ADDRESSING THE COMPUTING GENDER GAP:
A CASE STUDY USING FEMINIST PEDAGOGY
AND VISUAL CULTURE ART EDUCATION

DISSERETATION

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ABSTRACT

Gender and technology scholarship demonstrates a longstanding, persistence gender gap reflecting the inequity between the large numbers of men and small numbers of women in technology educational courses and careers. What instructional and institutional changes can address and counteract the current gender inequity status quo?

This dissertation presents a two-year critical case study of Digital Animation: A Technology Mentoring Program for Young Women, a pedagogical intervention that intends to increase the likelihood of young women participants pursuing future educational, personal, and professional technology opportunities. The program, situated at The Ohio State University’s Advanced Computing Center for Art and Design, provides a group of 15 – 18 young women with an intensive two-week animation experience using Maya 3D animation software to produce short films on local environmental issues.

The major program hypothesis is that women may be more likely to learn technology as embedded within an arts-centered curriculum, where arts function as the primary medium for learning and communication, as opposed to traditional computer technology instruction. Learning becomes co-constructed, collaborative, interdisciplinary, creative, and personal; learners become active. The aim is to provide participants with personal instructional support, a peer network, mentors, examples of successful women in technology, personal success, and exposure to a wide range of technology possibilities.

I use gender and technology scholarship in conjunction with multiple critical theoretical perspectives, including feminist poststructuralist pedagogy and visual culture art education, to create a multi-faceted, complex framework for analyzing Digital Animation, its efforts, and its outcomes.

This case study presents data highlighting ways a visual culture art education orientation can also utilize other critical theoretical perspectives, such as feminist poststructuralist pedagogy, to address educational equity issues. This program demonstrates ways the arts can serve as the primary medium for interdisciplinary education, including and incorporating technology education, in ways that benefit marginalized learners.
DEDICATION

To my grandmothers:
Nana whose art was cooking, wit was razor sharp, and heart was as big as the Georgia pines;
and Mema, who lived to the limits and flouted convention every chance she got.
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Like any dissertation, this is not the result of my singular efforts. I wish to thank my committee members wholeheartedly for their tremendous help, support, and encouragement throughout this process.

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Sydney Walker continually impresses me as a teacher, scholar, and person. Sydney convinced me I was at home in the field of Art Education, even as a latecomer to the field. Her classes challenged me intellectually; her mentoring challenged and supported me as a writer and scholar; her teaching and research continue to motivate and stimulate me; her friendship I treasure.

Maria Palazzi willingly opened her technology mentoring program to me. Maria’s personal dedication to high standards and drive for excellence, equity, and improvement impress all those around her; I am no exception. She makes us all believe we can accomplish great, meaningful things, through expectations and examples. She’s a dreamer, but more importantly, she’s an agent for creating change. She lives her philosophy; she is an inspiration.

Candace Stout has been my mentor, advisor, supervisor, teacher, support system, and champion. Her advice, feedback, and encouragement have been fundamental in this dissertation process. Candace not only taught me to be a better student and writer, but throughout the whole experience she has mentored me into becoming a scholar, researcher, and better teacher as well. I am eternally grateful to be her colleague and friend.

I was so fortunate to attend an Art Education department full of amazing scholars, educators, and students, and I am thankful for the opportunities I’ve had to work with and learn from them all. I want to specifically thank Jodi Kushins and Vicki Daiello; Jodi for connecting me with Maria Palazzi and the Digital Animation program, and being a whip-smart, forthright, passionate peer and colleague; Vicki for being such an amazing writer, thinker, artist, student, and friend. You’re both such inspirations.

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TABLE OF CONTENTS

Abstract ........................................................................................................................................................................ ii
Dedication ........................................................................................................................................................................ iii
Acknowledgements ........................................................................................................................................................ iv
Vita ................................................................................................................................................................................ v
List of Figures .......................................................................................................................................................... xi
Abbreviations and Nomenclature .................................................................................................................................. xii

Opening Poem: the professional, educational, and technological triumvirate: a conundrum of gender ..........1

CHAPTER 1: Introduction................................................................................................................................................. 2

Research Questions for the Digital Animation Case Study ................................................................................. 3
Digital Animation: A Technology Mentoring Program for Young Women .................................................. 4
New Resources, Old Problems: Using the Internet for Research .......................................................................... 6
Who cares if girls don’t like computers? Why the gender gap in technology matters ...................................... 8
Contextualizing conspicuous discrepancies in computing: The gender gap in technology ............................. 13
Persistence of resistance: Gender barriers in technology ...................................................................................... 14
Bridging the Technology Gender Gap ...................................................................................................................... 15
Purpose Statement ....................................................................................................................................................... 16
The Value of Feminist Poststructuralist Pedagogy for Equitable Technology Education .................................. 16
Art Education and Digital Animation ..................................................................................................................... 17
Rhizomes and Spotlights: Combining multiple theoretical lenses for analysis ................................................. 18
Into the Electric Blue: Digital Animation Case Study Design and Implementation ........................................ 21
Hey, I like those, too! Positioning myself as a researcher .................................................................................... 22
Designating the Parameters and Purpose: Scope, Limits, and Significance ..................................................... 24
What is Digital Animation and what happens there? ......................................................................................... 26
A Summary Before the Study ................................................................................................................................. 28
Chapter 1 Bibliography ........................................................................................................................................... 30

CHAPTER 2: Research Methodology and Methods .................................................................................................. 37

Choosing a Qualitative Research Methodology ..................................................................................................... 37
Developing Initial Research Questions .................................................................................................................... 39
Choosing a Case Study of *Digital Animation* ................................................................. 40

The Context of the *Digital Animation* Case Study ........................................................ 41
*Digital Animation* Demographic Data for Years 1 and 2 .............................................. 43
Participants....................................................................................................................... 43
*Digital Animation* Demographic Data for Years 1 and 2 .............................................. 45
College Mentors ............................................................................................................... 48
Program administration ................................................................................................. 49

Researcher Reflexivity: Positioning Myself within the *Digital Animation* Case Study ........ 50

*Digital Animation* Qualitative Research Methods and Analysis ................................ 52

**Methods Of Data Analysis** ............................................................................................. 58

P/research: Preliminary Data Collection, Review, and Analysis ......................................... 58
Qualitative Research and *Digital Animation* ................................................................. 62
Data Analysis .................................................................................................................. 64
  Preliminary Data Coding ............................................................................................... 65
  Shifting from Year 1 to Year 2 of Data Analysis .............................................................. 65

Developing an Analytical Framework: *Digital Animation* Data and Theoretical Lenses ................................. 66
Validity ........................................................................................................................... 69
*Digital Animation* Data Sources and Citation Codes .................................................. 69
Institutional Review Board and Human Subjects Protocol .............................................. 75
From Here to There: *Digital Animation* Developments and Struggles ......................... 76
*Digital Animation* Struggles ....................................................................................... 76
Chapter 2 Bibliography ................................................................................................. 78

**CHAPTER 3: Nerd Girls’ World? Gender & Technology Scholarship and Digital Animation** 82

Gender and Technology as an Analytical Framework for *Digital Animation* .................. 84
Defining Gender: Sex and Biology ..................................................................................... 84
Gender and Culture ......................................................................................................... 85
Technology and Digital Animation .................................................................................. 86
  Gender and Technology Relationships ......................................................................... 87
  Technology and Gender System Interactions ................................................................. 88
Technology and the Dissolution of Borders .................................................................... 91
The Gender Gap ............................................................................................................. 93
What Causes the Gender Gap in Technology? ................................................................. 94
Overlooking and Underestimating Women ...................................................................... 97
Social Justice and Equity Issues Around Gender & Technology .................................... 99
Technology Gender Gap Trends ..................................................................................... 101
Possible Solutions for Addressing Gender Inequity in Technology ................................. 106
Scanning the Horizons: Analyzing the Gender & Technology Landscape ...................... 107
*Digital Animation*: Attempting to Address the Gender Gap in Technology Education 110
PART TWO: Applying A Gender & Technology Lens To Analyze Digital Animation ................. 110

A Positivist Perspective of Digital Animation Data ............................................................ 111
A Constructivist Perspective of Digital Animation Data .................................................. 115
A Critical Perspective on Digital Animation Data ............................................................ 122
Digital Animation Addresses Critical and Constructivist Gender & Technology Issues .... 124
Digital Animation’s Distribution of Technology Education Resources .......................... 125
Digital Animation’s Access to New and Developing Technology ...................................... 126
Digital Animation’s Use of New and Developing Technology ......................................... 126
Digital Animation’s Technology, Power, and Expertise .................................................. 127
Critical Gender and Technology Research, Stereotypes, and Value Judgments .............. 131
Digital Animation and Gender and Technology Stereotypes .......................................... 131
Digital Animation and the Persistence of Gender and Technology Stereotypes ............... 132
Digital Animation and the Costs and Benefits of Gender and Technology Stereotypes .... 132
Changing the Visual Image of Technology from a Critical Perspective ......................... 134
Altering the Possibilities of What Women Can Be and Do With Technology ................ 136
Using Digital Animation as a Form of Resistance ......................................................... 139
The Importance of Representations of Image and Identity in Gender and Technology .... 139
A Postmodern Perspective of Digital Animation Data .................................................... 141
Digital Animation and Play as Postmodern Participatory Pedagogy .............................. 144
Reflexivity as a Component of Postmodern Pedagogy ................................................... 148
Digital Animation Discrepancies with Postmodern Theory and Practices ...................... 150
Challenging and Disrupting Postmodern Gender and Technology Research ................. 152
Gender and Technology Conclusions ............................................................................ 153
Chapter 3 Bibliography .................................................................................................. 155

CHAPTER 4 ...................................................................................................................... 165

Program Day One .......................................................................................................... 165
Defining Feminism .......................................................................................................... 166
Feminisms as Plural ....................................................................................................... 168
Defining Poststructuralism for Digital Animation Analysis .......................................... 169
Defining and Characterizing Feminist Poststructuralism ............................................... 172
Feminist Poststructuralist Pedagogy .............................................................................. 173
Feminist Poststructuralist Pedagogy and the Importance of Purpose ......................... 174
Why Feminist Poststructuralist Pedagogy is Important to Art Education? ...................... 174
PART TWO: Using Feminist Poststructuralist Pedagogy to Analyze Digital Animation Data ... 176
Feminist Poststructuralist Pedagogy: Language and Digital Animation ........................ 178
Feminist Poststructuralist Pedagogy: Subjectivity and Digital Animation ...................... 180
Feminist Poststructuralist Pedagogy: Power and Digital Animation .............................. 186
<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ix</td>
<td>Power and Cooperation, Collaboration, and Communication in Digital Animation</td>
<td>190</td>
</tr>
<tr>
<td></td>
<td>Power and Digital Animation: Providing Material Resources</td>
<td>191</td>
</tr>
<tr>
<td></td>
<td>Digital Animation: Truth and Knowledge and Feminist Poststructuralist Pedagogy</td>
<td>192</td>
</tr>
<tr>
<td></td>
<td>The Big Darby Creek Visit as a Site for Accessing and Producing Truth and Knowledge</td>
<td>193</td>
</tr>
<tr>
<td></td>
<td>Digital Animation: Truth and Knowledge and Feminist Poststructuralist Pedagogy</td>
<td>192</td>
</tr>
<tr>
<td></td>
<td>The Big Darby Creek Visit as a Site for Accessing and Producing Truth and Knowledge</td>
<td>193</td>
</tr>
<tr>
<td></td>
<td>Digital Animation and Passive Forms of Knowing</td>
<td>194</td>
</tr>
<tr>
<td></td>
<td>Digital Animation and Active Forms of Knowing</td>
<td>195</td>
</tr>
<tr>
<td></td>
<td>Creating Knowledge through Interdisciplinary Connections</td>
<td>196</td>
</tr>
<tr>
<td></td>
<td>Creating Applicable Knowledge through Real-life Connections</td>
<td>197</td>
</tr>
<tr>
<td></td>
<td>A Captivating Sense of Adventure, Challenge, and Stimulation</td>
<td>199</td>
</tr>
<tr>
<td></td>
<td>Chapter 4 Bibliography</td>
<td>201</td>
</tr>
<tr>
<td></td>
<td>CHAPTER 5: Visual Culture Art Education And Digital Animation</td>
<td>206</td>
</tr>
<tr>
<td></td>
<td>Opening Scenario</td>
<td>206</td>
</tr>
<tr>
<td></td>
<td>Introduction to Visual Culture Art Education</td>
<td>207</td>
</tr>
<tr>
<td></td>
<td>Summary of the Development of Visual Culture Art Education: From DBAE to VCAE</td>
<td>208</td>
</tr>
<tr>
<td></td>
<td>Visual Culture and Art Education (VCAE)</td>
<td>211</td>
</tr>
<tr>
<td></td>
<td>VCAE and Digital Animation: A Technology Mentoring Program for Young Women</td>
<td>214</td>
</tr>
<tr>
<td></td>
<td>Visual Culture and Computer Media</td>
<td>214</td>
</tr>
<tr>
<td></td>
<td>Visual Culture Art Education and Feminist Poststructuralist Pedagogy</td>
<td>215</td>
</tr>
<tr>
<td></td>
<td>Analyzing Subjectivity and Technology in VCAE: Spaces, Mentors, and MoCap</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>Visual Culture Art Education and Language</td>
<td>221</td>
</tr>
<tr>
<td></td>
<td>Visual Culture Art Education at ACCAD and the Power of Images</td>
<td>224</td>
</tr>
<tr>
<td></td>
<td>Program Day 1, Year 1</td>
<td>224</td>
</tr>
<tr>
<td></td>
<td>Images in/of Inequality</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>VCAE: Digital Animation and Truth</td>
<td>226</td>
</tr>
<tr>
<td></td>
<td>Reflexivity And Praxis</td>
<td>228</td>
</tr>
<tr>
<td></td>
<td>PART TWO: A Visual Culture Art Education Analysis of Digital Animation</td>
<td>231</td>
</tr>
<tr>
<td></td>
<td>Digital Animation Day 1 Summary</td>
<td>231</td>
</tr>
<tr>
<td></td>
<td>The National Art Education Association and the VCAE Advisory</td>
<td>232</td>
</tr>
<tr>
<td></td>
<td>The 2002 NAEA Advisory on Visual Culture Art Education Aims and Pedagogy</td>
<td>233</td>
</tr>
<tr>
<td></td>
<td>Aims</td>
<td>233</td>
</tr>
<tr>
<td></td>
<td>Pedagogy</td>
<td>233</td>
</tr>
<tr>
<td></td>
<td>1. Visual Culture Art Education: Contemporary Learning, Conception, and Visual Culture</td>
<td>234</td>
</tr>
<tr>
<td></td>
<td>2. Visual Culture Art Education: Student Possibilities and Guidance</td>
<td>237</td>
</tr>
<tr>
<td></td>
<td>3. VCAE: Media Communication, Skills, and Locations as Factors in Education</td>
<td>241</td>
</tr>
<tr>
<td></td>
<td>4. VCAE: Diversity, Complexity, Multiple Perspectives</td>
<td>245</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

Figure 1: Percentage of Bachelors STEM Degrees by Gender, NSF 2001 Data .............................................. 10
Figure 2: Percentage of Masters STEM Degrees by Gender ................................................................. 11
Figure 3: Percentage of Doctoral STEM degrees by Gender ................................................................. 12
Figure 4: Comparing STEM Degrees by Gender ........................................................................... 12
Figure 5: Using a Spotlight as a Visual Metaphor for Combining Multiple Theoretical Lenses ........ 21
Figure 6: Digital Animation Participant Demographic Data, Years 1 - 2 ................................................. 47
Figure 7: Mentor Demographic Data, Years 1 - 2 ........................................................................... 48
Figure 8: Administrative Staff Demographic Data, Years 1 - 2 ............................................................ 49
Figure 9: Data Gathering Timeline for Year 1 .................................................................................. 54
Figure 10: Data Gathering Timeline for Year 2 ................................................................................ 55
Figure 11: Overall Case Study Data Collection for Years 1 - 2 ............................................................ 58
Figure 12: Excerpts from Year 1 Pre- and Post-Program Survey Responses ........................................ 59
Figure 13: Survey Sample Questions and Analysis ............................................................................ 60
Figure 14: Initial Qualitative Data Coding Categories ......................................................................... 66
Figure 15: My Analytical Process for Theoretical Frameworks using Feminist Poststructuralist Pedagogy as an Example ........................................................................................................... 67
Figure 16: Percentage of Undergraduate Computer Degrees by Gender (2006) ................................. 94
Figure 17: Common Linguistic Binaries ............................................................................................. 116
Figure 18: Racial Demographics for Digital Animation, Years 1 - 2 ................................................... 135
Figure 19: Examples of Violent Computer Terminology ........................................................................ 221
ABBREVIATIONS AND NOMENCLATURE

**Acronyms**
- AAUW – American Association of University Women
- DBAE – Discipline-based art education
- NAEA – National Art Education Association
- NCES - National Center for Education Statistics
- NCWIT – National Center for Women & Information Technology
- NSF
- NEA – National Education Association
- NSB - National Science Board
- NSF - National Science Foundation
- STEM – Science, Technology, Engineering, Mathematics
- VCAE – Visual culture art education

**Data Nomenclature**
- MP = Maria Palazzi
- PC = Personal communications
- EV = Program Evaluation
- INT = Interview
- Y1 = Year 1 (2004)
- Y2 = Year 2 (2005)
- ON = Observation Notes
- VM = Voice Memo
- AM = Analytic Memo

**Examples**
- MP, PC, Y2 = Maria Palazzi, Personal Communication, in Year 2, or 2005
- MP, INT, 28Feb04, 3:15 = Maria Palazzi, Interview on Feb. 28, 2004, at 3 minutes and 15 seconds into the recording
- EVY2, p. 17 = Program Evaluation from Year 2 on page 17
**the professional, educational, and technological triumvirate: a conundrum of gender**

Men make up 42 percent of the nation's college students  
Women make up 58  
Men are less likely than women to get bachelor's degrees  
And less likely to complete them in four or five years  
Men get lower grades than women  
Men in college are more likely to skip classes, not complete their homework, and not turn it in on time

Of course,  
there are young men at the top of the class  
males dominated fields  
like computer science, engineering, physics  
in fact, men overwhelmingly populate their highest echelons, gain their highest degrees

women are 45% of the U.S. workforce, 48% by 2008  
but get just 21% of computer technology related bachelor’s degrees  
nearly 75% of future jobs will involve computer use  
girls comprise less than 33% of students in computer courses and activities

In 1999, over 80% of AP Computer Science test takers were male  
In 2006, girls represented 56% of all Advanced Placement exam-takers  
But only 15% of those in computer science  
the lowest representation in any Advanced Placement discipline  
Only 20% of Information Technology (IT) professionals are women  
Women earned 21% of computer science bachelor’s degrees at American universities in 2006  
a 9% decrease from 1984  
the only field in which women’s participation has decreased over time  
in 2001  
20% of college bound female students intended to major in computer and information sciences in 2006  
12%  
Women continue to be concentrated in fields historically dominated by women  
In 1996 women earned 75% of education degrees, same as 1970  
In engineering, from less than 1% to 16%  
this represents a gain  
“it’s good news” (it is good news.)  
“it’s a lot” (well, depends on how you define a lot…)  
depends on your perspective (and my perspective?)

women (in America)  
still make only 77.5 cents for every dollar that men earn, again a gain

and, yet, we want more….
CHAPTER 1
INTRODUCTION

Above is a found poem I culled from articles and statistics about gender inequity in science, technology, engineering, and mathematics (STEM) fields. I re-introduce, reference, and analyze these statistics later in the introduction, but here I use these lines to distill, or “crystallize” (Richardson, 2000), ideas around the wider impact of technology and gender inequity – academically, professionally, individually, and economically. The “found” poem distills partial understandings of how gender inequity continues to impact women disproportionately, educationally and economically.

The title of this dissertation is *Addressing the Computing Gender Gap: A Case Study Using Feminist Pedagogy and Visual Culture Art Education*. In this dissertation, I present a case study of a program for adolescent girls in Columbus, Ohio: *Digital Animation: A Technology Mentoring Program for Young Women*. The overarching purpose of this dissertation is to analyze this summer animation program’s data as a critical case for investigating whether combining technology with the arts can increase young women’s interest in future technology opportunities, courses, and possibly careers. Additionally, this study explores ways to apply multiple critical lenses and pedagogical practices to address equity issues in technology.

The introduction to the dissertation briefly sketches the problem of technology’s gender gap and the multiple ways the *Digital Animation* program attempts to address it. Out of respect for the program’s complexity and multi-faceted approach, I wanted to investigate it from several perspectives, primarily its basis in gender and technology research as well as feminist and arts-based foundations and practices.

In this introduction, I present my grand tour research question and consider its multiple components. After presenting the major questions and issues, I provide preliminary background information about the *Digital Animation* program itself and my role in it. Next I preview the overall organization of the dissertation by chapter and consider the significance of the study.

I follow the research questions and organization by providing recent gender and technology research from two preeminent educational research organizations, the National Science Foundation and the American Association of University Women. Their statistics about gender discrepancies in technology fields help provide a starting context for approaching the current, technology gender inequity. Following
this, I address reasons the technology gender gap is a perpetual, pervasive problem with broad repercussions. Furthermore I outline many of the literal, figurative, and cultural barriers facing women in technology as well as some of the tactics used to challenge and overcome such obstacles. I follow this with speculation and questions about ways to use scholarship and research on gender and technology as an investigative lens for this study.

I present a similar sequence using feminist theory and pedagogy and again with art education. I provide more specificity as an abbreviated introduction to major feminist poststructuralist tenets and then consider ways these tenets relate to the case study, crafting feminist poststructuralist pedagogy into a theoretical framework for data analysis. With art education, I provide more specificity by introducing, contextualizing, and considering the current critical concepts of visual culture art education (VCAE). This case study necessitates adopting a VCAE stance because of the prominent role of visual culture in Digital Animation, primarily in the form of computer animation, instead of more traditional arts media, such as painting, sculpture, or classical music. I explain the relevance of VCAE to Digital Animation and this study, constructing its key concepts into another analytical framework. I purposely combine these three theoretical perspectives to provide a fuller view of this critical case, to provide a complex, multi-layered image of a complex, multi-layered program. Hopefully providing complex analyses of complex educational efforts provides some guidance, comparison, illustration, or inspiration for other educators and towards greater equity.

After introducing these theoretical perspectives separately, I explain their inherent interrelatedness, particularly with regards to a program like Digital Animation. I concede the messy, convoluted complexity of combining analytical lenses and recognize the challenge of crystallizing meaningful information. Simultaneously, I value this complexity and resistance to reduction. I also acknowledge ways that even a study like this using multiple perspectives is still limited in its scope.

Additionally, I provide an overview of the Digital Animation case study methodology, design, and methods, including my own positioning as the researcher. The final section of this chapter delineates the case study’s potential relevance to the field of art education. Let’s start with the questions.

