of the class at the 4H Presentations. He is self-conscious, almost about what he is saying and how people are responding to him. Orni Mester often asks what the viewer's impressions of Josh would be if s/he were to see the chunk of video from the 4H presentation before seeing him talk to me about electrons and microchips with complete candor and comfort?
37 See Rochelle, Pea, and Trigg, 1990; also refer to the work at Xerox Parc by L. Suchman and R. Trigg.
38 Schneider, 1990.
39 In the multimedia environment called *Palanque* designed by Catherine Wilson, a user can take electronic snapshots of his or her simulated travels around the Aztec ruin, Palanque and put

it in an album along as s/he explores the site; in *Learning Constellations*, the user can appropriate the entire video chunk, or a small clip of it, clustering it with other chunks, write notes about it and eventually build the beginning of a theory about this grouping.

40 See Chapter 1, (1.2.1) for description of Illich's conviviality. Also see Goldman, 1983.

41 David Greschler joined our team a year after Orni Mester and I started editing for videodiscs. Orni Mester and Greschler were not only technical support—Orni Mester as an editor, and David as a program designer. Both have rich international backgrounds, well versed in cultural differences. The interface and videodiscs of Learning Constellations are the result of a devoted collaboration and was the starting point for our friendships

42 See Ekman, 1973; Burson, Carling and Kramlich, 1986; and Landau, 1989

43 Temaner and Quinn, 1973:62

4 The Logo Culture at the Hennigan School

1 I will also not discuss the effect of the school culture upon the lives of the group of researchers, although I am sure that would be an interesting story to tell.

2 See Neill, 1960; Holt, 1969; Falbel, 1989

3 I must admit my surprize that girls still play jump rope. One tends to think that, given the times, girls would have found another game. One would have thought that boys would also do sports other than kicking a ball around at recess. And, in spite of the fact that a few boys played jump rope and a few girls were hanging around the field, the demarcation lines were almost as strong as when I was a child in elementary school in the Canadian prairies. The only difference I saw was that boys could walk over the demarcation line and girls could do the same. But few chose to do so.

4 At the Gardiner Academy, an elementary school in San Jose, California where I conducted a shorter video research study to test out my methodology at another research site, I observed teachers outside with the children, playing skip rope, playing baseball, organizing dancing with sign language to popular music and so forth. The physical structure of the Gardiner Academy, with each classroom having access to the outdoors, encourages teachers to use the outdoors as a natural extension for activity. The warm climate of San Jose contributes to this relaxed atmosphere. In contrast, the weather in Boston is often very cold, and sometimes oppressively hot and humid. Recess is often a time to stay inside and hang out in the classroom.

5 Bateson, 1984:34

6 Edith Ackermann is an MIT Media Lab faculty member who was one of the founding members of Project Headlight. Being a student of Jean Piaget, she extended genetic epistemology by developing theories of cybernetic thinking.

7 Excerpted from an interview with Linda Moriarty, Andrew's classroom teacher and Josh's mathematics teacher, while she was watching video of children in Ricki's office at MIT, summer of 1987.

8 Excerpted from an interview with Linda Moriarty, Andrew's classroom teacher and Josh's mathematics teacher, while she was watching video of children in Ricki's office at MIT, summer of 1987.

9 Weir, 1986

10 Whitney Houston

11 MacDougall, 1975:118

12 Leacock,1975:148

13 Bateson, 1984:6

14 My descriptions of the children should also be considered in the context of the personalities of the MIT initiators whose diverse educational approaches deeply affected the way in which the teachers' and children's lives were influenced on a daily level.

5 The Empirical Mind of Josh

1 See Heath, 1983.
2 Geertz, 1973:10–20
3 See Dewey, 1902; Piaget, 1927; Papert, 1987
4 Papert had asked one of his famous situational questions: "If every person in China contributed one grain of rice, how big would the pile be?" Papert was helping the teachers and researchers think through ways to break down this particular problem as a model for how to think about programming in Logo. One of the teachers asked if the rice was cooled or not cooked. Papert answered by saying that thinking about details (such as cooked or uncooked rice) should be thought about after finding a system for breaking down the problem. What was most important was finding a strategy for analyzing the problem. The purpose of this episode was to relate this kind of thinking to programming in Logo and to reflect upon how programming in Logo develops thinking skills.
5 Papert, 1990:3
6 Papert, 1980:11
7 Papert, 1980:vi
8 Uri Wilensky, a fellow researcher in the group, who had never met Josh, viewed this segment of video and made the following annotation in *Learning Constellations:*

> 12/1/89 —5:39 PM
> Uri Wilensky
> Josh asks 'how can a microchip, an electronic pulse hold information?' Then he specifies 'a word' as the information it could hold. It would be interesting to probe further into his thinking here. What is especially anomalous about an electronic pulse holding a 'word?' A number of alternative theories of Josh might be distinguished by his answer.