**Research Questions for the Digital Animation Case Study**

This case study focuses on several overarching questions and their attendant embedded concerns. The main question central to this research is: How does the technology program for young women, Digital Animation combine multiple theoretical perspectives to address the technology gender gap? From this, I consider how Digital Animation defines and confronts the gender discrepancy in technology education, experience, and employment. What causes for this imbalance does the gender and technology literature identify? How does the Digital Animation program respond? What pedagogical practices result, and are they successful? What differences exist between the data created through Digital Animation and existing national data about girls and technology? How and why do these differences and similarities matter?
Digital Animation’s focus on increasing the number of women entering technology courses and employment reflects an undeniable feminist drive to improve gender equity for social, economic, and cultural reasons. How does Digital Animation incorporate feminist pedagogy in its structure and implementation? Why does Digital Animation employ practices aligning with feminist pedagogy? How does feminist pedagogy impact girls’ experiences with technology and their attitudes toward it? Toward technology-rich contexts?

Feminist pedagogy requires a critical stance, providing a nice complement to gender and technology research and also to the arts-based aspects of the Digital Animation program. Digital Animation materials and literature focus on the artistic aspects of computer technology as a means to create 3D animations. This contrasts sharply with traditional computer technology courses that begin with the abstract, theoretical, mathematical, and logical underpinnings of computer programming. Digital Animation prominently uses digital technology and media, and assumes their status as art. Within art education, this positions Digital Animation’s program more specifically as a visual culture art education (VCAE) approach, one that values newer media. VCAE provides the third theoretical framework for the case study. Like gender and technology and feminist pedagogy, VCAE assumes an initial critical stance.

How does Digital Animation function as an example of VCAE? How does its critical stance align with gender and technology and feminist pedagogy scholarship? Does this VCAE approach support or increase the likelihood of participants’ pursuing technology education and employment?

Finally, what kind of cumulative meaning develops from combining these multiple perspectives? More specifically, what does this all mean for art education? Is VCAE a viable approach, or at least component, for addressing persistent, complex, multiple causes and influences surrounding educational equity issues? If so, in what ways?

As an effort to begin answering these questions, the next section characterizes the Digital Animation program, including its inception, purpose, demographics, development, implementation, evaluation, and revision.

**Digital Animation: A Technology Mentoring Program for Young Women**

The Digital Animation program has its origin inside an unusual technology training program within a relatively traditional university setting. Maria Palazzi is the Director of the Advanced Computing Center for the Arts and Design (ACCAD) at The Ohio State University in Columbus, Ohio, as well as an Associate Professor of Design in the College of the Arts. Palazzi spearheads ACCAD’s efforts as a frontrunner in research and curriculum development in technology and the arts. According to its website, ACCAD provides access and support to “advanced technology, computer graphics, visualization, motion studies, and animation to support instruction and research in both the arts and the sciences” ([www.accad.osu.edu](http://www.accad.osu.edu)).

Maria Palazzi’s early personal experience in technology education and employment demonstrated to her the exclusive, sometimes hostile, environment of computer technology toward women. As an
educator and administrator, she continued, and continues, to see consistently few women entering computer
technology, even with great gains in gender equity in some STEM professional fields, like biological
sciences, and steady progress in others, like mathematics (NCWIT Scorecard, 2007). Palazzi is aware of
rationalizations for women’s relative absence in technology: women don’t like technology; they aren’t
good at it; they can’t use it well much less design or invent anything worthwhile (Margolis & Fisher, 2003;
Newitz, 2005; Turkle, 1988).

In contrast, Palazzi believes an accumulation of negative messages and influences often
discourage women from pursuing computer technology interests, including subtle, persistent messages of
technical inferiority; instruction that supports competition and individuality over collaboration and
community; the impression that technology is an entirely abstract pursuit; and the belief that men belong in
technology and are good at it. According to The Baltimore Business Journal, Claudia Morrell, executive
director for the Center for Women and Informational Technology, asserts, “boys and girls tend to receive
different cultural messages. Boys are allowed to take apart certain things, while girls are encouraged to play
with dolls” (Zibel, 2005, Para. 9). Educational and occupational cultures reinforce these gender biases by
aligning computers with math and science, insisting on abstract, theoretical beginning technology
instruction instead of exploring the creative, ubiquitous, and practical applications of technology for
communication, problem-solving, mechanical assistance, entertainment, and educational purposes.
Although these factors seem insidious and unassailable, Palazzi hypothesizes that addressing multiple
dissuasive factors simultaneously and providing positive experiences will increase women’s likely
computer technology involvement.

Digital Animation: A Technology Mentoring Program for Young Women is the result of Maria
Palazzi’s efforts to address the computer technology gender gap using digital animation technology as an
arts-based entry point, an arts and technology hybrid. In brief, Digital Animation is a two-week summer
program for 15 – 18 young women from the Columbus Public School district to learn 3D computer
animation technology with female college instructors, female college student mentors, administrative
support staff, and access to college technology equipment. Participants work in small groups to create
animated short films about local environmental issues using an interdisciplinary approach, applying
concepts from math, science, social studies, geography, art, and computer technology. Groups, matched
with college mentors, conduct research and compile data – visual, textual, audio, experiential, and
numerical. Female college instructors provide whole class digital animation software tutorials as mentors
provide individuals with direct support.

In the beginning years of the program, Palazzi aimed the program more generally toward high
school and some late middle school students, but by Year 2 of my case study, she deliberately lowered her
target demographic age to middle school students. This shift resulted from the sense that young women
needed exposure, experience, and success with technology earlier than high school in order to avoid
deciding against technology by (Palazzi, personal communication, summer, 2004). By high school, most
contemporary students in the United States have already defined, more or less, the scope and direction of their remaining education. If students have not taken the kinds of math or science prerequisite courses in middle school or early high school, in many cases, computer technology options become limited or unavailable (AAUW, 2000; Carlson, 2006; Gavin & Reis, 2005).

Palazzi developed the Digital Animation program using her available resources, including her access to ACCAD facilities, staff, students, and university and community connections. She also worked with administrative assistants to seek outside grant funding. Seeking and leveraging these resources enabled her to provide a strong initial foundation for Digital Animation. Palazzi also relied on her considerable knowledge and experience with gender, technology, and education to craft a program she hoped could get young women interested in pursuing technology and increase their likelihood of doing so. In constructing Digital Animation, Palazzi addressed specific gender and technology concerns, simultaneously deploying multiple strategies and resources to engage, support, encourage, entertain, captivate, and instruct with multiple technologies and for various purposes.

A central component of Digital Animation’s efforts to increase young women’s likelihood of future technology pursuit is Palazzi’s commitment to a continual spiral of planning, implementation, purposeful observation, reflection, and then re-planning – tenets of participatory action research (McTaggart, 1989). Two separate outside evaluators, a role I define more fully later, completed earlier program evaluations, one in 2001 and one in 2003. There was no program in 2002. A classmate connected me with Maria Palazzi and Digital Animation’s program evaluation opportunity based on my interests in the arts, technology, gender, and pedagogy. My involvement with Digital Animation officially began in 2004 when Maria Palazzi hired me as an outside program evaluator, a role I fulfilled the following summer, 2005, too.

Palazzi’s commitment to feminist practices does not end there, though. She performs another critical feminist pedagogical task – using evaluation, feedback, and personal reflection to reconsider the program’s direction, successes, resources, and continuing challenges to revise the next year’s program. I discuss this process of praxis and its importance more fully in Chapter 4 on feminist poststructuralist pedagogy.

Eventually, Palazzi hopes that approaching technology from a different perspective, as a creative tool and medium for communication, expression, and invention, instead of an abstract end in itself, will encourage young women to see themselves, and technology, differently. Hopefully as a result, young women will be able to seriously consider their interest and options in technology courses, opportunities, and employment. Animation becomes a medium for investigation and communication, a means for learning technology and interdisciplinary content.

New Resources, Old Problems: Using the Internet for Research

While scholars are justifiably concerned about the abundant casual, vaguely verifiable, information and research available online, I argue that my use of internet sources is appropriate and
necessary for this dissertation research and analysis. Gender and technology research, including that by the National Science Foundation (NSF), National Center for Education Statistics (NCES), and the American Association of University Women (AAUW), clearly indicates the preponderance of males in technology, as well as science, engineering, and math. This male pervasiveness becomes even more pronounced at higher academic levels, influencing who and what gets presented and authorized in peer-reviewed journals and publications in these fields, making it harder for women and other minorities to publish in traditional academic venues. As the field of gender and technology research has progressed, increasing numbers of scholars post their articles online as a way to make them more directly accessible, less subject to authorization and approval for publication and circulation. As an example, Mary Bryson and Suzanne de Castell (1995) writing as the “Sexed Texts Collective” electronically posted “A Chip on Her Shoulder? New Technologies, Gender, and In/equities,” a version of a peer-reviewed article and then a chapter published in an edited collection. The electronic publication made it available earlier, more widely, and for many, more accessibly. Technology scholarship has a tendency to appear online more frequently than that of more traditional fields of study, for what may be obvious reasons. Many of these electronic articles are from conference presentations, extensions of previous arguments and articles, earlier drafts of eventual publications, or collaborative, non-traditional forms of research and data presentation. Thus, while not all Internet sources are reliable, the scope and nature of this case study compels the inclusion of select Internet sources and information, subject to critical consideration in the context of other scholarship and sources.

Statistics like those in the introductory “found” poem, on gender, education, and technology, reveal an intricate web of socio-cultural and economic factors, their interactions, and outcomes. These facts tell, and hint at, many things: women finally outnumber men in U.S. colleges, more proportionally reflecting the population at large (NCWIT Scorecard, 2007); these women are better students; more of them get good grades and honors; and more of them graduate on time (Sax, 2007). On the other hand, these women continue to enter traditionally female fields and avoid, or make small inroads into, traditionally male ones (National Center for Education Statistics, Trends in Educational Equity of Girls & Women, 2000). While women currently outnumber men in the overall academic landscape, men still hold more top positions and garner professional prestige and recognition disproportionately. The percentage of women in the workforce is also increasing, but men still fill almost all the upper level and executive positions. Women hold 12% of executive positions across all industries and 8% of the executive positions at major technology companies (McGee, 2008). Also, if current trends continue, more jobs will use computers, but women will not have the same levels of education and experience as men (U.S. Department of Labor, Bureau of Labor Statistics). They will not have the same degree of input into technology development and application as men, nor the same access to the use, benefits, and creation of computers and technology that men will, or proprietorship, or power (Fountain, 2000).

In the next section, I provide an analytical summary of gender and technology research, theorize from that review, and discuss its relevance and use as a theoretical lens in this study.
Who cares if girls don’t like computers? Why the gender gap in technology matters

Complex socio-cultural beliefs, stereotypes, life experiences and interpretations, and many other factors form the intricate web connecting gender and technology. Gender and technology research builds from feminist explorations of how technology reflects, deconstructs, and challenges gender (Haraway, 1991). The definition of technology has shifted from any object or process assisting or performing work to a more modern mechanized sense of technology as digital, electronic, networked hardware and software (Gray, 1995; Wajcman, 1991). In this more postmodern sense, gender and technology research creates the awareness of what the American Association of University Women (AAUW) (1992, 1998), Margolis and Fisher (2003), and many others, term a gender gap in technology. This gender gap is important to our larger society in terms of what it costs us, collectively and individually, when women are largely absent from computer technology fields. Technology fields advertise a consistent shortage of educated, qualified, experienced workers, and the low numbers of women considering and pursuing these fields pinpoints a clear target audience for recruitment and retention efforts. Margolis and Fisher (2003) believe the greatest negative impacts of the absence of women in computer sciences “may be on the health of computing as a discipline and its influence on society” (p. 2). If women, their concerns, their ideas, their passions, creativity, and expertise are absent from computer technology, we deny much potential social benefit. Also, because computer technology is a primary cultural medium, Margolis & Fisher (2003) find the documented gender inequity in computer technology fields particularly troubling. If males continue to populate and dominate the computer technology field, as technology exerts increasing sociocultural influence, technology will increasingly reflect masculine concerns, creations, and desires in a self-perpetuating cycle.

The American Association of University Women (AAUW) is a primary force in commissioning, supporting, conducting, compiling and analyzing research on ways gender impacts education, careers, lives, and self-esteem in the United States. In 1991, the AAUW published Shortchanging Girls, Shortchanging America, a survey of students, 9-15, about gender, self-esteem, future plans, educational experiences, and interest in math and science. The AAUW continues exploring gender and education issues in Growing Smart: What's Working for Girls in School (1995/1998); Gender Gaps: Where Schools Still Fail Our Children (1998); Gaining a Foothold: Women's Transitions Through Work and College (1999); and Beyond the "Gender Wars": A Conversation About Girls, Boys, and Education (2001). Many of these reports include meta-analyses of current gender research and reports, sometimes exceeding 400 separate studies, to create a more thorough and nuanced synthesis of research and data on gender’s relationship within a network of multiple socio-cultural factors and their practices.

The AAUW supports continuing longitudinal research into how gender affects career considerations and choices as well as occupational salary and advancement trajectories. The AAUW’s (2003) report, Women at Work, focuses on the economic impact of gender. Women at Work compiles and analyzes census statistics, interviews, and surveys to investigate how working women currently fare, identify future employment and economic trends and effects, and recommend changes. Perhaps especially daunting, in a
society where teachers are overwhelmingly female, female academics face tremendous gender bias. In 2004, the AAUW’s *Tenure Denied: Cases of Sex Discrimination in Academia* is an investigation into court cases alleging gender bias in higher education institutions. This research report considers the economic, professional, and emotional toll on women faculty in these cases and, yet again, makes recommendations for faculty and higher education institutions. Additionally, AAUW conducts more general investigations of gender, employment, and economics, including *Public Perceptions of the Pay Gap* (2005) and its most recent studies, *Gains in Learning, Gaps in Earnings* (2007) and *Beyond the Pay Gap* (2007).

AAUW also supports, conducts, compiles, and analyzes research focused on gender in relationship to science, technology, engineering, and mathematics (STEM). These fields, individually and collectively, remain primarily male, despite the fact that our national educational and occupational rhetoric emphasizes the ever-present need for more qualified computer scientists, technicians, and engineers. The low numbers of women in these fields presents a clear deficit, and prime target, for recruitment and retention efforts. This research considers ways combining feminist and VCAE pedagogy in an all-female environment has the capacity to increase participants’ likelihood of additional technology pursuit. By increasing this likelihood earlier in young women’s educational paths, *Digital Animation* hopes for an eventual payoff of more women entering and remaining in computer technology. AAUW reports on gender and STEM fields include *Tech-Savvy: Educating Girls in the New Computer Age* (2000), *The Third Shift: Women Learning Online* (2001), and *Under the Microscope: A Decade of Gender Equity Projects in the Sciences* (2004). Like earlier AAUW studies, these reports consider large amounts of previous research by examining statistics, practices, and data about gender in STEM fields, offering information, criticism, and suggestions for improvements in achieving gender equity.

The National Science Foundation (NSF) is the other predominant organizational and funding source for STEM research and educational projects within the United States, including gender and technology education research. Perhaps more than any other organization, the NSF data reveal clear, persistent gender gaps in STEM fields, especially technology. Women’s participation in entry level STEM courses and activities starts low and dwindles throughout the educational pipeline, into the professional field, with a few trickling into administrative and authoritative positions (NSF, 2002). The following section provides a series of graphs visually depicting the technology gender gap with accompanying narrative explication.

In a striking visual example, Laura McCullough, from University of Wisconsin-Stout Physics Department, uses 2001 - 2002 NSF data about gender and STEM fields to create a series of three graphs depicting a clear and widening STEM gender gap across the levels of higher education. The first graph compares percentage of bachelor’s degrees earned in STEM fields by gender.
In the graph, women earn slightly more degrees in all science and engineering fields as a whole, but glaring discipline-specific gender gaps exist. Several disciplines show marginal gender differences, such as chemistry and math. Several other fields display women earning more degrees than men, primarily in biological and social sciences. Incorporating the social and biological sciences, while presenting numerically sound data, creates a skewed picture of the overall gender split in STEM fields. Social sciences include fields such as psychology, anthropology, geography, sociology, and education. Because of their quantitative methods and focus on relationships instead of measurable, objective facts, the social sciences are often known as the “soft” sciences, in contrast to the “hard” sciences like physics and geology.

Emerging cross-disciplinary research is hybridizing quantitative and qualitative research methods and analysis. Despite the blurring methodological and disciplinary boundaries, women still tend to enter more “soft” sciences, often the social sciences, those with less objective, deterministic rigor, less prestige, and lower compensation. In contrast, physics, engineering, and computer sciences show a significant gender gap between percentages of men and women completing bachelor’s degrees. In 2001, approximately 80% of physics and engineering undergraduate degrees go to men, only 20% to women. Though the gender split of the overall college population skews toward women, but these STEM gender gaps reflect the clearly primarily male population entering and matriculating in these fields. Data on the master’s degrees earned in STEM fields by gender provides further detail of this gender gap along the educational “pipeline,” in this case, from bachelor’s to master’s to doctoral degrees.
At the master’s level, women still get a larger proportion of total science degrees, still based mostly on biological and social sciences, but men overtake them in total degrees in all science and engineering fields combined. In several categories, including chemistry, math, and earth sciences, men begin noticeably outpacing women. Physics and engineering still skew male, retaining an 80% to 20% split between men and women.

By the doctoral level, men receive a visible majority of degrees in all STEM fields (over 60%) excluding the social sciences, where men still narrow the gap. Men receive over 2/3 of the doctorates in chemistry, math, and earth sciences. The already large gender gaps in physics and engineering increase slightly, too.
The fourth chart, below, summarizes this data by gender across degree levels. It contains overall gender information for comparison. Across all technology categories and degree levels, there is a clear, consistent, and growing gender gap.

Figure 3: Percentage of Doctoral STEM degrees by Gender

Figure 4: Comparing STEM Degrees by Gender
These statistics and studies reveal the trends toward male pursuit of technology and other hard sciences and female entrance and success in soft sciences. While the trends demonstrate this increasing technology gender gap, they provide little evidence of the multifaceted factors that precipitate and perpetuate it. The gaps are visible, and outcomes are materially significant and pronounced, but the underlying issues are multiple, subtle, and complex, requiring continual research and analysis of data on gender and technology fields. An intricate network of cultural pressures, socioeconomic access, experiences, and personal choices influences both women’s and men’s decisions to pursue, or not to pursue, technology education and employment. Chapter 3 delves into these tensions in greater detail.

**Contextualizing conspicuous discrepancies in computing: The gender gap in technology**

The issues around intersections of gender, education, and technology currently function to maintain, or even increase, the presence, success, and achievement of men in technology. Conversely, women remain largely absent, invisible, alienated, or marginalized. Even when they enter technology programs, women are much more likely than men to leave. Research on gender and technology reveal a multitude of factors that encourage women to abandon technology. Women have concerns about the demanding lifestyle of technology employment, considering it alienating, isolating, and obsessive (Margolis & Fisher, 2003). Women also report lower self-confidence in math and less preparation and experience with computers before college (Strenta, Adair, Matier, & Scott, 1994). Additionally, women choose to leave technology pursuits in an effort to match their personal priorities and satisfaction with their career choices (Seymour & Hewitt, 1997). I provide further discussion of reasons women leave technology in Chapter 3. The clear under-representation of women, and disproportionate over-representation of men in technology is disturbing and inequitable, but what can be done? How can technology more successfully recruit and retain women?

Because of the gender gap, women also miss the economic benefits of education and career options in technology fields, the kinds of positions that usually pay anywhere from a livable wage to middle and higher class income bracket salaries. These jobs are economically beneficial, and in the United States they almost all go to (white) men. Owning and investing in technology benefits men, too. According to Online Women in Politics, for every 100 shares of Silicon Valley stock options owned by a man, only one share is owned by a woman. In 2002 United States census data, women account for over 58% of individual poverty, and almost 38% of those living in poverty work. Worldwide, 70% of people living in abject poverty—on less than $1 per day— are women (http://www.onlinewomeninpolitics.org/statistics.htm). Women entering technology careers can reap these economic benefits and simultaneously promote women’s ability to form and maintain social networks and include women’s concerns, experiences, opinion, and assets in local, international, and global discourses.

The relevance of gender and technology issues extends globally. In the *Cultural Boundaries & Cyber Spaces: Innovative Tools and Strategies for Strengthening Women's Leadership in Muslim Societies* conference in 2000, Mahnaz Afkhami notes the possibilities for women with digital technology:
The information revolution, the fastest growing explosion of communications means in the history of the human race, has opened doors for people to instantaneously and inexpensively communicate with each other. Women's networks that have been established in more cumbersome ways can now be utilized and expanded in much easier and less expensive ways. (www.learningpartnership.org)

While Afkhami focuses on the internet as a prime tool in the quest for gender equity, many of her observations hold true for other digital technology and media, as well. Her criticism applies to the current state of technology:

The problem is, however, that so few people from disadvantaged groups are participating in this information revolution. What we must do is to try to find ways to bring in others. We need to bring in not only the masses of women from all regions and from all walks of life, but also other disadvantaged peoples who are not part of this international dialogue, and are not benefiting from the possibilities of the communications revolution. (www.learningpartnership.org)

Afkhami’s concerns echo feminist poststructuralism’s focus on gender, language, subjectivity, power, and knowledge production and access issues, covered in more detail in Chapter 4. She notes that of 300 million users, over a third are in the United States, and that North America and Europe comprise 70% percent. Only two million people in the Middle East use the Internet; only 4% of them are women. These women are usually urban and economically advantaged, creating some access to resources for internet use. Afkhami (2000) contends equity issues around technology, such as lack of access for poor women, can fuel “the growing disparity between the haves and the have nots,” but also stresses that digital technology “has made possible, for the first time, a truly global dialogue that can bring a variety of voices to the international debate” (www.learningpartnership.org).

Gender and technology scholarship supplies an accumulation of statistic and anecdotal evidence and analysis to provide an overall impression of the past, current, and probable future trends with regards to women and technology. This case study extends and complements feminist poststructuralist pedagogy by investigating ways gender impacts short-term and long-term outcomes of outreach, access, and educational efforts to address gender equity in technology.

Persistence of resistance: Gender barriers in technology

In general, technology presents many overt and covert barriers that serve to exclude and discourage women while simultaneously including, encouraging, and supporting men. Many cultural myths and rationalizations exist to explain the under-representation of women in technology, from innate male advantages to female disinterest and reticence to supergeek stereotypes (Healy, 1999; Huff, et al, 1992; Klawe & Leveson , 1995; Margolis & Fisher, 2003; Spertus, 1991; Turkle, 1986). Other long-term feminist concerns, such as the socio-cultural devaluing of women (Badagliacco, 1990; Patterson, 1984) also impact the interactions among gender and technology. Feminist research offers valuable insight and practical possibilities for improving gender and technology education, outreach, and retention efforts (Clarke, 1992; Hesse-Biber & Gilbert, 1994).
Meanwhile, other actual barriers for women in technology remain: 1) isolation in courses and careers due to scarcity of women in technology; 2) lack of quality, professional mentoring and female networks; 3) the vague, subjective policies and procedures in technology for performance evaluation and advancement; 4) inadequate institutional resources and support for women entering technology; 5) and pressure on women to perform additional duties. These and other barriers further impede gender equity progress (AAUW, TechSavvy, 2000; Under the Microscope, 2004; Etzkowitz, Kemelgor, & Uzzi, 2000; Margolis & Fisher, 2003).

Gender and technology research supports applying feminist pedagogy within technology education. Important pedagogical success factors for women in technology include: 1) collaborative, hands-on, practical, holistic application; 2) mentors, role models, guidance, and network connections; 3) service and work-based learning projects; 4) real purpose; 5) high expectations, quality program implementation, and outside support and encouragement; and 6) the recognition and treatment of individuals as such. (AAUW, TechSavvy, 2000; www.aauw.org; Margolis & Fisher, 2003; National Center for Education Statistics, Trends in Educational Equity of Girls & Women, 2000) While most theoretical frameworks support these as pedagogically sound factors, for many women entering technology, collaboration is necessary to contradict the prominent competitiveness and individual achievement models common throughout technology environments. From a feminist perspective, mentors and support systems should recognize, welcome, and support young women with an attention to their unique capabilities and contribution for technology. In technology, young women may need to see themselves more accurately represented, perhaps in more ways than by gender. The benefits of a real purpose should suggest service and work-based learning and projects that benefit a community as well as the young women involved. The Digital Animation program seeks to directly address and negate the barriers for its young women participants to pursue technology and employs multiple feminist pedagogical approaches to do so.

In the next section, I describe the kinds of questions that gender and technology research evokes and briefly consider how they may apply to the ACCAD summer program data as a theoretical lens.

Bridging the Technology Gender Gap

Many researchers, educators, and gender equity proponents are exploring different approaches to address this gender gap. One possible way to increase women’s involvement in technology is to interest them at a younger age, enabling them to make educational and extracurricular choices based on these interests and skills. Using this approach, what kinds of opportunities and experiences would interest and encourage young women to explore technology fields? Another potential way to increase women’s presence in technology fields is to retain them. Once young women are interested, what factors keep them engaged and involved? What factors encourage and discourage women’s pursuit of technology degrees? Technology jobs? What factors influence women to leave technology fields? What would promote women in advancing through the ranks and achieving equitable respect, prestige, and benefits in technology fields?
Gender and technology research encourages many questions about the factors creating and maintaining a gender gap, as well as those related to decreasing and eventually eradicating this gap. First, what is gender, and then why is gender equity important in technology education and employment? What discourses, assumptions, ideas, and stereotypes exist around gender? What about technology? Can we isolate the presence and effects of gender in and on technology? Should we? Much gender and technology research builds on feminist poststructuralist pedagogy concepts. How can applying feminist poststructuralist pedagogy affect women’s participation, engagement, success, and persistence in technology? How does feminist poststructuralist pedagogy describe and affect the relationships between, and on, gender and technology research and programs? How does gender and technology research support successful efforts to address the computing gender gap?

The next sections provide a similar level of background context for the other two theoretical lenses germane to this study: feminist poststructuralist pedagogy and VCAE.

**Purpose Statement**

After sketching these theoretical perspectives roughly, I outline the aims of this study and my plan to use these theoretical lenses, separately and cumulatively, to examine closely, strategically, and methodically, the two years of Digital Animation data. This case study analyzes ways these multiple critical theoretical perspectives align with, use, and inform art education theory and practice, particularly the subset of VCAE.

**The Value of Feminist Poststructuralist Pedagogy for Equitable Technology Education**

Feminist theory plays an important role in Digital Animation: A Technology Mentoring Program for Young Women. Maria Palazzi’s involvement with feminist theory influences the design and implementation of all aspects of the program. Broadly, feminist theory is critical theory that focuses on analyzing gender, its construction, maintenance, effects, limits, and absences (Butler, 1990; de Beauvoir, 1949; Wittig, 1981). Feminism stresses social responsibility, connection, and action as “important to feminist ideals and to liberatory education,” noting how “action moves academic theory into the realm of the experiential, commitment, and social change” (Garber, 2003, p. 58). Feminist pedagogy also values holistic learning, integrating prior information from multiple sources with feelings, cognition, experiences, and personal connections to create new knowledge and to increase “self-awareness and personal growth” (Garber, 2003, p. 58).

Feminist theory aims to question theory, culture, and practice in order to actively challenge and reverse the outcomes of gender bias (Ellsworth, 1989; Lather, 1991; Luke & Gore, 1992; Orner, 1996; Weedon, 1997). The end goal of feminist theory is actual, consequential improvement. Malson (1998) insists feminist research reject older models and “adopt epistemological and methodological perspectives that are appropriate both to [feminist] research questions and … emancipatory aims” (p. 36) Feminist theories critically examine current social hierarchies and beliefs that oppress women and other minorities and work to deconstruct and destabilize them. As an example, feminist theory might question why hairless
legs or long hair denote femininity and any places where these gender characterizations and stereotypes crumble or radically shift, such as men’s wigs shifting from fashionable, to non-existent, to toupees. What are the differences between wigs and toupees? How do these differences relate and interact with gender?


Art Education and Digital Animation

Another key theoretical aspect of the ACCAD program is its deliberate use of an arts-based approach as an enticement for young women to use computer technology. Maria Palazzi believes the general population sees technology as dry, math and science oriented, tedious, abstract, obsession-inducing, and geeky, and that this is a problem for women (Personal communications, Summer 2004, 2005). Her theory is that an arts-based approach to learning and applying technology could increase young women’s interest and encourage their continued participation in technology (Personal communications, Summer 2004, 2005). Many art educators would agree with Palazzi’s inclusion of digital media within the art education purview, but not all. Newer technologies re-ignite disagreement over appropriate subject matter in the field of art education. To explain, I provide an abbreviated context for art education’s current relationship with newer media and technology.

The field of art education is debating theoretical and practical concerns around the inclusion of newer media as “art” and its worthiness of study as such. Over sixty years ago, Lowenfeld’s (1947) ideas in Creative and Mental Growth on the creative and expressive nature and benefits of the arts dominated the field of art education. Newer media, like photography, collage, and installation, continued to challenge traditional boundaries and definitions of art, sparking debate within the art and art education communities. By the 1980s, art educators like Chapman (1978), Eisner (1979, 1982), and Smith (1989), clearly delineated discipline-based art instruction organized around art history, art criticism, aesthetics, and art production. Discipline-based art education (DBAE) continues to be a major art education pedagogical
orientation, validated officially through channels including state and national curriculum standards. Some art educators, like Kamhi (2003, 2004), Smith (2003, 2005), and Stinespring (2001), continue to argue for the primacy of DBAE and clear artistic disciplines, knowledge, skills, and masterpieces.

Other art educators advocate a different approach to art education that includes newer and popular culture media as valid, valuable art education content. From the 1960s to the present, prominent art educators like Vincent Lanier, June King McFee, Laura Chapman, and Brent and Marjory Wilson argued for including popular culture within art education parameters (Tavin, 2005b). As more art educators explored the inclusion of popular culture, visual culture emerged as a separate movement focused on the critical study of visuals and visualities, or what becomes visual culture art education (VCAE). Outside of art education, other visual culture scholars encouraged appropriating critical theory concepts from other disciplines and applying these to (popular) visual culture across a wide range of disciplines (Evans & Hall, 1999; Mirzoeff, 1999; Rose, 2001; Sturken & Cartwright, 2001).

While pockets of art educators dally in fully embracing a visual culture orientation, many artists, designers, and members of the greater art world have welcomed the inclusion of new media, techniques, aesthetics, and critical evaluation criteria. Visual culture still acknowledges and values traditional media and masterpieces, but interrogates, or even disregards, the high art/low art (or popular culture) divide. In this way, visual culture opens the available content for critical examination to include new and hybrid media. In art education, visual culture proponents argue for embracing a wide, almost infinite, range of media: web pages, television, film, advertisements, stickers, theme parks, shopping centers, virtual reality, video games, music videos, and many more (Anderson, 2003; Ballengee-Morris & Stuhr, 2001; Bolin & Blandy, 2003; Duncum 1999, 2000, 2001, 2002a, 2003a; Elkins, 2003; Freedman, 2000b; Freedman & Stuhr, 2004; Tavin, 2000, 2003, 2005a, 2006). Many of these educators, as well as visual culture theorists, value critical exploration, understanding, consumption, and responses to the endless barrage of visual culture many people increasingly face. Importantly, a visual culture orientation considers the socio-cultural and social justice implications of popular culture and its importance and application in real life.

In the next sections, I briefly acknowledge the compatible and contrasting aspects of the theoretical lenses, then contextualize and justify their collective use within this study.

**Rhizomes and Spotlights: Combining multiple theoretical lenses for analysis**

In *A Thousand Plateaus: Capitalism and Schizophrenia* (1987), Deleuze & Guattari introduced the biological concept of the rhizome as a metaphor to represent non-hierarchical networks, like systems of knowledge and meaning. Semetsky (2004) refers to rhizomes as “a metaphor for multidirectional growth and diverse productivity irreducible to a single root” (p. 227), and Haraway (1996) contributes the idea of a “cat’s cradle” arrangement of interconnected relationships with multiple junctures and pathways. In the field of art education, Wilson (2003) adopts the concept of rhizomatic connections of knowledge as a framework for analyzing the complex webbing of relationships. I follow Wilson’s (2003) lead and investigate the multiple, entwined, sprawling, non-linear intersections between art education and other...
critical theories. I apply a rhizomatic approach, considering multiple, non-linear relationships among gender and technology research, feminist pedagogies, and visual culture art education, and mulling the possible significance of their interactions.

Rhizomes are living organisms that form multiple, overlapping, web-like connections as they grow and expand. Maria Palazzi develops and implements Digital Animation: A Technology Mentoring Program for Young Women within the tangled, shifting intersections of gender and technology research, feminist poststructuralist pedagogy, and visual culture art education. Palazzi hopes combining multiple approaches to technology education will prove an effective strategy, stressing the artistic, creative, and practical aspects of digital animation in order to enhance young women’s encounters, interest, success, and pursuit of technology education and employment.

Digital Animation provides an opportune case study for investigating how multiple critical theories and bodies of research can be applied to addressing equity issues in technology. Gender affects issues of treatment, access, wealth, power, and status, and these issues impact women and men in technology, contributing to the prevalence of men and paucity of women. This imbalance has practical, daily repercussions. According to Freedman (2004), technology is an increasingly visual, and digital, medium for communication, connection, and commerce. This growing importance of visual and digital communication increases the impact of the gender gap on how and what technology is designed, for whom, by whom, and for what purposes.

Although each theoretical lens is complicated on its own, using the three together to analyze ACCAD data provides a fuller sense of how multiple theoretical factors impact the overall program singularly and as they interact, overlap, and diverge.

Next in this chapter, I outline the conceptual framework/s and analytical processes of this study. Using any analytical framework presents its own complications; using multiple frameworks increases the complexity exponentially. Digital Animation’s purpose is to confront and reduce the problem of technology gender inequity. Because many factors contribute to gender inequity in technology, as I listed previously, Digital Animation uses multiple tactics to reduce or ameliorate gender’s negative impacts on young women in an educational technology environment. These tactics can function within several different theoretical perspectives. For example, from a gender and technology perspective, working in groups can demonstrate the more social and interactive aspects of technology; from a feminist pedagogy perspective, the small group facilitates collaboration and provides instructional support for all group members; from a VCAE framework, small groups provide an opportunity for considering multiple perspectives and making multiple personal and cultural connections. Using several theoretical frameworks compounds the task of analysis, sometimes providing complementary information and interpretations, and sometimes divergent. Nothing operates in isolation. Consequently, considering any case, action, or issue from only one perspective can provide a very limited, one-dimensional understanding. Using three
frameworks creates a messier jumble of information, but this mess hopefully provides a fuller understanding and sense of the case.

To create a conceptual framework for examining the data, I combine the three theoretical lenses - gender and technology, feminist pedagogy, and VCAE. A visual metaphor of a spotlight illustrates the general idea.

In the figures below, consider each theoretical lens to be a different-colored beam of light, spotlights I intend to shine through all the data, each illuminating different relevant points. In Figure 5, each color spotlight represents one of my theoretical lenses, say blue for feminist poststructuralist pedagogy, green for visual culture are education, and red for gender and technology research. Unlike painting where mixing all primary colors results in black, an additive process, color mixing with light is a subtractive process where combining the three primary colors of light, as in Figure 6, creates a white beam, the most revealing kind. Combining these three theories into a conceptual framework to analyze Digital Animation data will hopefully illuminate some clear findings while still recognizing, highlighting, examining, and valuing the other complexities revealed in places where theories partially overlap each other and where they remain distinct.
In my analysis, I initially apply each critical lens in an artificially separate manner to the Digital Animation data, looking for examples and places where the theory and data resonate. I also seek places where research, theory, and data grate cacophonously, or even vibrate in slight discord. In this way, I will use theory to ground my investigation of the data; I will also use data to examine these theories. Hopefully this mutual cycle of investigation and evidence will generate meaningful data and analysis.

I use this combination of the three lenses to analyze ways Digital Animation reflects and applies current gender and technology, feminist pedagogy, and VCAE research. How can gender and technology research help describe, compare, evaluate, and improve this program? How can feminist pedagogy? How can VCAE? Do the three perspectives merge? Overlap? Align? Do they diverge? Contradict? Do these three theoretical orientations coalesce to illuminate a clear, compelling entry point for women into technology? Do they offer the potential to affect change? How can combining these theoretical frameworks to analyze Digital Animation inform future research, theory, and practice?

In the next introduction section, I outline my research methodology and methods and reflexively position myself as a researcher. Afterwards, I delimit the scope of this research, acknowledge major limitations, and consider its significance.

**Into the Electric Blue: Digital Animation Case Study Design and Implementation**

According to Denzin & Lincoln (2000), research methodology should focus on “the best means for gaining knowledge about the world” (p. 157). In this case study, the objective is to gain knowledge about the Digital Animation program through studying its gender and technology, feminist pedagogy, and VCAE aspects, and to gain knowledge about how to use research, critical pedagogies, and digital animation to confront the gender inequities in technology. Digital Animation aims to create positive, creative experiences and relationships for young women with technology in order to increase their chances of taking additional technology courses and eventually increase the number of women entering the technology field.
As a result, this study requires attention to ideas, impressions, hypotheses, and reflections - the kind of “complex, unstructured data” that “demand” qualitative research (Morse & Richards, 2002, p. 25 – 26).

Case studies often require in-depth, long-term researcher engagement using multiple methods of data collection and analysis. In this case study, I rely primarily on qualitative methods including observations, interviews, and interactions. Current research trends emphasize the value of mixing qualitative and quantitative methods, and I do this through pre- and post-program surveys, using open-ended questions and Likert scale measurements. These multiple methods of data collection provide a stronger basis for triangulating, or confirming, observations, analysis, and advice.

During and after the data collection, in and outside my capacity as program evaluator, I engaged in analysis. I grappled in the moment with program data and ideas through my written reflections, conversations with others, and continual consideration. I recorded demographic information as well as tallying, summarizing, dis/aggregating, and sharing survey data. At the end of each summer, I produced formal program evaluations. After collecting both years of data and any previous analysis, I began the process of organizing, fully reviewing, coding, and sorting data. The outcomes of these processes form the bulk of this dissertation.

A hallmark of this case study is its feminist poststructuralist orientation; a vital component of feminist poststructuralist research involves personal reflexivity. In effect, researchers must explicitly recognize their presence in the research and critically consider their own predispositions, positionality, roles, and impact. Next, I position myself as a researcher and in relationship to this study.

**Hey, I like those, too! Positioning myself as a researcher**

I grew up as a girl, in a working class home, with unconventional interests, aptitudes, and experiences. I was undeniably different. I loved math - the abstract precision of numbers, formula, and fractions. I loved science for its investigation, experimentation, and explanations. In it, everything starts as a quest for understanding and meaning. In school, I excelled in these academic subjects, but in college, a particularly dreadful Chemistry course and lab sequence squelched my science and math interest and my self-esteem. At each level of education, I understood being good in math and science was unusual for girls. Unexpected. And at each level, fewer and fewer girls were. And then I wasn’t anymore either. I didn’t return.

Luckily, I love reading and writing, too. With an eventual degree in English Education, I taught high school English, a notoriously female/feminine profession, sprinkled with the odd outlier male. Before and during my teaching career, I worked at co-ed and single-sex camps. After teaching high school, I worked in educational administration, including managing a partnership including social service organizations, the Philadelphia School District, adult educational and vocational assistance programs, two neighborhood schools, community-based arts organizations, parent and community representatives, and local colleges. Managing this partnership involved coordinating services and leveraging resources, as well
as managing its after-school, evening, and summer program components. Both administrative positions required program observation and evaluation.

After managing the community learning center, my interest in education and technology led to a community college position as the administrator of a computer-based education and testing center. The center worked with departments across campus to administer program entrance, placement, and certification tests. We also delivered computer and technology certification exams and field-specific professional licensing exams. Other center services included delivering business and technology learning modules online and providing the space, equipment, and support for evening ACT and college testing preparation courses targeted to minority youth.

My feminist upbringing, student experiences, and observations as an educator intensified my awareness of gender and its influence in education. I know gender impacts how a teacher instructs, how students learn, how much attention students get, how they view themselves as students, different teacher and student expectations, the kinds of subtle encouragement and discouragement individuals and groups receive, and educational and career options.

In graduate school, coursework in feminist theory and pedagogy, gender, technology, art education, and visual culture reinvigorated my interest in gender equity, technology, and their art/education implications. I realized that my experiences with STEM fields and the eventual outcome follow a common, gender-specific path. I am interested in how this gender bias happened, continues to happen, might cease, and why. I am interested in its impact and what I can contribute to changing it.

I followed my interests in feminism, technology, and the arts throughout my graduate program in Art Education. My early coursework included gender and technology, feminist theory and pedagogy, contemporary art, visual culture, and one using the artistic aspects of computer technology. In early 2004, the Advanced Computing Center for the Arts and Design was searching for an outside evaluator for their summer program and a classmate recommended me. After an initial meeting with Maria Palazzi and her graduate assistant, they offered and I accepted the evaluation position.

I became deeply invested in the program during the planning, observation, and evaluation process. Shortly after completing the first year’s observations, the program director and I mutually agreed on me as the evaluator for the following year’s program, too. Throughout the intervening academic year, I used the program as a constant example in my qualitative research course series. I was investigating more and more of it; it was becoming my “case” (Stake, 2000). Despite matching my obvious interests, having collected data, and committing to another year of research, it took another six months for me to see this as a possible dissertation focus. A short discussion with Maria Palazzi and a simple rider on ACCAD’s approved Internal Review Board request allowed me to use the program data for personal research purposes. Digital Animation: A Technology Mentoring Program for Young Women became my official dissertation site and topic.
Designating the Parameters and Purpose: Scope, Limits, and Significance

Although caution is necessary not to generalize, the sample size of 33 middle and high school aged female participants and 19 mentor subjects across a two-year study provide a persuasive case for combining feminist pedagogy and VCAE as a means to address the technology gender gap. This case study focuses on Digital Animation’s efforts to use animation as a primary means for capturing and continuing young women’s interest in technology and the impact and short-term outcomes of those efforts. The study considers ways a feminist and creative approach to technology, even as an intensive extracurricular experience, impacts young women.

Another necessary clarification and limit of this study is its separation of technology from the other STEM fields. In much gender and technology research, STEM fields tend to be lumped together as a unit. While there are many similar and intertwined issues in these fields around gender inequities, there are also important differences. This dissertation does not address in depth the gender inequity in these related subjects. Science and math gender research began earlier and outpaces that in technology, often providing evidence and suggestions applicable in technology, too. In this study, though, after the initial overview data about gender across STEM fields the focus becomes gender inequity in technology.

This study also recognizes that gender disparity is not the only form of inequity present in computer technology, that race and class bias is even more pronounced (Nakamura, 2001; Sands, 1993; Wacjman, 1991). While this study does not address them specifically, I acknowledge their presence and profound impact on technology, too.

Digital Animation program evaluation data, of varying degrees, exists from its 1999 inception through its most recent iteration in 2007. Also, Digital Animation began distributing and posting surveys in 2005 in an effort to gather longitudinal data on former participants’ impressions of the program and its impact on their education and lives. As Maria Palazzi continues to accumulate, analyze, and respond to program data and evaluations, she is building a mounting body of evidence about gender and technology research, feminist poststructuralist pedagogy, and visual culture art education. She is building a resource library of data, including successful, non-traditional strategies and examples for addressing the gender gap in technology. While I do have access to this larger data set, I consider it beyond the scope of this case.

There are surely many other worthwhile things to examine and learn from this data and this program. I admittedly exclude other relevant critical theories and connections with the data, limiting the extent of my analysis. Using three theoretical lenses does not capture the Digital Animation program in its entirety, but I am bound by how many theories I can consider within the context of one study. Additionally, the very specific conditions and purposes of this study may limit its generalizability.

Also, even with two years’ worth of compiled data as evidence of the program’s depth and breadth, I cannot recreate the program or even create an accurate, truthful representation of it. I can combine specific details of the summer program with broader impressionistic strokes, but I am restricted in
my ability to accurately convey and objectively report the facts of the program. Eventually, though, the larger collection of data may address and erase some of these early limits.

I am limited in my capacity to create and collect data. Not all program data correlates perfectly with all the tenets of any theoretical framework; sometimes data even contradicts them. My observations, questions, assumptions, and agenda construct and alter my always-partial understandings and my always-shifting perspective. My subjectivity does not just influence my recording and interpretation of data, it dictates the facts I experience, create, and construct. I am limited by it.

This case study is significant in several ways. The proposed case study operates at the intersections of gender and technology research, feminist pedagogy, and VCAE, and it may provide useful information about each of these areas individually and in relationship to one other.

The visual culture debate, as it stands in art education, is too narrowly focused on defining and validating the objects worthy of study and needs to be more complicated (Elkins, 2003). This case study will explore visual culture aspects of the program in relationship with feminist pedagogy as a means to answer calls for scholarship combining visual culture with critical theories, such as feminism. This case study begins to address the lack of research about VCAE in combination with feminist pedagogy.

This research will also be significant in terms of analyzing the complex interrelationships between gender technology and visual culture art education within the case study. Some scholars write about gender and technology issues in general (Badagliacco, 1990; Haraway, 1991; Kramer & Lehman, 1990; Turkle, 1995; Ullman, 1995), some about gender issues in art education (Collins & Sandell, 1996; Colbert, 1996: Daniel, 1996; Garber, 2003, 2002, 1996; Gaudelius & Guinan, 1999: Sandell & Spiers, 1999), and a few write about technology issues in art education (Harris, 1997; Taylor, 2000). In contrast, there is little, if any, scholarship on gender and technology issues in relation to VCAE. This study proposes to generate data and analysis about these interrelationships.

Also, studies about gender and technology have been primarily focused on college-aged women in computing from a science and mathematics perspective (Margolis & Fisher, 2003). This research builds on that by adding an arts-based perspective and by focusing on middle and high school girl participants, adding multiple layers of information to research on gender and technology.