9 Uri Leron visited the Media Lab in the summer of 1987 and viewed many hours of video rushes of Josh and Andrew. This is one of the comments he made about Josh.
10 As I wrote in Learning Constellations on 11/16/89 —1:35 PM:

> Interview with Josh in car: About a toy moving "without power"
> One can see how moving has to be connected with a source of power for Josh. This chunk is also related to how he understand the source of ideas; he says, ideas 'have to come from something.' Here, we see how Josh finds the 'source' to be the person or thing which started it. The source of the movement is not within the object in motion. Josh seems to be touching on theories of force.

11 This comment emerged from a conversation after Mitch watched the video segment on *Learning Constellations.*
12 Falbel, 1989
13 A common problem for explainers (or teachers), geniuses or not, is that it's always easier explaining things to people who already have some knowledge of the subject, or, better yet, who know it. Another problem, a problem which behaviorists tend to dismiss) is that explaining how to do something is not the same thing as defining what something is. These problems may be why Josh, when sitting on the hill away from his computer, was much more in awe of the wondrous nature of procedures and what they were.
14 See Harel, 1988
15 Sachter (1990) explained this to me while conducting her study of children's 3-D spatial cognition. Josh was not one of her research subjects and he kept asking her why he had not been selected!

6 The Narrative Mind of Andrew

1 Coles, 1989:164
2 Brice Heath, Johnsons
3 Coles, 1989: 30
4 ibid.:30
5 See Bruner, 1986, for a somewhat different use of the term narrative. Bruner's narrative has more to do with a story genre than a thinking style.
6 The 4H Club is an agricultural organization once more well-known for sponsoring activities around farming practices. Their approach now is to sponsor competitions for children to present their hobbies in state-wide competitions.
7 Coles, 1989
8 Turkle, 1984
9 Turkle, 1984
10 Influenced by Turkle, 1984.
11 Illich, 1989:84
12 Bruner, 1984; Illich and Sanders, 1989
13 Heider, 1983.
14 See introduction of this dissertation for a more complete discussion of this issue; also refer to Leacock, 1986
15 Sendak, 1963
16 Bruner, 1986:69
17 ibid.:69
18 Another issue related to this incident is the seeming abundance of materials, yet the dependence upon the adult who has the control of the computer which will make the creatures move. Granted that no one would say that having one terminal connecting Lego bricks to Logo is an ideal situation. However, the fact is that technological equity of resources in schools is a long way off, as teachers well know and feel—they too have to struggle for what their classrooms "have" or don't have and feel the crunch of not providing the tools to their children for them to have a cutting edge.
19 Andrew's comments here have always reminded me of the philosophy of Rabbi Israel Salanter, leader of the Musar (or Moral) Movement in nineteenth century Europe; one' actions not one's thoughts determine one's level of goodness.

7 The Social Mind of Mindy

1 Bateson, 1989:20
2 Although Moses' comment does not seem to be racist, it's roots are most likely racist. Within a racially stratified culture, class stratification within the races begins to grow as a way of maintaining the status quo that one person is always better than another. During this same conversation, I remember thinking that I heard Moses saying, "Jews, Jews, Jews!" also with a derogatory intonation. I remember this from the same conversation and still think that is what he is saying on tape. But I can't be sure, and I find it difficult to understand why he would have said this. Even if he were trying to upset me, as I am Jewish, how could he have known that I am Jewish. To this day, I am confused about what was happening with Moses and sense that Moses provides us with interesting clues to problems of self-esteem and self-worth.
3 Gilligan, 1982; Fox Keller, 1985
4 People often tell me that they wish all children could see things as Josh sees them. On many instances I agree with them. I wish more people who heard Mindy speak about liking the unknown, the unexpected and the different would say the same thing.
5 Bateson, 1989:55–56

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