This case study will serve to apply, document, validate, trouble, theorize (Freedman, 2004) about VCAE and feminist pedagogy in relationship to issues of gender and technology. Furthermore, this study seeks to understand ways that VCAE can address issues like the gender gap in technology, a very feminist goal. Because this study explores these complicated intersections of theory and practice, it should help validate the transdisciplinary nature and value of visual culture. This underscores the benefits of using VCAE, feminist pedagogy, and gender and technology frameworks to analyze data from Year 1 and Year 2 of my case study of the summer technology mentoring program for young women. In the final section of this chapter, I summarize this study, its purposes and procedures, and its significance. I also outline the upcoming chapters and their contents.
This case study holds much promise for the field of art education. First, it delineates ways that VCAE philosophies and practices align with feminist poststructuralist pedagogies. Inextricably intertwined, this research then investigates the application of these critical pedagogies to the significant gender imbalance in technology. How can feminist poststructuralist and VCAE pedagogies address sociocultural inequities? How can these pedagogies support marginalized learners in fields that traditionally exclude or discourage them? How can interdisciplinary learning through artistic and communications media can support learner interests and successes?

In the next section, I provide a brief overview of the Digital Animation program itself.

**What is Digital Animation and what happens there?**

The Digital Animation program, during this case study, occurs over a two-week span in the summer, with a week of staff preparation before and a week of staff debriefing and wrap-up afterwards. The two-week program for the participants follows a similar pattern each summer of this study.

On Day 1, the participants arrive. Mentors and administrative staff greet arriving program participants. After a brief tour, participants complete a pre-program survey. Once all participants have arrived, the whole group relocates to a larger conference room for staff introductions and warm-up activities. These activities include dividing into their assigned small groups and creating individual drawings that then become components of their small group’s totem pole. During this process, mentors and participants chat freely, beginning to socialize and bond.

After the introductory activities, everyone returns to the classroom to their individual computers. Groups are clustered together. The instructors have participants log on to their computers with assigned usernames and passwords. Mentors help anyone struggling. The participants get a brief introductory tutorial to using these computers as well as an introduction to the program. Over the two weeks, they are going to create short digital animations that deal with local environmental issues – in Year 1 the Ohio prairie and in Year 2 the Big Darby Creek watershed. They will learn Maya 3D animation software to do this.

As an introductory activity on the computers, participant groups research other environmental artists working with technology. They gather information, create outlines, and then do short presentations about the artists they selected to the other groups.

After this, small groups choose subtopics of the larger local environmental issues. They spend the remainder of the morning researching their topic area electronically and with print resources gathered and provided by the program staff – books, articles, photographs, and pamphlets.

After lunch, the first Maya 3D animation tutorials begin. Instructors demonstrate how to open the program and provide a brief orientation to it. They work to relate the program to concepts familiar to the participants from school – primarily math and science to begin. Then they begin learning the program through simple modeling. The instructors demonstrate step-by-step how to create objects and manipulate them to form a 3D ladybug. Mentors again help any participants struggling, but participants begin to help
each other, too. Participants have the freedom to be a little creative in these early tutorial lessons, choosing the shapes and colors they use in modeling their ladybugs.

The lesson then evolves to animating their model ladybugs walking up a plant stalk. First they create a plant model and then learn how to make it begin as a tiny plant and grow, over time, into a larger plant with several leaves. After the plant grows, the participants repeat the procedure for making action happen across time by having the ladybug crawl up the stalk and stop at the top. These lessons use the remainder of the day.

On Day 2, participants learn more about Maya modeling. They learn how to take models constructed by others, animate them, and then add sound. Matching movements with sound is a bit complex, so mentors spend a lot of time working with their group members individually. When participants succeed, most are obviously overjoyed. The afternoon consists of more tutorials, learning to create and sculpt landscapes, how to add multiple models into a scene, and how to have simultaneous actions from different models. They also learn about the different views possible within Maya and how to place and maneuver the “camera,” or perspective during these actions, panning from one position to another, zooming in and out, and moving the point of view.

On Day 3 each year of the study, the participants take a field trip to the site of that year’s focus. On site, participants can explore the physical environment and collect photos and documentation of the site. Each year they also meet with site specialists – naturalists at the prairie and a ranger at the watershed. Participants can ask them questions related to their group topics, gathering information they may not have been able to locate beforehand. Importantly, after touring the sites, each year the groups then meet there and begin brainstorming preliminary ideas and even roughly storyboarding some of them. During this process, participants can still ask questions, gather information, document, or personally investigate aspects of the sites.

Days 4 and 5 consist of a mixture of small group planning meetings and discussions coupled with additional short tutorials on Maya. Groups begin to organize their ideas, create more complex storyboards, and develop and distribute individual and group tasks. Once the tasks are divided, groups return to the main classroom to work.

During Week 2, most program activity centers around working individually and within the small groups to develop their animations. Mentors assist participants as needed, within their own group and across groups. Instructors are available for additional support, but larger tutorials and lessons cease. Participants help each other. Each young woman becomes responsible for certain segments of the overall animation. They sketch their ideas often, then divide work – some creating landscapes, others models, others animate. Each participant usually performs a range of these tasks throughout the final program week. They locate images, use scanners, find sound files, create their own narration, and decide on music to use.

During this week they also have the option to experience other ACCAD resources, including a motion capture lab and virtual reality equipment. These experiences happen simultaneously with the group
work time; often having only one or two members from a given group leave at once while others remain and continue working. Additionally, participants work with different software packages, including Adobe Photoshop, Microsoft Word, and Final Cut Pro; they learn beginning editing skills in each. During the last days of the program, participants complete their animations and work to develop final presentations for a concluding showcase event that parents, friends, teachers, university students, professors, administrators, and other community members attend. Most groups create outlines and note cards, dividing speaking duties and practicing in side rooms.

The program concludes on Day 10, a Friday afternoon, with each group presenting what they did, sharing their individual contributions, and then screening their animations in a formal, filled auditorium. Afterwards, there is a reception and open house. During this time, the participants usually lead their friends and family through the facilities, ending in the computer classroom and often demonstrating things they have learned and created throughout the two weeks. Many parents and other stakeholders talk with the mentors and the administration about the program and its successes. The participants and their families leave together at the close of the day, some lingering well after the actual end time.

Given my brief overview, this program may seem simple on the surface, but with critical examination, hopefully the depth of its purpose, planning, implementation, and impact will become more visible and meaningful.

A Summary Before the Study

These intersections of visual culture, feminist pedagogy, and gender and technology create complex interrelationships, but Elkins (2003) argues that visual studies (as he even more broadly construes visual culture) needs to become more complicated. He wants art education to be developing and testing theories rather than continuing merely to debate which visuals merit study and which do not. Art education traditionally delimited the realm of visual objects worthy of study to those deemed proper and worthy by “authorities” (museums, curators, galleries, historical accounts, critics). Visual culture proponents argue not to banish these traditional art objects, but also to incorporate other visuals, critical theories, and disciplinary knowledge into this discourse.

VCAE proponents also acknowledge the debt to and need for other critical theories, such as feminism, to visual culture, particularly in order to demonstrate the trans-disciplinary nature and usefulness of visual culture (Boughton, et. al., 2002; Tavin, 2003). Both visual culture and feminist pedagogy are essential to consider when examining computer technology from an educational standpoint because of the gender gap (Margolis & Fisher, 2003). Analyzing the complex interrelationships of visual culture art education, feminist pedagogy, and gender and technology are vital to understanding and documenting the summer technology mentoring program for young women because they are foundational to the program’s structure and functioning.

In the following chapters of this dissertation, I describe, contextualize, and analyze this case study, from design, through research, and into findings. In Chapter 2, I cover the methodology and methods of this
case study. I provide more specific demographic information about study participants and evidence of following university human research guidelines. I present necessary background information about the Digital Animation program, including its participants, staff, and structure. I describe, define, and deliberate the boundaries of this study, providing rationales for my data gathering tools, techniques, and analysis. Following this chapter, I present the three theoretical lenses as separate chapters, each with its own literature review and program data analysis. Afterwards, I analyze larger themes across the three areas – what does this project offer to educators more generally? To art education? To technology education? I conclude with a summary and possible directions for further research.

Chapters 3 – 5 provide crystallized (Richardson, 2000) theoretical analyses of the case study data. Each chapter focuses on a separate theoretical lens: Chapter 3 on gender and technology research; Chapter 4 on feminist poststructuralist pedagogy; and Chapter 5 on VCAE. Each chapter begins with a germane scenario from the case study data. Next, each theoretical framework chapter includes a topic-specific literature review as background for developing a theoretical framework. The second half of each chapter applies the theoretical framework to the body of case study data, exploring connections, dissonances, and disconnects. In each of these theoretical chapters, I provide preliminary case study analysis with specific examples of program data, framework by framework. This analysis provides the foundation for Chapter 6, which contains a more cumulative analysis of findings, the Gestalt of the study results, combining and synthesizing each theoretical and practical perspective. Chapter 6 also provides some implications for this research to the field of art education, as well as suggestions for possible future research directions.
CHAPTER 1 BIBLIOGRAPHY


31


36
CHAPTER 2
METHODOLOGY:
CREATING COMPLEXITY WITH CASE STUDY

Is art a legitimate way to entice young women into computer technology? Is digital art? This study examines a digital animation program’s attempts to improve gender equity in technology. More specifically, this study considered ways *Digital Animation: A Technology Mentoring Program for Young Women* addresses gender equity issues present in technology through applying feminist poststructuralist and visual culture art education pedagogies. What can we, as art educators, learn from *Digital Animation*? About content? Pedagogy? Program structure? Equity? This case study’s theoretical grounding emerges from the existing bodies of scholarship around gender and technology, feminist poststructuralist pedagogy, and visual culture art education (VCAE). Qualitative research provides an appropriate framework for exploring these kinds of open-ended wonderings that require investigating complex inter-relationships among data and theories, including their commonalities, absences, disconnects, and contradictions.

In this chapter, I introduce the methodological concerns of the *Digital Animation* case study, detailing my research questions, choices methodology, research methods, and other relevant issues. I present study population demographics, data collection and analysis methods, validity issues, limitations of this study, and details around the Institutional Review Board and the protocol for research using human subjects.

Choosing a Qualitative Research Methodology

Denzin & Lincoln (2000) advise researchers to choose their methods according to their questions and purposes, selecting what provides “the best means for gaining knowledge about” their questions (p. 157). The *Digital Animation* study is predominantly qualitative for several important reasons. First, because of my role as the program evaluator, I began this research with a set of what Morse & Richards (2002) call “unstructured data” that could hopefully serve as the basis for generating “new understandings” about the program, its successes and challenges, and for developing suggestions and ideas for improvement (p. 25). This beginning data set includes two prior *Digital Animation* evaluation reports, brief observation notes,
and email correspondence between the program administrator and previous evaluators. The existing data and initial meetings with the program administration, Maria Palazzi and Kathy V., quickly shaped my approach - I needed to be able “to make sense of complex situations, multicontext data, and changing and shifting phenomena” (Morse & Richards, 2002, p. 26 - 28). Collecting qualitative data was a way I could approach these goals.

Second, my own research curiosities and questions about Digital Animation started very broadly. Like Jennifer Greene (2000) states, my research really began with one question: “What do I want to know in this study?” (p. 382). In this study, I wanted to explore the complexities of the Digital Animation program, collecting, creating, and analyzing data to understand how the program functioned. In particular, my research interests concerned how the Digital Animation program implemented, or failed to implement, feminist poststructuralist and visual culture art education pedagogies in trying to address gender inequity in technology education and employment.

My interests in technology, gender, feminism, and pedagogy reinforced my adopting a feminist research orientation for this study; correspondingly, this feminist research orientation fortified my choice to conduct mainly qualitative research, because according to Greene (2000), “for the qualitative researcher, the question cannot be entirely separated from the method” (p. 382). Morse & Richards (2000) add that good research includes methodological integrity and methodological purposiveness, meaning “good research is purposive and good methods are congruent with a fit among question, method data, and analytic strategy” (p. 4). In this way, I worked to align the methodological integrity and methodological purposiveness of this study – hoping to align theories with practices.

In addition to methodological alignment and purposiveness, feminist research stresses holistic forms of investigation, underscoring the value of contextual, subjective, complex data and critical theories to precipitate practical change. Greene (2000) believes qualitative research “looks at the larger picture, the whole picture, and begins with a search for understanding of the whole. Qualitative research is not constructed to prove something or to control people” (p. 385). At Digital Animation, I began this research as an open-ended investigation of what was happening in the program; I wanted to be “properly responsive to discoveries in the data” (Morse & Richards, 2002, p. 26). I wanted to figure out what this program could offer in terms of evidence of feminist poststructuralist and visual culture art education pedagogies as well as insight into how educational environments can employ them. An open-ended qualitative approach allowed me to search for prominent, recurring themes, as well as outliers and deviations, instead of testing or assessing for specific pre-determined answers.

This study presumes a social constructivist orientation, another characteristic conducive to qualitative research (Denzin & Lincoln, 2000, p. 8). From this perspective, knowledge is not objective, static, and universal but rather subjective, fluid and slippery, cultural and local, and constructed through social interaction and negotiation (Dewey, 1934, 1938; Noddings, 1990; Vygotsky, 1978). Like feminist qualitative research, social constructivism endorses the practice of capturing and creating “rich descriptions
of the social world” of any case, according to the “specifics of [that] particular case” (Denzin & Lincoln, 2000, p. 10). In the Digital Animation research, a social constructivist perspective compelled me to ask questions and interrogate knowledge around feminist pedagogies, VCAE, and gender and technology research.

In short, I began this research as a qualitative process because I had developed what Janesick (2000) terms a “preoccupation with what can be learned” (p. 382). I wanted to know what I could learn from and about Digital Animation. I wanted to know what art educators could learn about digital arts, visual culture, technology, gender, and feminist pedagogy from this program. To do this, after reviewing the prior data and discussing the program’s data needs, I began my investigation and evaluation broadly, capturing as much data as I could, although not in an exceptionally focused or polished way. Across the study, I struggled alternately with the desire to collect ever-increasing amounts of data and to hone my focus. In choosing to do qualitative feminist research, I acknowledge there are no easy, objective answers. Instead, this case study can contribute its specificity and its representational power to our understandings of new possibilities, applications, and mutual benefits for learners, educators, and societies.

The case study results from my struggle to piece together qualitative, open-ended research into meaningful data and analysis. In the next section, I recount the initial questions I developed about the program based on scholarship around gender and technology research, feminist poststructuralist pedagogy, and VCAE.

Developing Initial Research Questions

I started this research as Digital Animation’s outside program evaluator, investigating whether the program increased participants’ interests in considering future technology courses and careers, and perhaps even their likelihood of pursuing STEM fields more generally. But Maria Palazzi was also curious about other components of the program and how they were working, like how the mentor component worked for the participants and mentors or the implications of doing group storyboarding on site at outdoor locations. As Digital Animation became my dissertation research site, I began shaping my own research interests into questions about the program. I shifted from the umbrella question of what I wanted to know in general, to more specific interests about this program and gender and technology research, feminist poststructuralist pedagogy, and VCAE.

I used these interests to guide initial research and the refinement of my research questions, although they remained impressionistically vague. What could I learn about gender and technology scholarship from this program? About feminist poststructuralist pedagogy? About VCAE? My interests were consistent, but the connections among them were nebulous and strained. Were these concepts and perspectives related in the Digital Animation program? If so, how and why?

After continual reflection and analysis, my concerns became how to define these different theoretical perspectives within the context of this study, how to conceptualize their inter-relationships, and what results from considering and applying them concurrently. While the Digital Animation program aims to narrow the technology gender gap in education and employment, my research goals included recording
and analyzing ways feminist poststructuralist pedagogy and VCAE manifest and operate in this program and how these relate to and impact gender and technology inequity. Importantly, how can art educators apply a VCAE orientation, in conjunction with other critical theories, to address social justice issues?

In the following sections, I further explore how choosing a qualitative research orientation leads to my choice of more specific qualitative research strategies and methods. I include information about participant demographics, my research framework, and my research timeline.

**Choosing a Case Study of Digital Animation**

I had several reasons for choosing to do a case study of *Digital Animation*. First, across Year 1 and Year 2, I collected raw data within a naturalistic setting in order to gain authentic, multifaceted information, a prime characteristic of case studies (Stake, 2000). The initial purpose of my data gathering was to produce a holistic program evaluation for *Digital Animation* to use for themselves, for grant funding and reporting, and for long-term evaluation. As I shifted from being an outside evaluator to being a more engaged researcher, I continued to wonder, “What can be learned from this case?” (Stake, 2000, p. 436). What was happening in the *Digital Animation* program in terms of gender and technology research, feminist pedagogy, and VCAE? Did this summer program increase participants’ desire to pursue addition computer technology education or employment? I wanted to investigate these “complex, situated, problematic relationships,” focusing “around a small number of research questions…[aligned by] issues or thematic lines” (Stake, 2000, p. 440). Also, in art education, Eisner (1991) advocates case studies as a means to demonstrate the complexity of how the arts function in educational practice. *Digital Animation* explicitly positions itself as an arts-based educational and experiential program aimed at increasing and retaining women in technology. Is this an appropriate task for art education? Does this require a VCAE perspective? Can VCAE interrogate and address equity issues?

In conducting this case study, I followed Stake’s (2000) list of primary case study researcher tasks:

1. Bounding the case, conceptualizing the object of study;
2. Selecting key phenomena, themes, or issues - research questions;
3. Seeking patterns of data to develop the issues;
4. Triangulating key observations and bases for interpretation;
5. Selecting alternative interpretations to pursue;
6. Developing assertions or generalizations about the case…. (p. 448)

The *Digital Animation* program, on the surface, seems easily bounded, but I still had to make many conscious and unconscious boundary decisions. Each summer, *Digital Animation* comprises approximately four weeks, from staff preparation week through staff wrap-up week, with the administration dedicating bursts of time to the program throughout the year. There were several sub-groups of participants that I could analyze as cases within the larger study: middle and high school student participants, college mentors, administration, the researcher/s, family/friends, community stakeholders, media representatives,
and outside experts. In the actual study, I include the community stakeholders, media representative, and others as secondary, considering them mainly in relation to the young women as primary participants. I do collect data from and on some of these populations, but my main concerns in this study remain what Digital Animation can teach about gender and technology, feminist poststructuralist pedagogy, and VCAE.

Case studies also provide a “richness and depth of information not usually offered by other methods” (Hancock, 1998, p. 6). Hancock (1998) considers the case study a “highly versatile research method” that “employs any and all methods of data collection” (p. 7). This flexibility allowed me to choose and alter data collection choices and tools throughout the study, honoring Digital Animation’s particularities, its own issues (Stake, 2000, p. 439). As Hancock (1998) also notes, “By attempting to capture as many variables as possible, case studies can identify how a complex set of circumstances come together to produce a particular manifestation” (p. 7). My research struggle was to capture those variables vividly, sort them out during the data gathering, hone data collection to focus on more prominent issues, collect additional data, and analyze.

In the following sections of this chapter, first I further contextualize the case study and describe my other qualitative research tasks: collecting and coding data; triangulating, validating, and interpreting data; considering alternative interpretations; and proposing findings, generalizations, and hypotheses about the case (Stake, 2000, p. 448). I reveal my struggles with researcher choices in collecting and analyzing data, as well as in presenting it. I considered:

1. How much to make the report a story;
2. How much to compare with other cases;
3. How much to formalize generalizations or leave that to readers;
4. How much to include description in the report of the researcher interacting;
5. Whether or not and how much to anonymize. (Stake, 2000, p. 448)

I wrestle with these issues not only throughout this entire chapter, but also throughout the entire manuscript. In the end, I conducted a case study of Digital Animation because I want to glean from it whatever we can about how art education can function as a tool for increasing sociocultural equity. I believe the lessons we can learn from this study have larger significance for critical classroom pedagogies and reinforcing the importance of art education efforts in an age of increasing visual culture.

In the following sections, I provide a comprehensive overview of the context of this case study. I begin broadly at the university level and narrow its context from there. Each layer of context provides additional information, nuance, and understanding about the Digital Animation program.

The Context of the Digital Animation Case Study

The Digital Animation program inhabits multiple contexts. For the purposes of this study, the university, departmental, and program contexts promote a fuller understanding of Digital Animation. I provide narrative summaries for each environment, working to create a rich, multi-layered setting for the overall study.
The Ohio State University campus is big. An October, 2006 *Columbus Dispatch* article ranks Ohio State first nationally in enrollment with almost 52,000 students. The main campus is also geographically large, encompassing more than 1,700 acres in the city of Columbus. The university ranks highly in athletics, academics, and research, with the incoming university president, Gordon Gee, announcing his intention to take Ohio State from “excellence to eminence.”

The far west edge of campus includes agricultural research fields, intramural sports fields, the parking services building, and huge parking lots. Two smaller, low, non-descript buildings hide in a distant grove of trees along the south side of the lot. They house the College of the Arts’ glass studios. Nearby, in a clearing of trees, a more prominent brick and glass building anchors this edge of the parking lot. Concrete steps lead up to the glass entry area. Large windows let light pour inside. A sign warns the building uses surveillance.

A receptionist sits at a contemporary desk across from the entryway. Unpretentious metal and fabric chairs with small tables and magazines designate a waiting area. Framed posters of recent films and framed computer-generated images line the outside two hallways extending into the building. At the intersection of these hallways, directly opposite from the reception section, square glass windows form the back and a side wall of a classroom. Computers wait in rows on long tables, each with a rolling desk chair. The room also has dry erase boards, chalkboards, retractable screens, projection equipment, a little additional table space and several extra stationary chairs along the side wall of windows. The low lights, odd angles, and charcoal grey foam baffling of the far corner fade into a dark emptiness. The computer monitors glow brightly in the dimness; the screen images do, too.

The hallway continues past smaller classrooms, offices, equipment rooms, storage, conference, and dining areas. Computers, and other sophisticated technology, play prominent roles in most spaces. Where the hallways fork again, one direction leads past a display window housing an imac next to a door to a control room. Large windows separate the hallway from the control room and the control room from a performance space. Matte black walls and floors enclose the performance space. Tape outlines form a square on the floor, marking the space digital cameras can capture.

The right hallway passes restrooms and ends at another junction. Ahead is another building entrance from a small back parking lot. To the left is another entryway into the space of a separate program. To the right is a large conference room with rows of long, empty tables, a screen in the front, and a small kitchen area along the back wall.

This is the Advanced Computing Center for the Arts and Design, better known as ACCAD, in the building it shares with the Ohio Supercomputer Center. On its website, accad.osu.edu, ACCAD traces its historical development from its conception by an art education professor and painter, Charles Csuri, who became interested in computers as artistic tools. In the late 1960s, Csuri began working with a colleague in mathematics using sine waves to alter and map “intermediate frames on paper using an IBM plotter to create a haunting blend of images” (accad.osu.edu). In 1969, The National Science Foundation awarded...
Csuri funding to continue studying computers “for research and education in the visual arts” (accad.osu.edu). Artists rarely receive National Science Foundation funding, reinforcing the wider significance of Csuri’s work.

By 1971, Csuri formally instituted the Computer Graphics Research Group as an interdisciplinary undertaking involving faculty representatives from Math, Computing, Science, and the Arts. In 1987, the group officially became ACCAD. ACCAD’s designated purpose is “to provide computer animation resources in teaching, research, and production for all departments in the College of the Arts at Ohio State” (accad.osu.edu). The center has been an innovator in computer graphics for over three decades. ACCAD continues to form “partnerships with visual and performing artists, designers, art historians and critics, computer scientists, engineers, and architects” to “provide multidisciplinary experiences” for students (accad.osu.edu). As a result, ACCAD students “make a huge impact on the American film industry in special effects and computer graphics,” as well as in “premier design firms, universities, research groups, and government agencies across America” (accad.osu.edu).

As ACCAD Director, Maria Palazzi initially leveraged her available resources and courted additional support and funding to develop the Digital Animation summer program. Research on gender and technology confirmed Palazzi’s personal experiences and sense of the still masculine environment and culture pervading technology fields. In brief, gender and technology research, spearheaded by the American Association of University Women (AAUW) and the National Science Foundation (NSF), documents a small, and diminishing, rate of women pursuing education in technology fields, particularly with advanced and terminal degrees. Researchers use the metaphor of a “leaky pipeline” to describe what happens with women in technology (Camp, 1997; Margolis & Fisher, 2002). Fewer women pursue technology courses initially, and many women who do enter technology courses or programs tend to exit the education/career path, or pipeline, all along the way. The ACCAD summer mentoring program for young women is an attempt to address the dearth and disappearance of women in technology fields. The main Digital Animation thrust is using (digital) arts as a potential conduit for successfully developing and supporting young women’s interests in technology as current and future educational, artistic, and career possibilities.

Below, I continue to develop the context of the program, providing more specific information about participants. I define and characterize participant populations, including charts to display their demographic data. I conclude by positioning myself as a researcher in the context of this study.

**Digital Animation Demographic Data for Years 1 and 2**

**Participants**

The following paragraphs provide basic demographic data about the participants, mentors, administrators, a small group of teachers, and myself as the researcher. After delimiting and describing the demographics of the subjects, I proceed to the methods of data collection and analysis.
This case study involves the specific set of administrators, participants, mentors, and parents from Year 1 and Year 2 of Digital Animation, as determined largely by the program director, Maria Palazzi. Palazzi recruits specific populations for each program role. In the following paragraphs, I explain Digital Animation’s philosophy, structure, operation, and content. Following that, I detail the selection and composition of participant groups, including an ill-fated teacher component in Year 1. I also review my role in the program. In providing this information, I hope to offer additional context for partially re-creating and adequately assessing the impact of the program.

Digital Animation’s philosophy, structure, functions, and content form a symbiotic, holistic approach to fostering young women’s interest and skills with technology; these factors indivisibly influence and are influenced by one another. Philosophically, Maria Palazzi developed this program to address gender disparity in technology and technology-heavy classes, programs, and career fields. She believes girls can and do like technology when they experience it positively (MP, PC, Y1). Palazzi believes girls often do not have a sense of the real options and possibilities in technology. They see technology as boring, hard, solitary, and obsessive; they rarely see or use the creative, collaborative, and exciting aspects of it. By most accounts, by the time young women arrive in college, it is often too late for them to enter directly into a computer technology degree path or program (AAUW, 1998, 2000, 2004a). They often lack the necessary academic prerequisites, by default and by design. Palazzi wants to re-construct technology instruction and environments to support young women, for a brief period of time, to see if their views of technology do change (MP, PC, Y1).

Palazzi uses a four-pronged approach to construct and implement the summer program: making it all-female, highly inter/active, relevant, and interdisciplinary. Digital Animation promotes participants’ access to technology and high quality instruction, an atmosphere of inclusion and support, collaborative and cooperative interaction, relevance, engagement, and equity. The summer program administration, staff, participants, outside evaluator, reporters, and most guest speakers are female. In this way, participants see women involved in all levels of computer technology and in other technology-related fields. The program stresses inter/action. The instruction is hands-on, groups are the primary work units, and the project addresses real, local issues. The digital animation technology serves as an artistic and communicative medium for working together to learn about relevant issues, respond to them, and hopefully create positive change. Digital animation and imaging technology and software also provide current, cutting-edge relevance. The program uses state-of-the-art, creative sector industry standard equipment and software. The Digital Animation instructors are current professors from ACCAD’s official graduate program at Ohio State University. Connection and support form another key component in Palazzi’s program design – the participants, mentors, administrators, and guests all directly interact, in formal and informal ways, bonding with each other (ONY1; ONY2).

Palazzi’s dedication to creating a support network of women in technology stems from her background in feminist theory, gender and technology research, and her personal experiences. The mentors
serve as the most explicit example of implementing inclusion and support. For each year’s program, Palazzi hires from six to eight female college students affiliated with ACCAD’s program as official mentors to work directly with the young women participants. These mentors attend a week of pre-program training and planning before the two-week program, and then a week of post-program wrap-up. Palazzi hopes the program will foster a support network of women interested and working in technology. She officially connects the college students to the middle school students, but the program unofficially connects the mentors, and all the participants, to each other (MP, PC, Y1, Y2). Importantly, Palazzi herself is a mentor to the participants and all the college mentors. The greater goal is an expanding network of women able to support and encourage other women to pursue, and continue, education, careers, and creative expression in technology (MP, PC, Y1, Y2). In many ways, this program is a model for an ideal connection and support system for women in technology fields. It is a small start, but it is a start.

ACCAD articulates program participation criteria for young women on their website:

Digital Animation: A Mentoring Program for Young Women at The Ohio State University runs from June 20th through July 1st in 2005. A free, two-week (M-F) summer program for young women from local high schools, Digital Animation is an opportunity for girls currently in the 7th, 8th or 9th grades (entering 8th, 9th, or 10th in Fall of 2005) to work in small collaborative teams, directed by women mentors in a dynamic and focused technological experience using the latest computer animation and web technologies. The mentors are graduate students who, in conjunction with OSU faculty, lead the girls through a shared discovery of the world of graphics and animation integrating problem-solving skills, collaborative learning and presentation. Participants explore the same high-end software used in movies like Finding Nemo, Shrek and Shark Tale!

Applicants are not required to have any previous technology experience but should be interested in art and design as well as enthusiastic about exploring the creative possibilities through technology. There is no fee for participation. Participants will need transportation from their parents or guardians to and from campus for the start and end of each daily session, Monday – Friday, for two weeks. (www.accad-osu.edu)

Other program advertisement and recruitment efforts included contacting Columbus middle school art and technology teachers through the district offices, making some individual contacts with teachers to recruit, and advertising in the Columbus Dispatch. Interested girls submit an application packet and teacher recommendation letters. Program administrative staff selects the participants and alternates.

Digital Animation Demographic Data for Years 1 and 2

The Digital Animation program population varies from year to year. The 15-student study population of Year 1 included more high school students, recruiting incoming 9th to 11th graders, with an incoming senior included, too. In Year 2, the program deliberately shifted to recruiting a younger group, this time of 18 students, incoming 8th through 10th graders. This time one of the 18 participants was an incoming 11th grader. In each year, the two slightly older participant acceptances appear due to oversight. Neither participant has any negative impact on the programs; both are noticeably enthusiastic.

In terms of ethnic and racial demographics, in Year 1, out of 15 participants 10 identified as Caucasian, one as African American, one as Asian American, one as Latina, and two as Bi-racial or Bi-
ethnic: one identifying as Puerto Rican and European and the other as German and Native American. One of the 10 girls identifying as Caucasian was Scandinavian by birth. In Year 2, out of 18 participants there were 12 who identified as Caucasian, two as African American, one as Chinese American, one as Latina, and two as Bi-racial: Caucasian/African Americans. Most of the participants both years are from the metropolitan area, but most are not from the local urban school district, instead coming from nearby suburbs. One dedicated participant and family in Year 2 made an extreme hour and a half commute each way to attend each day.

Since the program is free for participants regardless of income level, Digital Animation does not collect economic information. Again, even waiving any explicit program fee, not all potential participants can overcome certain economic barriers, like transportation or the necessity of a job. As a result, all participants in the Year 1 and Year 2 program appear to be middle class, dropped off and picked up by parents, well-fed, well-rested, and well-kempt.

The study population for Year 2 was intended to be late middle school and early high school students (from incoming 8th through 10th graders). Of the 18 student participants, 17 fit these criteria while one was an upcoming 11th grader, making her older than the upper age limit of girls specified in the application materials. She was one of the minority participants in the program. The charts below provide participant demographic information for Year 1 and Year 2.
### Year 1 Participant Information

<table>
<thead>
<tr>
<th>Student</th>
<th>DOB</th>
<th>Grade</th>
<th>Eth/Race</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS</td>
<td>3/15/90</td>
<td>8th</td>
<td>B</td>
</tr>
<tr>
<td>AM</td>
<td>9/15/86</td>
<td>11th</td>
<td>W</td>
</tr>
<tr>
<td>RS</td>
<td>8/8/87</td>
<td>11th</td>
<td>W</td>
</tr>
<tr>
<td>LB</td>
<td>7/24/88</td>
<td>10th</td>
<td>W</td>
</tr>
<tr>
<td>NG</td>
<td>8/22/87</td>
<td>10th</td>
<td>W</td>
</tr>
<tr>
<td>JS</td>
<td>2/20/88</td>
<td>10th</td>
<td>W</td>
</tr>
<tr>
<td>GC</td>
<td>3/22/90</td>
<td>8th</td>
<td>E/E*</td>
</tr>
<tr>
<td>RP</td>
<td>10/20/86</td>
<td>11th</td>
<td>E/NA*</td>
</tr>
<tr>
<td>CG</td>
<td>5/16/87</td>
<td>11th</td>
<td>W</td>
</tr>
<tr>
<td>Britt</td>
<td></td>
<td></td>
<td>W</td>
</tr>
<tr>
<td>SE</td>
<td>5/16/88</td>
<td>10th</td>
<td>A</td>
</tr>
<tr>
<td>MB</td>
<td>1/5/90</td>
<td>8th</td>
<td>W</td>
</tr>
<tr>
<td>ED</td>
<td>3/6/89</td>
<td>9th</td>
<td>W</td>
</tr>
<tr>
<td>MH</td>
<td>2/12/90</td>
<td>8th</td>
<td>W</td>
</tr>
</tbody>
</table>

*DOB = Date of Birth*

### Demographic Abbreviation Key (for Race/Ethnicity column)

A = Chinese  
B = African American  
E = European  
L = Latina  
NA = Native American Indian  
W = Caucasian  
*Pairs of letters signify a participant’s multiple race/ethnicity self-identifications.  
Shading indicates alternates contacted when participants did not attend. Two came later on day one, two the next day.*

### Year 2 Participant Information

<table>
<thead>
<tr>
<th>Student</th>
<th>DOB</th>
<th>Grade</th>
<th>Eth/Race</th>
</tr>
</thead>
<tbody>
<tr>
<td>JB</td>
<td>1/18/92</td>
<td>7th</td>
<td>W</td>
</tr>
<tr>
<td>DMC</td>
<td>9/15/90</td>
<td>9th</td>
<td>B</td>
</tr>
<tr>
<td>ED</td>
<td>8/2/90</td>
<td>8th</td>
<td>W</td>
</tr>
<tr>
<td>KDR</td>
<td>3/13/92</td>
<td>7th</td>
<td>W</td>
</tr>
<tr>
<td>KDO</td>
<td>10/12/91</td>
<td>7th</td>
<td>W</td>
</tr>
<tr>
<td>KDU</td>
<td>08/29/90</td>
<td>8th</td>
<td>W</td>
</tr>
<tr>
<td>DAF</td>
<td>10/19/90</td>
<td>8th</td>
<td>W</td>
</tr>
<tr>
<td>GG</td>
<td>01/03/90</td>
<td>9th</td>
<td>W</td>
</tr>
<tr>
<td>AG</td>
<td>06/12/92</td>
<td>7th</td>
<td>W</td>
</tr>
<tr>
<td>RH</td>
<td>12/27/90</td>
<td>8th</td>
<td>B</td>
</tr>
<tr>
<td>MJ</td>
<td>05/29/92</td>
<td>7th</td>
<td>B/W</td>
</tr>
<tr>
<td>TK</td>
<td>6/6/91</td>
<td>7th</td>
<td>W</td>
</tr>
<tr>
<td>AL</td>
<td>10/11/91</td>
<td>7th</td>
<td>A</td>
</tr>
<tr>
<td>TL</td>
<td>4/18/91</td>
<td>8th</td>
<td>W</td>
</tr>
<tr>
<td>NM</td>
<td>02/03/89</td>
<td>9th</td>
<td>L</td>
</tr>
<tr>
<td>MS</td>
<td>8/28/90</td>
<td>9th</td>
<td>W</td>
</tr>
<tr>
<td>TS</td>
<td>5/28/92</td>
<td>7th</td>
<td>W</td>
</tr>
<tr>
<td>TT</td>
<td>12/30/91</td>
<td>7th</td>
<td>B/W</td>
</tr>
</tbody>
</table>

*Figure 6: Digital Animation Participant Demographic Data, Years 1 - 2*
College Mentors

Maria Palazzi, the program administrator, recruits and hires the college-aged female mentors [See Figure 7]. They are mainly graduate students in ACCAD’s programs and have a demonstrated interest in technology. Maria chooses mentors based on their willingness to work with the girls for the duration of the program and into the future (MP, PC, Y1). In Year 1, the mentors included one undergraduate student (allowed to be in ACCAD’s programs without graduate standing) who has served as a mentor over the past three summers. In Year 2, one mentor is another undergraduate student majoring in computer technology and animation at an out-of-state college and a former girl program participant. Year 2 mentors also included four graduate students involved in ACCAD’s programs either in technology programs or as artists interested in incorporating technology into their work. The four graduate students Year 2 are new mentors.

### Year 1 Mentors Information

<table>
<thead>
<tr>
<th>Mentor</th>
<th>Status</th>
<th>Ethnicity/Race</th>
</tr>
</thead>
<tbody>
<tr>
<td>YH</td>
<td>Grad/ACCAD</td>
<td>A</td>
</tr>
<tr>
<td>FK</td>
<td>Und/ACCAD</td>
<td>J</td>
</tr>
<tr>
<td>JM</td>
<td>Grad/ACCAD</td>
<td>W</td>
</tr>
<tr>
<td>SB</td>
<td>Grad/ACCAD</td>
<td>W</td>
</tr>
<tr>
<td>RS</td>
<td>Grad/Art Ed</td>
<td>W</td>
</tr>
<tr>
<td>FB</td>
<td>Grad/ACCAD</td>
<td>W</td>
</tr>
<tr>
<td>CW</td>
<td>Grad/ACCAD</td>
<td>W</td>
</tr>
</tbody>
</table>

### Year 2 Mentors Information

<table>
<thead>
<tr>
<th>Mentor</th>
<th>Status</th>
<th>Ethnicity/Race</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC</td>
<td>Grad/ACCAD</td>
<td>W</td>
</tr>
<tr>
<td>MC</td>
<td>Grad/ACCAD</td>
<td>B</td>
</tr>
<tr>
<td>FK</td>
<td>Und/ACCAD</td>
<td>J</td>
</tr>
<tr>
<td>KL</td>
<td>Grad/ACCAD</td>
<td>W</td>
</tr>
<tr>
<td>EP</td>
<td>Grad/Dance</td>
<td>J</td>
</tr>
<tr>
<td>AP</td>
<td>Und/Univ</td>
<td>W</td>
</tr>
</tbody>
</table>

### Demographic Abbreviation Key

- A = Chinese
- B = African American
- W = Caucasian
- Grad = Graduate Student
- Und = Undergraduate Student
- ACCAD = affiliated with ACCAD program/classes
- Univ = attending another college
- Art Ed = enrolled in Art Education department
- Dance = enrolled in Dance department

*Figure 7: Mentor Demographic Data, Years 1 - 2*
Program administration

The main program administration consists of the director of ACCAD, Maria Palazzi, and her assistant, Kathy. Palazzi holds a BSID in Design and a Masters of Arts in Art Education from The Ohio State University. Her assistant Kathy completed a Masters in Art History at The Ohio State University. They worked together successfully to secure program funding and support over the previous few years. Vita B. works with the program administration as a Maya instructor (Maya is the animation software used in the program), and Aline D. works as administrative and program support.

<table>
<thead>
<tr>
<th>Administrative Staff</th>
<th>Role</th>
<th>Ethnicity/Race</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maria Palazzi</td>
<td>Administrator/Instructor</td>
<td>Caucasian</td>
</tr>
<tr>
<td>Kathy V.</td>
<td>Administrative Assistant</td>
<td>Caucasian</td>
</tr>
<tr>
<td>Vita B.</td>
<td>Instructor/Program Support</td>
<td>European</td>
</tr>
<tr>
<td>Aline D.</td>
<td>Administrative/Program Support</td>
<td>African American</td>
</tr>
</tbody>
</table>

Figure 8: Administrative Staff Demographic Data, Years 1 - 2

In Year 1 of this study, Maria Palazzi instituted a teacher component of Digital Animation, offering local middle and high school teachers an experience similar to participants’, free-of-charge. Palazzi even hired two mentors to work with them. In the end, three teachers applied; the program accepted them all MP, PC, Y1). They all attended the first day: two women and one man; they remained separate from the student participants much of the time. The plan was for them to work intensely with the two mentors to create a digital frame for holding all group digital animations and connecting them into a single set. The teachers’ commitment and participation deteriorated from the beginning of the program. Their attendance turned spotty and when they did attend, they were often late and left early (ONY1). Their mentors became frustrated. The initial goal became impractical and the teachers decided to use digital video footage they recorded in chunks at ACCAD and on the field trip to the prairie to create brief videos. The male teacher titled his “Little Man on the Prairie.” Their films were uninteresting and technically unsophisticated. The lack of time and focused effort seemed obvious from my perspective as researcher.
Palazzi expressed her frustration at the teachers’ lack of dedication and interest in the program, its resources, and its potential value to them and their students (MP, PC, Y1).

In interviews during and after the program, Palazzi and I discussed ways to improve the teacher component. She wondered how ACCAD could offer teacher education or staff development credit for the program. Could this happen through the art education department? She also wondered if teachers should bring a partner to learn and work with during the program and possibly later in their respective schools. Would paying the teachers a stipend to attend increase their participation (Palazzi, personal communication, Summer 2004)? Palazzi mused that most schools could get access to digital animation software and technology for a reasonable investment, stressing Maya’s free and downloadable student version. What if ACCAD offered to help teacher participants write grants to get additional technology, too (MP, PC, Y1)?

Palazzi decided to abandon the teacher component during Year 2, at least temporarily. Instead, she shifted those resources to add three slots for student participants and to hire six mentors, one for each small group of three. She wanted to find ways to get animation technology to a wider audience of girls, and other marginalized groups, and believed reaching and educating teachers is a key to being able to do that in schools (MP, PC, Y2). She just believed Year 2 was not a good time to try again with teachers; the teacher component needed more critical thought and revision, and those resources could be used to serve additional student participants (MP, PC, Y2).

**Researcher Reflexivity: Positioning Myself within the Digital Animation Case Study**

Qualitative case studies compel researchers, especially feminist ones, to provide intense personal reflection, reflexivity, and identification in order to situate herself with reference to the research (Belenky, et al, 1986; Feldman, 1995). In the following paragraphs, I provide personal background in an attempt to locate myself, admittedly partially, in relation to this program and this research.

I grew up as a southern white girl in a working class home and neighborhood in what became the suburbs of Atlanta, around the corner from my grandparents. I got a lot of adult attention and a lot of stimulation in a wide range of alternative, nontraditional educational environments. People taught me things all the time: how to play checkers and cards, how to fish, how to cook, how to read and write, how to drive a tractor and riding lawnmower, how to shoot a BB gun. I had very non-gender restricted experiences. I got to get dirty and play football and ride bikes on a secluded, unofficial motorcross track. I played with Army men, firecrackers, and Matchbox cars. I climbed. I did my expository essay and lesson on how to box.

In short, I grew up as an unconventional girl with unconventional interests, aptitudes, skills, and experiences. I was undeniably different. First, I loved school. Everything about it. All the teachers and all the subjects. I loved reading and writing for their ability to express and communicate, to suppose and pretend. I loved Math for the abstract precision of numbers, formula, and fractions. I loved Science for its investigation, experimentation, and explanations; in it, everything starts as a quest, a puzzle, an exploration.
for understanding and meaning. Plus, its answers seemed so solid. I did well academically, and participated on the high school Math, Science, and Academic Bowl teams. I always considered a science degree a strong possibility, but in college, a particularly dreadful Chemistry course, teacher, and lab sequence squelched my interest and my self-esteem. At each level of education, I understood being good in Math and Science was unusual for girls. Unexpected. And at each level, fewer and fewer girls were. And then I wasn’t anymore either. I didn’t return.

With an eventual degree in English Education, I taught high school English, a notoriously feminine profession, sprinkled with the few outlier, Hemingway-esque males. Before and during my teaching career, I worked at co-ed and single-sex youth summer camps. After teaching high school, I worked in educational administration, in the Philadelphia School District offices and in a Latino social service organization within a public school. I evaluated school and social programs. I managed a community learning partnership involving representatives from other social service organizations, the Philadelphia School District, adult educational and vocational assistance programs, two neighborhood schools, community-based Latino arts organizations, parent and community representatives, Americorps, and local colleges. Managing this partnership involved coordinating services and leveraging resources, as well as managing after-school, evening, and summer program components.

After managing the community learning center my interests in education and technology led to a position as the administrator of a computer-based education and testing center at a community college. The testing center worked with departments across campus to administer program entrance, placement, and certification tests. We also delivered computer and technology certification exams as well as field-specific professional licensing exams, like nuclear medicine, nutritional science, and social work. Other center services included delivering business and technology learning modules online and hosting and supporting evening ACT and college testing preparation courses targeted to minority youth.

My feminist upbringing, student experiences, and observations as an educator intensified my awareness of gender and its influence in education. I know gender impacts how teachers instruct, how students learn, who gets attention, how individuals view themselves, their expectations, the kinds of subtle encouragement and discouragement individuals and groups receive, as well as students’ educational and career options. In graduate school, coursework in feminist theory and pedagogy, gender, technology, and visual culture art education reinvigorated my interest in gender equity, technology, and their (art) education implications. I realized that my own experiences with science and math eventually followed a common, gender-specific path, despite my interest and success. I am interested in why and how gender biases persist as well as their impact. I am interested in what I can contribute, as a scholar and educator, to changing this.

My introduction to ACCAD and Maria Palazzi resulted from a happy coincidence. An Ohio State classmate told me about a summer program for girls using computers and art. The program director needed an outside evaluator; she thought of me. I was immediately attracted to the position based on my previous program evaluation experience and my interests in technology, feminist theories, and art. In
the spring of Year 1, I contacted Maria Palazzi. After the initial contact, Maria, her assistant Kathy, and I had a preliminary information and interview meeting. I was excited and intimidated. What if my previous program evaluation experience wasn’t what they were looking for? What if they wanted hardcore scientific, statistical analysis? What if I was completely bewildered by the technology they used? What if I needed to know digital graphic design and programming to do this job? The meeting started, congenial yet intense. My fears were premature and unfounded. Maria and Kathy expressed their concerns about previous evaluations and evaluators. They obviously had high standards and expectations for people involved in any component of this program. They wanted meaningful information about the program, not just anecdotal data and separate survey data, but extended observation, interaction with, and information from program participants and staff. They wanted some specific analysis and data about the program’s successes, failures, struggles, and areas and suggestions for improvements – for the summer and longitudinally. They wanted evaluation that could provide a larger context for the program’s goals, operations, results, and future directions. They wanted to be able to offer data and proof of the need and value of a program like this one to current and potential partners, funders, and eventually to other similar efforts. By the end of the meeting, we all thought, or at least hoped, I could be the person to provide that kind of evaluation (MP, PC, Apr04).

In the remainder of this chapter, I outline and describe my design, methods, and analytical process.

**Digital Animation Qualitative Research Methods and Analysis**

The methodological *bricoleur* is adept at performing a large number of diverse tasks, ranging from interviewing to intensive self-reflection and introspection. The theoretical *bricoleur* reads widely and is knowledgeable about the many interpretive paradigms …that can be brought to any particular problem…the interpretive *bricoleur* understands that research is an interactive process shaped by his or her personal history, biography, gender, social class, race, and ethnicity, and by those of the people in the setting. The political *bricoleur* knows that science is power, for all research findings have political implications…. The gendered, narrative *bricoleur* also knows that researchers tell stories about the worlds they have studied. Thus the narratives, or stories, scientists tell are accounts couched and framed within specific storytelling traditions, often defined as paradigms…The product of the interpretive *bricoleur*’s labor is a complex, quilt-like *bricolage*, a reflexive collage or montage – a set of fluid, interconnected images and representations. This interpretive text is like a quilt, a performance, a text, a sequence of representations connecting the parts to the whole. (Denzin & Lincoln, 2000, p.6)

In this research study, I inhabit the roles of a *bricoleur* in order to conduct as thorough and meaningful of a study as possible. In the following sections, I demonstrate my functions as a methodological *bricoleur*, including the impact and usefulness of past research data and data collection methods, my research planning, and the process and methods I use to collect data on the Digital Animation program.

Because I began the study as an outside program evaluator, I had access to previous program data and evaluations gathered and compiled by other researchers. This data included prior evaluations, interview notes from individual and small group sessions, interest inventory surveys of participants, and some brief observational notes. Palazzi expressed some disappointment over the relevance and usefulness of these
earlier evaluations and wanted to direct the research more toward her questions instead of collecting
general information about the participants and the program (MP, meeting, Apr04). While Denzin & Lincoln
(2000) note that people’s words and actions are the data of qualitative inquiry, and researchers need to
choose methods and capture this language and behavior, Patton (1990) adds that, more importantly,
qualitative study designs should connect to the research purpose, gathering information that will be most
useful and most credible.

After noting Palazzi’s disappointment, I read these previous evaluations and data and used them as
the starting point for reflecting and proposing Year 1 data gathering methods. My planning relied heavily
on what scholars consider the key forms of gathering qualitative data: observation; interviews; collecting
relevant documents; photographs and videotapes; surveys; and member checks (Angrosino & Mays de
Perez, 2000; Denzin & Lincoln, 2000; Harper, 2000; Hodder, 2000; Soy, 1997). I sent a research proposal
draft for Year 1 to Maria Palazzi and Kathy V. for their review, as well as drafts of initial surveys; then we
met and discussed them. We discussed ways to alter and improve the data collection to address their
questions about the program more specifically. During this time, Palazzi also decided that while gathering
data on the young women and how the program impacted them was the focal issue, important things were
happening with the mentors, too (MP, PC, Y1). We discussed how to capture some of this data, too. After
this meeting, I created a research timeline for Year 1 showing data gathering and evaluation tasks and
proposed completion dates.
## Figure 9: Data Gathering Timeline for Year 1

During the course of the Year 1 program, the data I gathered included: interview/meeting notes, pre- and post-program surveys of the participants and the mentors, observation notes, and relevant program documents. I also had access to other Digital Animation data about participants: date of birth, grade, school, personal contact information, self-reported software knowledge, t-shirt sizes, and dietary preferences.

I used this data, along with local and national technology standards, to create the Year 1 program evaluation. After completing the project, I met again with Maria and Kathy and we discussed the possibility of my returning as the program evaluator the next summer. I was thrilled with the idea of being able to augment and improve the study of this program and its impacts. I was also determined to become a better qualitative researcher in the interim.

Throughout the next academic year, I took a qualitative research sequence of courses. During these classes, I relied increasingly on Digital Animation data for class discussion and project examples while I tried to choose a dissertation topic. Finally, one night in class in early January, I realized that being a paid program evaluator did not eliminate using this program as my dissertation research site. This was quite a revelation for me. By the middle of the month, I emailed Maria and asked if she would support this
idea, and she wholeheartedly agreed. She also agreed to serve on the dissertation committee (MP, PC, Winter05).

During this interlude between study years, I had the opportunity to consider my data gathering plans with more information and deliberate intention. I wanted to ensure I was collecting multiple, interconnected forms of evidence in working to understand the complexities of the program (Eisner, 1991; Lincoln & Guba, 1985; Patton, 1990; Stake, 2000; Wilson, 2003). I wanted to enter Year 2 of the study with clearer questions and plans for more thorough and focused data collection, but I also wanted to leave room for emergent data and collection strategies to surface (Denzin & Lincoln, 2000; Hoepfl, 1997). To do this, I reviewed and reconsidered previous practices.

I continued collecting observational data as a means to portray this program as a complicated “thing of many parts” (Angrosino & Mays de Perez, 2000, p. 675). I wanted to collect data for the purposes of program evaluation, but I also wanted to collect data for the purposes of my own research. To do this I incorporated Angrosino & Mays de Perez’s (2000) three types of observation processes – descriptive observation, focused observation, and selective observation (pp. 677-678). I wanted to collect general observations, and more of them, but I also wanted to be more focused, excluding information without relevance to our purposes, and selective, including more of the information that was relevant. In order to do this in Year 2, I attended each day of the Digital Animation summer program, as well as the bulk of pre-planning with staff and a significant portion of post-program wrap-up sessions. I took written notes on program activities, participant and mentor actions and interactions, and instruction, as well as drawing sketches of physical arrangements and action. I also recorded information from informal chats with mentors, administrators, and parents as observational notes.

I also wanted to include interviewing as a method of data collection. I interviewed Maria Palazzi several times before, during, and after Year 1 of the program, but no one else. The previous Digital Animation evaluators used focus group interviews with the participants, although the data yielded little useful information for the program administration. Because of this, although I considered doing interviews Year 1, I did not follow through with them. Instead, I relied on other collection methods. By Year 2, I understood I could use interviews as “active interactions between the two (or more) people leading to negotiated, contextually based results” (Fontana & Frey, 2000, p. 646). I could use them as opportunities to understand others’ perceptions of the program and its impacts, to augment and complicate my own observations and hunches. Denzin & Lincoln (2000) agree interviews are negotiated texts and recognize their importance as “a site where power, gender, race, and class intersect” (p. 633), particularly important within the context of researching how gender, feminist pedagogy, and VCAE interact within the program. I could approach them as semi-structured interactions, where I provided some starting points for conversation but allowed for diversions and departures. As a result, during Year 2, I included several interviews with participants as part of my research. I selected interviewees rather subjectively. I interviewed one participant because I found her interesting, different from most of the other participants in
the way she dressed, how she communicated, and the amount of direct assistance she needed. I based several interviewee choices on participants becoming available as they finished one task and waited to proceed. In one instance, a second participant entered during an interview and proceeded to join us. I chose one interviewee based on the fervor she displayed for the program and technology. In all, I officially interviewed six of the eighteen participants (ONY2; VMY2).

Surveys were one of the most important research methods I employed both years. I revised the mentor and participant pre- and post-program surveys from Year 1 for Year 2. I was more deliberate in word choices and explanations. I purposely chose to continue splitting the surveys into both qualitative and quantitative sections (Soy, 1997), for mentors and participants, even though the quantitative portions of the mentor surveys seemed less important throughout Year 2. While I distributed the surveys to participants on paper before and after the program, I emailed the mentor surveys, creating a hybrid instrument along the lines of what Fontana & Frey consider “electronic interviews” (2000, p. 666).

During Year 2, the biggest occasion for including emergent data collection strategies involved participant parents (Denzin & Lincoln, 2000; Hoepfl, 1997). As the program proceeded, I noticed parents had a lot of unsolicited and observational comments about the program and about their daughter’s participation in it. I began to record these in my observation notes at the end of each day. About midway through the Year 2 program, I realized the possible importance of capturing this data, too. Using the other surveys as models, as well as considering the parents’ comments, I created a survey for parents that I distributed and collected at the program final ceremonies and noted any additional verbal commentary they offered.

I also collected various forms of program documentation (Hodder, 2000). The ACCAD website contains the actual animations the participants created during their two weeks as well as storyboards, photos, and their website/research information (Harper, 2000). Additionally for Year 2, I arranged to have the final presentations taped, with help from Maria and other ACCAD staff members.

During Year 2, I ended each program observation day by writing analytic memos and reflections. This process helped me continue to focus my observations even more, as well as pointing me toward additional sources of information, such as the parent perceptions of the program. These memos provided a sense of continuing investigation, prodding me to consider larger ideas and their connections to smaller details.

Finally, I incorporated minor quantitative methods within the larger qualitative research scope. This mainly consisted of the Likert-type questions at the beginning of each pre- and post-survey. I intended to use this data to augment, triangulate, verify, and challenge my qualitative data and analysis (Fine, et al, 2000).
In the chart below, I list my Year 2 data collection strategies and timeline:

<table>
<thead>
<tr>
<th>Year 2 Data Gathering Timeline</th>
<th>Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>Met with Program Director</td>
<td>June 2005</td>
</tr>
<tr>
<td>Observed 4 days of pre-program staff planning (took Observation Notes)</td>
<td>June 13th - 16th</td>
</tr>
<tr>
<td>Pre-program surveys with Mentors</td>
<td>June 13th, 2005</td>
</tr>
<tr>
<td>Pre-program surveys with Girls</td>
<td>June 20th, 2005</td>
</tr>
<tr>
<td>Attended and Observed Week 1 (took Observation Notes)</td>
<td>June 20th – 24th</td>
</tr>
<tr>
<td>Daily Process Notes Week 1</td>
<td>June 20th – 24th</td>
</tr>
<tr>
<td>Attended and Observed Week 2 (took Observation Notes)</td>
<td>June 27th – July 1st</td>
</tr>
<tr>
<td>Daily Process Notes Week 2</td>
<td>June 27th – July 1st</td>
</tr>
<tr>
<td>Interviews with Mentors (recorded)</td>
<td>June/July 2005</td>
</tr>
<tr>
<td>Interviews with Girls (recorded)</td>
<td>June/July 2005</td>
</tr>
<tr>
<td>Post-program surveys with Girls</td>
<td>July 1st, 2005</td>
</tr>
<tr>
<td>Post-program surveys with Mentors</td>
<td>July 6th, 2005</td>
</tr>
<tr>
<td>Post-program surveys with Parents</td>
<td>July 1st, 2005</td>
</tr>
<tr>
<td>Copies of Visual Objects produced by Girls</td>
<td>July 2005</td>
</tr>
<tr>
<td>Web access to Animation produced by Girls</td>
<td>July 2005</td>
</tr>
<tr>
<td>Drafted Program Evaluation and submit for review</td>
<td>Sept 2005</td>
</tr>
<tr>
<td>Revised evaluation and submitted final copy</td>
<td>Sept 2005</td>
</tr>
<tr>
<td>Follow-up contact with last year’s participants (longitudinal survey)</td>
<td>ongoing</td>
</tr>
<tr>
<td>Meeting with Program Director</td>
<td>ongoing</td>
</tr>
</tbody>
</table>

*Figure 10: Data Gathering Timeline for Year 2*
Year 2 was a modified version of the data collection timeline for Year 1. Below, I provide a chart summarizing the Digital Animation data I collected both years:

<table>
<thead>
<tr>
<th>Data Collection for Digital Animation Case Study</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous Evaluation Data</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Pre-program surveys (girls)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Post-program surveys (girls)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Pre-program surveys (mentors)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Post-program surveys (mentors)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Formal Interviews (girls) (INT)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Informal Interviews (girls)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Formal Interviews (mentors) (INT)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Informal Interviews (mentors)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Formal Interviews (administration) (INT)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Informal Interviews (administration)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Post-surveys (parents)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Informal interviews (parents)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Observations/field notes (ON)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Analytic/Reflexive Memos (AM) If voice memo, VM</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Formal Program Evaluation Report (EV)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Comparison w/ Tech Education Local and National Objectives</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Web Pages with Digital Animation finished projects</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Videotape of end presentations</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Figure 11: Overall Case Study Data Collection for Years 1 - 2

While I had access to all of these data sources, I did not use all of them in my data analysis. Some are redundant, some off topic, and others, projects for a later time.

In the next section I present and contextualize the methods of data analysis I use in the Digital Animation case study.

METHODS OF DATA ANALYSIS

My data analysis began well before my dissertation; Maria Palazzi expected a formal program evaluation about two months after the Year 1 program’s conclusion. I used previous evaluations, pre- and post-surveys from participants and mentors, interviews, observation notes, personal communications, and access to the online Digital Animation photos, websites, and animations.

P/research: Preliminary Data Collection, Review, and Analysis

My first goal was to provide some hard information about the kinds and degrees of changes participants and mentors reported before and after the program. To begin this analysis, I created a chart for
recording the Likert survey responses in two dimensions – by participants and by questions. The chart below is an excerpt from this initial sorting process of participant pre- and post-surveys:

<table>
<thead>
<tr>
<th></th>
<th>Lynn</th>
<th>Ana</th>
<th>Raquel</th>
<th>Liza</th>
<th>Gillian*</th>
<th>Renee</th>
<th>Carla</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
</tr>
<tr>
<td>1 Self confident</td>
<td>A</td>
<td>SA</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>2 artistic</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>3 consider art job</td>
<td>SA</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>4 comfort w tech</td>
<td>SA</td>
<td>SD</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>5 sci/tech career</td>
<td>A</td>
<td>SA</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>6 computers social</td>
<td>SA</td>
<td>SD</td>
<td>A</td>
<td>A</td>
<td>SA</td>
<td>SA</td>
<td>SA</td>
</tr>
<tr>
<td>7 computers active</td>
<td>A</td>
<td>SA</td>
<td>A</td>
<td>A</td>
<td>SA</td>
<td>SA</td>
<td>SA</td>
</tr>
<tr>
<td>8 computers collab</td>
<td>A</td>
<td>SD</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>SD</td>
<td>SA</td>
</tr>
<tr>
<td>9 comps imp prob</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>SA</td>
<td>SA</td>
</tr>
<tr>
<td>10 take tech in hs</td>
<td>A</td>
<td>SD</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>SD</td>
</tr>
<tr>
<td>11 tech post-hs</td>
<td>SA</td>
<td>SD</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>12 men likely</td>
<td>A</td>
<td>A</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>13 art/creat women</td>
<td>SD</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>14 techno women</td>
<td>SD</td>
<td>SA</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>15 women artists</td>
<td>SA</td>
<td>SA</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>16 women technos</td>
<td>SD</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>SA</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>race</td>
<td>AfAm</td>
<td>W*</td>
<td>W</td>
<td>W</td>
<td>PR</td>
<td>Germ.</td>
<td></td>
</tr>
</tbody>
</table>

Pre/Post: A = Agree; SA = Somewhat Agree; SD = Somewhat Disagree; D = Disagree

*This participant did not complete a post-program survey due to absence.

Figure 12: Excerpts from Year 1 Pre- and Post-Program Survey Responses

Using the table above, first I tabulated the results across participants, question by question. I noted any changes participants reported, their direction, and their magnitude. For instance, a participant reporting an initial SD (Somewhat Disagree) and a final A (Agree) creates a positive change of two magnitudes, or a +2 change. In one calculation, I combine categories A with SA, as a positive attitude or response; and SD with D, as a generally negative attitude or response. Using these two categories, I recorded the percentage of participants responding positively and negatively, before and after the program. For instance, 83% could generally agree with a statement before with 91% agreeing after the program, showing an 8% increase. I also examined each participant’s responses to note their overall positive or negative trends. Additionally, I noted anything interesting or unusual about the pattern or specifics of the responses. I produced a data set
for each Likert question, including the text of the statement, any relevant or captivating information or absences, and a statistical percentage of participant response rates. Here are two examples:

4. I am comfortable with technology-related tasks and activities

Only 2 girls did not feel comfortable (SD) with technology at end of the program (Lynn and Renee – minorities, although Lynn wants a career in technology as an engineer and Renee thinks technology “is a lot more fun and easier than [she] thought it would be,” and is interested in future ACCAD opportunities.

At least 92% of girls in the program reported being comfortable with technology.

13. I know women who are good at artistic and creative tasks

All girls were positive on this at end (M was lowest at end with the only SA). Lynn from SD to A.

From 92% at beginning to 100% at end.

In the Year 1 final evaluation, I presented this information and analysis as an appendix. One factor I found striking was that after the program some participants reported a slight decrease in, or more negative impression of, technology, as well as a decreased likelihood of pursuing future technology options. These statistics, although accurate overall, did not reflect my impression of the Digital Animation program. I struggled to reconcile the numbers with the feelings. I knew the negative responses of these participants would dissolve a bit in the larger pool of data, but they continued to tug at me. I rationalized that one of the most positive participants did not complete a post-program study and how that may have skewed the percentages. I worried that this kind of evidence, taken out of context, could have a negative impact on program funding opportunities, depicting Digital Animation as unsuccessful without accurately representing the comprehensive experience and impact of the program. Using the Likert scale binary division, overall data trends more accurately reflected my holistic sense of the program’s unqualified success. For example, survey statement 6:

Figure 13: Survey Sample Questions and Analysis
6. Working with computers is social

Renee and Lynn did not see computers as social (SD) post program. 3 went down 1 ranking, 2 went up. Overall, those viewing computers as social decreased, but only slightly, by one more participant reporting a decrease than an increase.

At least 83% saw working with computers as being social.

In this data, I note the post-survey decrease, the participants reporting them, and additional significant information. For example, I note which two participants responded with Somewhat Disagree or Disagree on the post-survey; the implication is that the other decrease was from Agree to Somewhat Agree – a negative change, but still a positive response overall. Two participants reported an increase in their perceptions of working with computers as social, slightly countering the three decreases. In the end, I provide a simple statistic synthesizing the most positive statistical interpretation. For this example, I determine that 83% of the participants report seeing computers as social by the end of the program but without fully contextualizing the qualitative components of this information, a task I tackle in the next three chapters. This number presents a limited slice of information. It does not intimate relationships, whys, or hows. It does not offer room for much reflection or questioning. In my naiveté, I assume the data and the final evaluation report need to be positive to be valuable. As a result, I am pleased when any of the quantitative statistics are positive, pleased with any increases or positive numbers. Eventually, I realized these numbers, without context and complexity, are mere simple abstractions of the program – like pretty pictures. I realized the combination of quantitative and qualitative methods produced much richer data with much more information for consideration and analysis.

While I hoped the Likert response section would provide solid, easy data for Digital Animation’s use, I hoped the qualitative responses would give me a fuller understanding of how the participants experienced the program and why. Again, I aggregated participants’ qualitative responses, first by each participant and then by each question. In reading any participant’s response set, I understood more about her expectations, experiences, and impressions of the program, technology, and animation. I synthesized the program pre- and post-survey responses, included as an appendix. In reading all participants’ responses to a question, I created a fuller understanding of their collective reactions, the overall program sense of something, while simultaneously seeing more nuances and individual interpretations. I relied on these collective impressions to craft a more narrative version of participants’ responses to the program – most positive, but some critical, offering valid points to consider in planning for future programs.

After compiling the same kinds of initial analyses for the mentor survey data, I revisited the Digital Animation evaluation from the previous researcher, summarizing the highlights: 57% of participants would consider animation as a career; 60% had more positive impressions of what working in technology might entail; and 100% enjoyed working with the mentors. Then I re-read my Year 1 observation notes, summarizing my overall impressions of the program and highlighting key practices, philosophies, and ideas.
what I called “data trends.” From these data trends and observational notes, I compiled a list of what I considered best practices, providing observational evidence to support my assertions. I compared the Year 1 data with the previous evaluation and recommendations, analyzing which ones Palazzi implemented, modified, and disregarded.

Following this, I again reviewed the Year 1 observation and survey data, comparing and compiling a list of concerns and recommendations. These concerns included the decrease in participant racial diversity, the frustrations of minority participants, the lack of formal critical reflection/critique, times when participants watch others use technology versus the times they use it themselves, the ineffectiveness of the teacher component, and the lack of direct technology connection from the guest speakers.

My continuing doubt and dissatisfaction with the numerical data also spurred me to demonstrate ways Digital Animation achieved national and local technology educational objectives. I located the Ohio Department of Education and State Board of Education’s official K-12 technology standards, adopted in 2003, the International Society for Technology in Education’s National Education Technology Standards for Students (known as ISTE-NETS); and the No Child Left Behind Technology Literacy requirements. I used these documents to produce a summary of the objectives and requirements Digital Animation addressed through the two-week program. I also began considering ways Digital Animation met educational objectives and goals across other multiple disciplines – science, mathematics, language arts/literacy, social studies, and the arts. I briefly considered producing a document demonstrating the interdisciplinary effectiveness of Digital Animation’s curriculum and pedagogy, but after realizing the magnitude, I abandoned that plan.

I used the data and analyses to create a full evaluation draft for Maria and Kathy to review. They returned them with suggestions, and I worked to address those. Maria registered some frustration with the numerical data, too, wondering whether this kind of information was even useful (MP, PC, Sept04). She wondered what we could do to capture the kind of information she wanted in a better way, or if it was even possible to get the information she wanted without longitudinal data. She was pleased with the report, overall, but still troubled by her unanswered questions about the impact of this program, and similar approaches, and her sense of how trends with women and technology might be shifting in ways contrary to recent data on girls and technology (MP, PC, Sept04).

Qualitative Research and Digital Animation

Following Year 1 of the Digital Animation study, I took a three-course sequence on qualitative research. During this series, I returned to my Digital Animation data over and over. I used the data for examples in class discussions and assignments. I became more intimate with the data, and learned more explicit ways to examine and present qualitative data. Fred Erickson’s (1986) process for creating and supporting assertions, and then presenting discrepant data, became a foundational tool for my analysis. I used class assignments as opportunities to think deeper about the conflict between my impressions of the program as successful, while the qualitative data questioned its success.
I returned again to my Year 1 observation notes and responses to qualitative survey questions. I reviewed my evaluation of the program’s successful “best practices.” Then, I looked at the qualitative answers of the participants who reported a decrease in their likelihood to take additional technology courses. I thought about their answers and reasons for this decrease. Afterwards, I examined the demographic data of the participants who reported an increase and those who reported a decrease. I applied the qualitative research process of “inductive analysis, which means that categories, themes, and patterns come from the data,” searching for commonalities (Greene, 2000, p. 389).

One thing I realized was that two of the participants reporting decreases as a result of their Digital Animation technology program experiences were racial minorities, more specifically, racial minorities unrepresented by the mentors. I was hesitant to offer this interpretation initially. I was concerned about drawing conclusions from such a small sample, but I was interested in considering reasons participants gave for decreasing their plans to seek courses or careers related to technology. I was also interested in the participant who did not complete a post-program survey due to a family vacation, Gillian. She self-identified as a racial minority, a member of a race also not represented by the mentors. Gillian was also the most vocal and demonstrative participant about her enthusiasm and enjoyment of Digital Animation. Although I have no solid proof, my observation notes recording her repeated “yeah,” “cool,” and “wow” statements led me to believe her post-survey would have been very positive toward the program. In considering this, I estimated the possible impact of an additional set of positive post-program ratings on the statistics. I realized that given the small sample size, negative experiences and decreased rankings could also have a disproportionate impact on the statistical data. This process helped me determine what I wanted to investigate about Digital Animation. It provided a way to use the data to craft a hunch, look for additional support, and to question the hunches – vital in feminist and poststructuralist research.

About midway through the school year, in a slow-dawning fashion, I realized Digital Animation could be my dissertation study site. Once my study was approved and confirmed, I used more course assignments as opportunities to learn and practice data gathering, analysis, and presentation skills. I continued to review my data, often in small chunks. I wrote about my data as a form of qualitative inquiry (Greene, 2000), a “method of discovery and analysis” (Richardson, 2000, p. 923). I created visual representations for data and for conceptual mapping.

After confirming my case study, I began a short supplemental lab experience using Nudist qualitative research software. Using the Year 1 Digital Animation data for exercises encouraged me to extend my earlier analytical attempts, working to develop initial codes, or topics, that seemed significant or prolific within the data. At first, as I created digital versions of Year 1 data and re-read it, I developed codes at a dizzying pace. Every idea was an important idea. I quickly surpassed the point of manageable codes, struggling to keep notes, abbreviations, and definitions for these codes organized and updated. Simultaneously, I continued to mull research question possibilities and consideration. How did I want to explore this data? What did I want to learn from this program? Why?
As I began working on sections of my dissertation proposal, I continued to struggle to define what I was trying to do, what I wanted to analyze. I wrote reflections and reviewed my course work for guidance. Eventually, I noted my interest and pursuit of courses involving feminist poststructuralist theories, research, art education, visual culture, gender, and technology issues. As I worked to “crystallize” my ideas with respect to my interests (Richardson, 2000), I also worked to combine my multi-layered, over-abundant codes, merging topics and examples into larger concepts. I used Nudist coding and sorting functions to do a few simple data sorts and elementary attempts at analysis. Using Nudist gave me insight into ways of coding and organizing data. While Nudist allows any section of data to have multiple codes, using the same approach with multi-colored highlighters eventually results in smudgy, indiscriminately striped, near unreadable text. Nudist, or a qualitative software program like it, may eventually help in grappling with larger bodies of data or larger numbers of variables and codes, in this research, it demonstrated my need to combine and simplify.

I met with Maria Palazzi in February of 2005 to discuss the previous evaluation and think critically about what changes to make to our research processes, tools, and questions for Year 2. As I solidified my case study research plan for Digital Animation, I needed to define my questions and their relevance to gender and technology research, feminist poststructuralist pedagogy, and VCAE. I wanted to use these areas as theoretical paradigms for examining the Digital Animation program, working to align my research in ways that supported and complemented the current program evaluation strategies.

In the sections that follow, I document additional Year 2 Digital Animation case study analysis methods and realizations. I explain my concurrent processes of refining the research questions with revising my coding categories. I use these to guide my development of a case-specific analytical framework. I provide a flow chart to illustrate how I apply each component of my analytic framework, including relevant research and scholarship, to the data from Digital Animation.

Data Analysis

Earlier in this chapter, I noted my different data gathering methods from Year 1 to Year 2 of the Digital Animation case study. In Year 2, I did no additional comparisons with external organizations’ technology education objectives; the previous comparisons provided enough evidence of ways Digital Animation met national and local technology education aims. From Year 1 to Year 2, I mostly augmented data collection: adding observation days and increasing my note-taking; writing analytic memos (Guba & Lincoln, 2000, p. 183); official interviews with select participants, based on my interests and their availability; informal parent interviews and formal post-program parent surveys; final presentation videotaping; and longitudinal surveys for previous participants.

I also realized the processes I used to compile my Year 1 evaluation (EVY1) for Digital Animation provided a partial draft for more comprehensive, rigorous analytical processes. I had a rough idea of how to sift through and consider my data, but I needed more focus. I used my three primary
concerns to construct specific lenses for analyzing data: gender and technology research, feminist poststructuralist pedagogy, and VCAE.

**Preliminary Data Coding**

My original broad coding categories included my three theoretical paradigms and my role as researcher. I felt relieved to have some focus, even if it was multi-faceted. But I could not completely relinquish my desire to capture everything I could from the data. I kept two catch-all categories: “Lingering Questions” and “Miscellaneous.” I assigned each preliminary category a color and used highlighters to code the data manually.

Next, I provide examples of my data analysis tools, including a revised coding categories chart. I referred to notes and scholarly materials in each of my focal interest areas, using these to compile three sets of qualities and concerns. As I developed these sets, I also began considering ways my data might contradict, extend, or modify these characteristics – discrepant data. I added this code to my categories.

**Shifting from Year 1 to Year 2 of Data Analysis**

The shift into gathering Year 2 data did not end the analysis I had already started. In fact, the Year 1 final evaluation analysis provided my data gathering with more focus and intent. Having focal concerns in mind impacted the kinds of data I looked for, noticed, excluded, recorded, and reported. Also, the preliminary coding categories and subcategories encouraged me to think specifically about the program philosophies and operations. I wrote analytic memos at the end of each program observation day (AM05), reflecting on and beginning the analysis of each day’s happenings or realizations. The categories constructed and framed what I saw, pondered, and believed.

After Year 2’s conclusion, I again sorted and analyzed data, first toward producing another program evaluation for Palazzi and then for this case study. I compiled and compared pre- and post-program survey data from participants and mentors, qualitatively and quantitatively. I also reviewed the parent surveys and my observation notes. I used the Year 1 program evaluation as a template for analyzing and evaluating the program, delineating continued successful practices, overall impressions of the program from each set of subjects, areas of improvement, and suggestions for more.

I delivered a draft of the Year 2 evaluation (EVY2) to Maria Palazzi after the program. She reviewed the document, a member check of sorts (Lincoln & Guba, 1985), and provided feedback. I revised the document based on her feedback and submitted an official copy. In the next sections, I continue explicating my post-evaluation analysis methods, including data organization, application of the theoretical frameworks, coding, sorting, and proposing findings. In the figure below, I use feminist poststructuralist pedagogy as an example for illustrating my analytical process.

Qualitative research insists on rigorous, systematic procedures as a method of validating qualitative analysis and findings (Denzin & Lincoln, 1994; Richardson, 1991; Steinke, 2004). In order to conduct a systematic review and analysis of this data, I organized hard copies of the data into two separate notebooks, Year 1 and Year 2. Within each notebook, I separated the data by categories: evaluations,
participant surveys, mentor surveys, parent surveys, demographic information, observation notes, analytic memos, and meeting notes. I transcribed any digital voice memos and catalogued observational recordings and added them to the appropriate years.

I began my formal case study analysis by coding data from Year 2 because of its freshness to me. I began with large codes that represented my major theoretical perspectives as well as a couple of other broad categories.

**Large Topics:**
1. Research - My Role, Relationships, Problems, Issues, etc…(ME) RED
2. Feminist Poststructuralist Pedagogy (FPP) BLUE
3. Visual Culture Art Education (VCAE) PURPLE
4. Gender and Technology Research (GT) PINK
5. Miscellaneous (MS) YELLOW
6. Discordant Data (DD) GREEN
7. Lingering Questions (LQ) ORANGE

*Figure 14: Initial Qualitative Data Coding Categories*

As I read the data, I highlighted words, phrases, and passages of text, but not without difficulty. Sometimes data did not fall cleanly into only one category; sometimes it did not fall into any categories at all. During this coding cycle, I still allowed myself to assign data into multiple categories, marking some passages of text into linear, near-illegible rainbows. I coded my observation notes, survey data, analytic memos, and the evaluations. Sometimes I made notations, writing key topics or words from the text in the margins. I transcribed interview and meeting recordings, added them to the notebooks, and coded them, too.

At times I had to shift my understanding and clarify my use of each code. Sometimes I included anything related to the code, and sometimes I decided related data might be more relevant elsewhere, working to distinguish more clearly between coding categories. I tried to note these changes in my process notes, but the shifts were not always smooth, and sometimes my coding of similar data vacillated between topics. Also, during this coding pass, I realized several of my codes were confusing and unnecessary, mainly “Miscellaneous” and “Lingering Questions.” Eliminating these codes forced me to focus on relevant data and disregard other information. I repeated this coding process with each hard copy document in my Year 1 data notebook, too.

**Developing an Analytical Framework: Digital Animation Data and Theoretical Lenses**

After completing the preliminary coding of all Year 1 and Year 2 data according to my major areas of interest and concern, I implemented a two-pronged approach to data analysis, one starting from the
data and one from a theoretical perspective. I took the *Digital Animation* data and re-sorted it into separate documents according to my major codes: Feminist Poststructuralist Pedagogy (FPP), Visual Culture Art Education (VCAE), Gender and Technology Research (GT), and Research/er (ME), and Discrepant Data (DD).

![Flowchart diagram](chart.png)

*Figure 15: My Analytical Process for Theoretical Frameworks using Feminist Poststructuralist Pedagogy as an Example*
After sorting data into these broad areas, I returned to the theoretical paradigms, using their main characteristics to construct my frameworks for reviewing and analyzing this data. I re-read articles, chapters, and notes, applying a process similar to coding the qualitative data — noting the major ideas and providing evidence to support them. I used these major ideas to create subcategories for coding within each theoretical framework. For example, within the larger feminist poststructuralist category, I created codes for subcategories including “collaboration,” “power,” “language,” and more. I re-read and re-coded all Year 2 data, each time using subtopics from different theoretical perspectives, revising the codes continually in an evolving process of categorization, agreeing with Charmaz (2000) that coding “keeps us studying our data” (p. 515).

I tried to group data and theoretical categories logically, but the decisions on placement are subjective and may appear arbitrary at times; sometimes my original reasons for their placement elude me. These topics are inseparable, overlapping. I try to explain my choices and analysis throughout each chapter. Combining theory and data, I analyze ways they align and ways they conflict or exceed each other. I reorganize the data and theory combinations into more developed outlines.

While this analysis process appears cumbersome, it provides a structure for methodological and rigorous review of my data and the scholarship pertaining to my three theoretical perspectives. This process provides me with the means to critically examine the data from each lens, and with the framework for critically examining the relationships and tensions between and among them.

Hopefully my narrative of data collection and analysis, along with the analysis chart provide a clear sense of my process. In many ways, my analysis reflects a grounded theory approach. Like Charmaz’s (2000) grounded theory, my research includes: a) simultaneous collection and analysis of data; b) a two-step data coding process; c) comparative methods, d) memo writing aimed at the construction of conceptual analysis, e) sampling to refine the researcher’s emerging theoretical ideas, and f) integration of theoretical framework (pp. 510-511). I also incorporate Charmaz (1983, 1995, 2000) and Glaser’s (1978, 1992) ideas about the “constant comparative method” of grounded theory, where comparing includes data from the same individuals across time, incidents with each other, data with categories, and categories with each other (Charmaz, 2000, p. 515). Grounded theory also allows for research starting from multiple different theoretical vantage points (Charmaz, 2000, p. 511), like this study. Additionally, grounded theory challenges the arbitrary divisions between research and theory (Glaser & Strauss, 1967), similar to feminist research.

Freedman (2004) advocates that we, in art education, should do more research that serves to document, apply, validate, trouble, and develop grounded theory. Eisner (2001, 2006) advocates increasing art education research. This case study is an attempt to create, gather, and analyze data in an effort to construct grounded theory relevant to each theoretical framework. This study provides information about the complicated intersections of theory and practice. Additionally, this case study validates and troubles each theoretical framework’s assumptions, assertions, and applications. Investigating these intersections...
should provide an important foundation for further development of theory and practice, increasing each theoretical area’s sense of transdisciplinary relevance.

**Validity**

One of the major concerns of qualitative research such as this case study is the question of validity. For Lincoln & Guba (2000), validity means that research findings are “authentic,” related to the study context, and that researchers must be able to trust their findings enough to allow them to form the basis for “social policy or legislation” (p.178). In the next paragraphs, I develop the concept of validity in poststructuralist qualitative research and provide evidence of validity measures in the Digital Animation case study.

Lather (1991) argues that in qualitative poststructuralist research, the primary validity questions we must continually ask are: “Are we interpretively rigorous? Can our co-created constructions be trusted to provide some purchase on important human phenomenon?” (p. 179). Qualitative research “becomes the practice of a form of practical philosophy – a deep questioning about how we shall get on in the world, and what we believe to be the potentials and limits of human knowledge and functioning” (Lather, 1991, p. 179). To evaluate and validate these kinds of practices and findings, we need to apply “entirely different criteria [that] might be used for judging social inquiry” than we use for judging scientific and artistic ones (Lather, 1991, p. 179).

**Digital Animation Data Sources and Citation Codes**

To create a valid study, I gathered multiple forms of data using multiple methods, developed rigorous analytical frameworks and processes, and used member checks. My data must support critical analysis that rings true, to the research participants themselves and to other scholars (Lincoln, 2000; Stake, 2000, p. 443). A major factor in establishing the validity of this case study was the length of my involvement with the program. I attended Digital Animation for two consecutive summers, attending each program day during Year 2 of the study. I also returned for unofficial observations during the program year following the case study. During the span of my involvement I took notes during meetings and conversations, kept email records, digitally audiotaped some meetings and program sessions, kept observation notes, completed personal interviews, surveyed mentors and participants before and after the program both years, surveyed parents at the end of Year 2 and videotaped the presentations. I also completed program evaluations both years, providing appendices correlating Digital Animation with state and nationally recognized technology education standards as well as across academic disciplines. I collected news articles about the program as well as information and the animations on the Digital Animation website. Throughout this dissertation, I use abbreviations for different data sources: ON for observation notes, EV for program evaluations, INT for interviews, VM for voice memo, followed by 04 or 05 to designate the case study year. For data where abbreviations could prove too confusing, I defaulted to fuller titles, like with participant post-surveys or personal communication.

In order to consider what this case study could offer to help us “get on in the world” better, I reviewed literature about gender and technology, feminist pedagogies, and visual culture art education.
What can this program contribute to our understandings of these concerns? What are the related implications of the program’s functions and outcomes? Answering these questions and judging the validity of these responses requires some community consensus, building validity through the believability of my assertions for different stakeholder populations (Lincoln & Guba, 2000, p. 167). The data, representations, theoretical and analytical processes, and conclusions must have enough substance, logic, and evidentiary support to validate them, given the specifics of my case. Each method of data collection becomes a layer of evidence, and my duty as the researcher involved ensuring I gathered enough data to create a sense of data saturation – enough evidence from enough different sources to support analysis and conclusions. This triangulation of data “surfaces as a critical element in the practice of social science: ‘adding’ one layer of data to another to build a confirmatory edifice” (Fine, Weis, Weseen, & Wong, 2000, p. 118).

For this study to possess strong internal validity, I also need to align my researcher practices and intentions with my theoretical frameworks, grappling with ethical issues involved in doing research, or what Lather (1993) calls bringing “ethics and epistemology together” (p. 686). To conduct critical, feminist, poststructuralist research, my methods need to be concerned with issues of language, power, subjectivity, and truth with attention to (mainly gender) inequities. I developed consent forms for participants and mentors and I asked interviewees to verbally acknowledge awareness and consent for recording and using interviews. I questioned my use of terminology throughout the case study, especially the use of “girls” versus “young women.” Official program documents use the term “young women” very deliberately (www.accad-osu.edu), but in conversations, meetings, tutorials, and with the participants themselves, the term “girl” dominates. In this dissertation, I try to use young women in my analysis and “girl” as it occurs in context.

My research also includes several formal and informal member checks. The program evaluation draft and revision process provided Maria Palazzi and Kathy V. the opportunity to review and respond to the data, analysis, and presentation. In meetings, Palazzi and Kathy V. also deliberated the value of the evaluations and research. What were we learning from this data? Is that what we really wanted to know? What should we ask? What changes should we make based on this? These venues provided direct program feedback in this case study, raising issues and highlighting observations.

In feminist qualitative research, researchers acknowledge their biases, assumptions, and agendas. I embraced reflexivity, or the process of critical self-reflection, to investigate my own biases and assumptions, acknowledging and considering the benefits and limits of myself as the research instrument (Guba & Lincoln, 1981). I continually pondered my representations of myself and others within the context of this study. I wrote reflective memos about the data and about myself, working to situate myself in relationship with this study. I continually returned to scholarship surrounding my theoretical frameworks for guidance with my reflexive awareness as well as for guidance with my data analysis.

Admittedly during the course of this research I formed an intimate relationship with the program, the study, and the data, aware that my interests and observations, as well as situational factors, shaped this
inquiry (Denzin & Lincoln, 2000, p. 8). Reflexivity included acknowledging and considering my own subjectivity as well as considering how these affect my positions, actions, and impact on others and the program. For Greene (2000), “qualitative researchers accept the fact that research is ideologically driven. There is no value-free or bias-free design” (p. 385). What were my reasons for doing this research? What did I hope to learn? I asked these kinds of questions throughout the process. I also considered ways past data and evaluations could inform future program structure and implementation.

In doing feminist poststructuralist research, I locate myself within traditions that value reflexivity as a key process, a defining feature (Pillow, 2000; Travers, 2001). Reflexivity is a fluid process of locating subjects and acknowledging the slipperiness and messiness of their multiple, unknowable, and shifting subject positions (Pillow, 2003). In feminist and poststructuralist research, many scholars insist researchers bear primary responsibility for reflexivity, beginning with their own critical self-reflections, acknowledging their multiple subjectivities socially, historically, geographically, culturally, and contextually (Charmaz, 2000; Gergen & Gergen, 2000; Pillow, 2003; Sinacore, et al., 1999). Reflexivity involves researchers disclosing their personal investments, biases, assumptions, and beliefs (Creswell & Miller, 2000; Pillow, 2003), as well as explicitly exploring and exposing the politics of representation (Pillow, 2003) and scrutinizing the ethics of the research (Kleinsasser, 2000).

Reflexivity can serve several purposes simultaneously: increasing self-awareness, increasing scholarly accountability, acknowledging multiple truths, and valuing collaboration with others (Pillow, 2003; Sinacore, et al., 1999). Pillow (2003) presents reflexivity as including the recognition of self, recognition of others, recognition of truths, and transcendence. The recognition of self proceeds through rigorous researcher self-monitoring, precipitating the recognition of others. These recognitions of others invoke the “crisis of representation,” or the struggle to recognize and represent the self and others accurately and respectfully (Denzin & Lincoln, 2000; Lincoln & Guba, Pillow, 2003). Researchers must represent themselves fairly and accurately, including their presence and the impact of their personal subjectivities on the research. Researchers must also represent others in fair, accurate, respectful, kind ways (Denzin & Lincoln, 2000, p. 158; Fontana & Frey, 2000; Olesen, 2000). Qualitative researchers must present a believable, justifiable, and contextualized version of their data, observations, and interpretations (Stake, 2000). This believability includes addressing issues of representation and voice, such as minority experiences within systems that oppress them (Olesen, 2000, p. 231).

According to Pillow (2003), the principle of reflexivity insists researchers not believe they transcend any situation, becoming objective; instead, researchers should have continuous awareness of their situatedness and a constant acknowledgement of their subjectivity, evolving point of view, and state of being. A goal of reflexivity is to use the methodical processes of learning about the self and continual self-awareness through self-monitoring to illuminate deeper, richer meanings about personal, theoretical, ethical, and epistemological aspects of research. Qualitative researchers believe this depth and awareness
creates good data (Kleinsassser, 2000), exposing more of the multiple mechanisms of power at work in society, in themselves, and therefore in the research (Gubrium, J. & Holstein, 2000).

In this study, I worked to notice, consider, and report my own biases, foreground my theoretical frameworks, acknowledge my assumed “regimes of truth” (Lather, 1993), and hopefully relate and contextualize any insights. The Year 1 evaluation I delivered to Maria Palazzi reflected my absolute enamored-ness with the whole program. To me, it was a complete and utter success. I wanted all the data to echo that sentiment clearly. Funders needed to understand that this program was amazing and working and worthy of continued support. During the school year between Year 1 and Year 2, I realized Maria was not completely satisfied with having such an overly positive evaluation. It dawned on me that she wanted data to provide her with a clearer picture of what was happening in this program, not just a pretty one. Palazzi wanted to know what different groups thought about the program, positively, negatively, and as constructive criticism. She wanted to know what worked, what did not, why, and how to improve the program as a result. She wanted to know how different participant groups experienced the program, what impact it had, and what future impacts it might have. During the year, I realized reflexivity required challenging and deconstructing my research assumptions, data, data gaps, inconsistencies (Fontana & Frey, 2000), or what Gergen & Gergen (2000) call recognizing the “surprises and ‘undoings’ in … research” (p. 1027).

As an attempt to formalize my reflexivity during Year 2 data gathering, I wrote a reflexive memo at the end of each program day. In these memos, I struggle much more directly with issues of my research process, taking time to consider events of the day more fully, as well as my roles and investments in them. In the following example, I provide an excerpt of a reflexive memo from Year 2. In this memo, I explicitly use reflexivity to consider the “crisis of representation” as well as to challenge my own previous biases and assumptions. Lather (2004) asserts reflexivity provides the opportunity to “interrogate representation” and “contest bodies of thought and practice which shape inquiry, negotiating the complex heterogeneity of discourse and practices” (Lather, 2004, p. 427). Throughout the academic year, I spent time considering discrepant data and thinking about the program, planning future data gathering as I mulled the previous set. My July 4, 2005, reflexive memo provides an example of this process, where I interrogated my own thinking about the program, reflected on what I have been noticing as a result, and considered other ideas, approaches:

What was I thinking about this program last night? I was thinking that I should consider the discrepant data – what was going on in Ingrid’s group that this year another minority student who wasn’t represented specifically by the mentors did not really respond as well as the indicators suggested she would (Alyssa). She identifies as having “Chinese heritage” and there were no Chinese mentors. She did not see anyone who looked like her as a mentor in the program. Interestingly, Natalie, who identifies as being of Puerto Rican heritage, experienced the program entirely positively even though she was not represented by the mentors ethnically either. She was older. And I should check to see what each of these girls said about their experiences and their desire to return or continue considering this field. Also, I should think about what they say about their mentors. Is it enough for some kids that they have women mentors while others really need to see themselves specifically? Are other factors also at play here? I should also examine Kayla’s
survey to think more about what her experience (self-reported) might also reflect. She and Diane were very similar in terms of their incoming attitudes, but they seemed to experience the camp very differently and have different ending attitudes toward a computer career by the end (or maybe they were more honest or maybe they are more fickle right now...who knows???). (VM, 4July05)

In this example, I reconsider my previous interpretations of the overall success of the program in the context of the discrepant data around minority students’ experiences. I am particularly interested here in whether some students need to see their identities more closely represented in order to support their success. I express concern about how minority students experience this program differently than white participants, even though all mentors are female and relatively close to the participants in age. Practicing this kind of reflexivity prompted me to re-examine my data with more sensitivity. I needed to think carefully about the data that did not reflect my strong bias toward seeing only program successes. I needed to pay attention to how I was representing the data, and what it meant to elide the differences between students as they reported their experiences. I needed to consider more complicated, conflicting interpretations and observations of the program. Where did Digital Animation succeed? Who experienced it positively? Who experienced it negatively? Who felt indifferent? How? Why?

In addition to considering data more fully, reflexivity also prompted me to consider the effectiveness of my research methods. In Year 2, I recorded larger amounts of data through observations, surveys, and interviews. One of my most significant changes in Year 2 was making a commitment to use writing more intentionally. I used writing as an attempt to make my thinking more visible so I could more closely consider and interrogate my data and my methods (Kleinsasser, 2000). I also used more writing because it forced me “to relate to [my] material differently” (Richardson, 2000, p. 931). Perhaps most significantly, the increased writing as deliberate reflexive practice helped me achieve critical presence as both a participant and observer in the research study and process (Frow & Morris, 2002, pp. 326 – 327).

Here I provide an example where reflexive writing improving my awareness of, and ability to alter, my research methods. By paying attention to the research process, I was able to develop a sense of some things I could change to increase the likelihood of participants interacting with me more fully and providing better information. Also, in this example, I reflexively consider how to solicit more of the information Palazzi wants from the participants. This is an important part of reflexivity for me – enabling me to pay attention to being a collaborative researcher so that the research always reciprocally benefits the program and future participants (Lather, 1986b; Pillow, 2003). In observation notes from June 21, 2005, I write:

It’s around 3:30 now. I’m interested in how the girls have experienced another day. I am also interested in how tomorrow will go [the trip to Big Darby Creek watershed]. I want to see if I can do some informal interviews and discussions with the girls, hopefully I can hit some of the questions Maria mentioned to me that she might like to explore more (and that I completely left out in revamping the survey). I can’t decide if it would be better to do a survey addendum or to try to ask the girls more individually. I might get more thorough responses in discussing versus asking for written responses. Their written responses weren’t all that developed, for the most part. I got responses, but often they seem more surface-level. I am a bit reluctant because it means
taking a more prominent role in interacting with the girls than I have before. It may be easier with this group because they are younger. I may be able to do it on the bus ride tomorrow. I should have the opportunity to do that as we travel, but I have to get up my nerve to insert myself into their interactions and conversations. I should create a note card or crib sheet for asking them questions to make sure to cover the topics Maria wants included. I think they are interesting topics.

The topics are:
• What kind of group work experiences the girls have before the program
• How the girls think about working with computers
• What the girls think mentors are
• Top 5 career choices

I suppose I could do a quick sheet that has a couple of those things on it. Hmm...

Employing reflexivity in this manner was important to me as the program evaluator and as a case study researcher. I was responsible for ensuring we gathered the kinds of data and information that would allow rich, meaningful evaluation of the program, including areas for improvement.

Reflexivity also greatly impacted my interactions with participants. First, I had to make certain the participants and mentors knew who I was and what I was doing during the program. In Year 1 and Year 2, Maria Palazzi introduced me to the mentors during staff preparation week and also to the participants during formal program introductions. Each year, as I distributed pre-program surveys, I explained who I was and what I was doing with the surveys, as well as what my role would be throughout the program. I answered any questions they had about me. I felt these personal introductions and explanations created stronger connections between the participants and me each year.

Reflexively considering both program years, my relationships with participants and staff enhanced my involvement and investment in the program, as well as hopefully contributing to its overall operations and success. I continually monitored how much I interacted with the participants and mentors, and under what circumstances. My notes and reflections reveal my personal investment and sense of responsibility to contribute to this program. Each year, I actively engaged participants who seemed reticent or shy or intimidated by the larger group situation. I talked with girls before and after the program, discussing online video games or art interests, sometimes playing games with them or watching them show me websites they liked, sometimes talking about pop culture and technology. I also lit the grill and used it for cookout day. While these roles were outside my official duties as an evaluator and researcher, the reflexive process helped me see their value to me, to the girls, and to the program. This willingness to fully engage and participate, when possible and appropriate, allowed me to build positive relationships with program participants, staff, and stakeholders.

Sinecore, et al (1999) argue that reflexivity reveals the necessary interdependence between personal and professional roles, providing space for greater involvement and investment. This increased involvement precipitates collaborative processes of “social transformation” and changes how participants and researchers “engage in the process of transformation” (Kemmis & McTaggart, 2000, p. 579). This is
one of reflexivity’s most powerful applications - creating awareness that leads to personal and social change.

In this feminist poststructuralist qualitative study, reflexivity impacted the possible outcomes of the research. Kemmis & McTaggart (2000) insist the practice of research is reflexive and political because it “understands that to study practice is to change it” (p. 578). Reflexivity impacted the research paradigms and theoretical frameworks I chose, as well as the goals for the research. In conducting this study, I wanted to provide formal, worthwhile evaluations for the program administration and staff in order to improve future programs. I also wanted to acknowledge and accept this case study as a “messy text” (Marcus, 1994) in process that is never completed, remains unstable, and creates continual critical consideration. I wanted to ensure that throughout this research process I worked to disrupt my own tendencies, reinforced by certain segments of the academic community, toward authorized scientific realist third-person narratives that convey smooth operations rather than uncoordinated, chaotic progress (Foley, 1998, p. 110 - 111). Instead, I want this research to represent the range and depth of Digital Animation experiences in a way that proves useful to the program, to females in technology, and art education more generally. From this perspective, I wanted to strive to have a “less academic, more reflexive, hybrid voice” that can “bridge the vast cultural and linguistic gap between academics and ordinary people” (Foley, p. 113). This research must be understandable and meaningful in order to be useful, empowering to women, and linked with political action through reflection at “each step of the research process” (Pillow, 2003, p. 178). Approval from an Institutional Review Board provides the legitimacy necessary for ethically conducting and distributing research data involving actual people.

Institutional Review Board and Human Subjects Protocol

All research involving human subjects conducted under the auspices of a university must be reviewed and approved by an Institutional Review Board (IRB). The IRB monitors research involving human subjects to ensure that the rights and welfare of the participants are protected and that research methods and information collected are appropriate and necessary to the research (http://www.orrp.ohio-state.edu). ACCAD completes an application each summer to the IRB in order to conduct the program evaluation. For the purposes of this proposal, I completed an IRB amendment request to add my research to ACCAD’s study and was granted permission by the IRB to conduct this research.

As per IRB protocol, the program participant identities will remain confidential throughout the research process. Program staff, including mentors and program administrators who ask or give explicit permission, may be identified. The Internal Review Board requires that all minors remain confidential and have parental permission to participate. Each student participant has given her permission to be included confidentially in this research. Both ACCAD and I will retain secure copies of all research and permission forms. The approved IRB Protocol form, participant permission slips, and surveys are included as appendices following the references.
From Here to There: Digital Animation Developments and Struggles

For Year 2, I was a more aware, practiced, and prepared observer and researcher. My survey questions were better aligned with the program goals, my observations were more voluminous and directed, and I included interviews. I attended over half of the planning and wrap-up weeks, as well as all ten program days. I recorded personal impressions and reflections. I noticed differences, subtle shifts across time. I gained a broader sense of the context of the technology field for women as well as the program’s potential long-term impact.

In the course of, and in addition to, my formal role as the outside program evaluator, I also became a participant and factor in the program and the study. I was around. I asked mentors questions and listened as they processed program events and issues related to their group members. I chatted with mentors and participants before and after the program day. I ate lunch with the program. I chatted with parents. I joined the groups in a creek. I spent a summer afternoon grilling hotdogs and hamburgers for lunch. I’m a vegetarian, but I’m not intimidated by lighting contained propane. I tried to help participants acclimate to the program, particularly shy, reluctant ones. I was an additional adult interested in these participants and their work. I was a constantly available audience able to offer informal feedback and response to individuals and groups. I talked with mentors about my research, interests, and graduate program. I researched moving company recommendations for one mentor and provided a potential employment contact for the boyfriend of another. I was included in the fabric of the program, and I worked to ensure my involvement contributed to the overall program efforts and operations. I’m sure at times I was obtrusive, distracting, and irrelevant, too. Hopefully the evaluations and personal investment balance this.

Digital Animation Struggles

Digital Animation is a very deliberate, organized, impressive intervention aimed at increasing the number of women entering and remaining in computer and technology fields. The participants are excited, involved, enthusiastic, and successful. The mentors are invested in the program, their group members, and the overall field. The administrators are active, dedicated, and supportive. But the program does have struggles and areas in need of improvement. The diversity and scope of the program are small on a yearly basis. Seeking and securing funding is a constant effort, particularly after the first few years of a program. Application and acceptance processes are both subjective and somewhat arbitrary. Distribution of program information is spotty and uneven, skewing the participant pool. Family plans and individual issues sometimes affect participant attendance. These issues and problems are real, but the intention of continual program evaluation, reflection, and revision are attempts at revealing and addressing these shortcomings in a process of constant improvement. The program’s overall effectiveness and even greater potential to encourage women in technology provide powerful motivation for investigating its successful and challenging aspects. Digital Animation provides promise for producing programs and pedagogy more conducive for the success of girls in technology.
In Chapter 3, I begin the data and analysis portions of the case study starting within the gender and technology framework. The first half of each data and analysis chapter provides a review of scholarly literature and research while the second half applies this to Digital Animation data and analysis. Chapter 3 consists of a gender and technology literature review followed with relevant case study data. Chapters 4 and 5 follow the same structure with feminist poststructuralist pedagogy and visual culture art education.


CHAPTER 3
NERD GIRLS’ WORLD? GENDER & TECHNOLOGY SCHOLARSHIP
AND DIGITAL ANIMATION

Program Day One

The first day of Digital Animation: A Technology Mentoring Program For Young Women begins in a very low-tech manner. After an initial tour and completing a pre-program survey, the mentors escort the middle and high school students to a conference room with rows of thin tables and lines of chairs facing forward toward a blank screen and whiteboard. The mentors congregate here and begin introducing themselves, using no technology. Farah is an undergraduate student with a focus in computer animation. Xin is a graduate student with a Bachelor’s degree in Architecture and seven years of work experience. She intends to specialize in visual communications in Architecture. Felicia wants a Master’s in 3D design to use virtual environments and technologies to help people with disabilities. Shawna has a set design background and a focus in animation. Cassie has an MFA in Design and is interested in incorporating 3D technologies into performance. Raquel is a Master’s student in Art Education with an interest in technology and education.

Maria Palazzi, the ACCAD and program director, tells the participants the purpose of this program is for them to learn to use technology in the arts. She gives a broad program overview. Maria notes, “We will spend two weeks using animation as art and as a way to talk about things that are important, to us.” This year, “We will become animators using art as the medium for communicating about prairies.”

After the opening comments, everyone heads toward the Fishbowl, ACCAD’s main animation classroom. The groups find their name tents and claim those computer stations. Mentors help the girls find login names, use and change passwords, and log on, as needed. The instructors, Maria and Vita, circulate and help troubleshoot, too. The girls are visibly and audibly excited, discussing and hypothesizing about technology – where it is now and where it might go. One pair discusses “the evolution of voice commands.” Another few talk about their regular computer use.

Vita begins with some ACCAD computing basics, showing the girls how to get to their designated area on the shared server space, accessible from all ACCAD computers. She shows how to adjust computer settings. Then the internet goes down. For everyone. Maria works with Gene, a male staff member to troubleshoot; after some work, they re-establish the internet connection.

After this computer orientation, the staff shows animated shorts with environmental significance, like Henry’s Garden (2002). The instructors and mentors take turns using the instructor station computer to present examples of environmental arts and artists. One artist attaches digital cameras to different animals, another uses scientific equipment to monitor water quality and then they artistically interpret and relay this information. After these example
presentations, the first group assignment is to choose an artist using technology creatively and artistically to explore environmental issues. The groups begin huddling together, searching online and talking, the mentors sometimes prompting and assisting.

The girls enthusiastically approach their beginning research assignments, almost all focusing their search in online sources. Most groups muddle around online, mentioning environmental artists as they find them, until they choose an artist they find interesting enough to research and share. As they research, they continue chatting casually, talking about themselves. Much of this conversation includes discussing their interests in computers and art.

After choosing an artist, group members divided research sub-topics and tasks. Each member starts working. Some participants have difficulty starting, technologically or conceptually. Mentors move in strategically to help troubleshoot, offer ideas, and support efforts. Mentors also help groups create presentation outlines and organize the chunks of research accordingly.

As individuals and groups finish researching, some participants start playing computer games briefly, but they quickly return to work. After a final block of time to prepare, each group presents an environmental and technological artist along with examples of the artist’s work. Each participant speaks to the whole program, even though some are obviously nervous. The group choices begin revealing the wide range of creative uses and meaningful applications of technology within, and as, art.

After a break, the participants all return to the Fishbowl. Vita stands at the instructor computer station at the front of the room. Once participants are ready, Vita begins telling and demonstrating on the front video screens how to open the Maya program on their computers. She explains Maya as a high-end animation program for modeling, rendering, and animating. She mentions it is a big program and begins explaining menus and tools. She explains that Maya is an Indian term meaning “illusion.”

Vita then explains Maya’s complex file system, with infinite levels of hierarchy and connection. The girls monitor one another’s progress. Vita has students save a file and check to see if they’ve done it right. She has students make a cone using the “create” menu and then manipulate it using the Alt key and left mouse button to look at the model from different angles, by “tumbling” the view. The center button makes the image pan; the right zooms in and out. There are four views and each allows different commands.

Vita and the mentors help participants. The girls seem excited and engaged, even during troubleshooting. Vita encourages them to play with the “move” tool. Vita also asks girls how good their math is, and notes how much math Maya contains underneath. She explains how Maya’s 3D environment uses grids to create the illusion of depth and dimension within a two-dimensional space, and how grid squares serve as adaptable, measurable units. The Maya channel editor can use grid coordinate numbers to locate, move, and rotate models with increased precision.

The girls follow Vita’s actions on their own computers. One participant moves ahead, using tools to manipulate and warp her cone. Vita continues to explain how to shift views and then how to undo levels of actions and commands. Participants who quickly understand can experiment while others persevere.

The remainder of this tutorial involves more basic instructions in menus, tools, and commands. Vita verbally instructs and demonstrates while participants continue to follow along. Mentors continue to monitor girls’ progress and conceptual grasp. They offer assistance, reminders, and additional information as necessary. Mentors, participants, and instructors join to ensure individual and group success. The participants learn to color objects before they progress to modeling. Girls who move ahead sometimes go online quickly, until the next step of the process.

As the groups model butterflies, Vita uses the scientific names for each part, as she does for Maya tools and animation concepts. She shows girls how to select individual and group segments and delete. She discusses alternative ways to achieve the same effects. She encourages creativity. She tells the girls that, after lunch, she will lead three more Maya tutorials.

(Summarized from ONY1, Day 1)
Gender and Technology as an Analytical Framework for Digital Animation

This chapter focuses on gender and technology scholarship and ways its concepts converge, diverge, and interact as evident, and absent, in the Digital Animation summer program. To begin, I define gender and technology with regards to this study. Then I explore current gender and technology literature, emphasizing trends and effects. I define and document the “gender gap” in technology and analyze possible consequences of this gap and its anticipated closure. I also investigate the complicated web of gender stereotypes and myths, and the obstacles those create for women with technology. Additionally, I discuss Maria Palazzi’s deliberate efforts to create and implement the Digital Animation summer program to address this gender gap using research, theory, and experience, including her knowledge of important factors for female success in technology classrooms and environments. Afterwards, I consider discrepant data from the Digital Animation program, including how young women’s perceptions of and relationships with technology are shifting and the possible impacts from these shifts. The chapter conclusion foreshadows Chapter 4 with its more nuanced, intricate analysis of ways feminist poststructuralist pedagogy can address gender inequity in technology education, employment, and use.

The information throughout this chapter stresses technology gender issues and inequities as systemic issues. I employ an overt feminist analysis of gender and technology scholarship and of Digital Animation data. While some gender and technology research ignores or glosses over gender inequities (Bernard, 1996; NCES, 1996; Seidensticker, 2006), most reveals clear gender distinctions throughout technology education, employment, and use (AAUW, 1991, 1992, 2000; NSF, 2002; Sanders, 2005). These gender inequities result from the complex interaction of sociocultural factors, not the direct action and collusion of a secret group of malicious men. In this analysis, I want to represent the research data about gender and technology critically, but without any sense of hostility toward men in technology or men in general. I am interested in understanding, not in blaming; I am interested in equity, not enmity.

Defining Gender: Sex and Biology

On the surface, gender seems deceptively simple. Two mutually exclusive choices: male or female. But it is troublesome from the start. People often conflate gender with sex, eliding their differences. Most people also assume sex determines gender – men are male and women are female – and this separation is based on clear-cut natural boundaries, definitions, and characteristics (de Beauvoir, 1949; Wittig, 1981). Traditionally, gender primarily involves a person’s roles, qualities, and skills, and how those align with expectations based on a person’s biological sex (Butler, 1991; Haraway, 1991). Problems emerge immediately. These either/or choices leave no middle ground, excluding any other possibilities (Butler, 1991; Halberstam, 1991). Accepting this ignores too much evidence that disrupts these binaries (Butler, 1991). In terms of biological sex, medicine provides plentiful examples of ways the human body exceeds our narrow categories; not everyone is clearly man or woman. The reality is much more complicated; our bodies have much variation initially, and medical advances blur and manipulate gender
further, through cosmetic procedures or even gender reassignment surgery. Another factor is culture and its inextricable ties to subjectivity and intersubjectivity.

**Gender and Culture**

While sex is about biology, gender is about behaviors. In terms of gender, binary categories are also problematic. We assume males and females are biological opposites, so we expect inverse behaviors and qualities. We want our men manly and our women feminine, even though these two categories are imperfect and limiting. The foundation of gender on sex is unstable from the start. Many feminists illustrate how the gender binary is actually an artificial construct (de Beauvoir, 1949; Wittig, 1981), with arbitrary cultural expectations for male/female roles, behaviors, and characteristics (Butler, 1991; Ortner, 1974). Ideas of what is masculine and feminine change drastically over time (Gray, 1995; Wajcman, 1991). Consider the wig and its gendered associations now and historically. There are many, many examples. Gender is not as self-evident as we might believe.

In fact, many feminists question the binaries of man/woman and masculine/feminine, emphasizing that these somewhat arbitrary and slippery distinctions are culturally constructed and subject to minor shifts and extreme changes. Some feminists assert that sex and gender are socially constructed myths based on the idea that women are naturally different from and inferior to men. In *Gender Trouble*, using Foucault’s “archaeological” (1970, 1972) methods of historical analyses of cultural constructions and power, Judith Butler (1991) deconstructs the traditional gender binary, *man/woman*, and concludes “There is no gender identity behind the expressions of gender;” instead, “identity is performatively constituted by the very ‘expressions’ that are said to be its results” (p.25). The repetitions of gender performances serve to culturally construct, maintain, and naturalize gender, rendering it invisible and naturalizing it (Halberstam, 1998; Bryson & de Castell, 1995). Butler’s ideas echo Ortner’s (1974) assertions that the processes of repetition, naturalization, and providing de facto “evidence” of male superiority serve to create and maintain an unequal power balance between males and females. Butler (1991) also echoes Wittig’s (1981) arguments that one is not born a woman but made one through culture. Instead of being innate, gender characteristics are really directions for performing gender roles appropriately. From this perspective, women do not naturally prefer dresses, heels, and lipstick; these are elements used to signify and reify gender. In this case, the clothes actually do make the woman. These performances of gender serve as evidence of gender division. Butler (1991) advocates making “gender trouble” by challenging these traditional binary gender norms, repeating gender performances that differ from cultural dictates. Individuals can use their agency to make gender trouble and work toward eradicating gender binaries that value “male” while devaluing “female” (Wittig, 1981). This theory of identity as performance and not innate allows space for men who like dresses, heels, and lipstick, as well as women who do not, and many other possibilities and actualities.

Additional feminist theories about gender and culture help frame this study. In her foundational feminist text, “Is Female to Male as Nature is to Culture?” Ortner (1974) exposes a near-global
fundamental analogy of men with culture and women with nature, resulting in an imbalance of value and power favoring men and masculine traits. Ortner (1974) bases her “essential” analogy on Levi-Strauss’ (1949) nature/culture binary where he associates women with nature based on women’s reproductive roles. Gendering nature and culture creates and perpetuates a system aligning men with “thought, intellect, and reason and women with body, emotion, and intuition” (Halberstam, 1991, p. 468). This primary mythical division continues to underline and enable widespread gender inequity. Wittig (1981) argues that these divisions perpetually devalue women and trap them in an underclass unable to mobilize against an oppressive, class-based system. This study examines a program addressing a specific permutation of this gender inequity in the field of technology as exemplified by the technology “gender gap,” or low percentages of women compared to men in the field. This case study analyzes a program designed to value young women and mobilize them to overcome and then overhaul technology education, occupations, design and development, and applications.

In general, the Digital Animation case study uses gender in its commonly accepted ways: as the roles and behaviors typically assigned, expected, and enacted based on the biological sex categories of men and women. I freely acknowledge that these are problematic concepts that shift and slip, revealing a cultural façade of certainty. But I also recognize that who society recognizes as men or women, as male or female, has material impacts (Cowan, 1999; Kramarae, 1997; Oblepias-Ramos, 1998; Rasmussen & Hapnes, 1991; Stanley, 1983) Woman/women can be useful as a unifying identity, despite the contested definitions (Wittig, 1981). In fact, gender and sex are central in this case study research due to their prominence in Digital Animation: A Technology Mentoring Program for Young Women. Gender and sex are tricky, but still useful in some situations. In the next section, I define and contextualize technology. After I define gender and technology separately, I present gender and technology scholarship and use it to build a framework for analyzing Digital Animation data.

Technology and Digital Animation

Technology and gender are inextricably intertwined. To understand the complexity of their interrelationships it is necessary to understand what constitutes technology, how its definitions evolve over time, and its shifting associations with gender. Technology has many definitions outside and within education. John Bilton, of the UK Technology Education Centre, defines technology as “objects, knowledge, activities, processes, and sociotechnical systems,” or combining objects and people (atschool.eduweb.co.uk/trinity/watistec.html). The International Technology Education Association (ITEA) defines technology as “1) Human innovation in action that involves the generation of knowledge and processes to develop systems that solve problems and extend human capabilities. 2. The innovation, change, or modification of the natural environment to satisfy perceived human needs and wants” (http://www.itea.org/). While both of these definitions stress human involvement, technology can result from other means. Dolphins, primates, and other animals demonstrate clear creation and use of technology, as well as the cultural transmission of skills and knowledge (Hooper, 2005; Vala, 2007; van Schaik, 2004).
Technology is not the sole domain of humans, but most of our current cultural understandings of technology insinuate it is.

Another common assumption is that technology follows a linear evolution, advancing with each new iteration. Evolution and progress seem unavoidable. From this perspective, technology advances are unquestionably good. Technology possesses the potential for perpetual progress. But, technology is more complicated than this simple, uncluttered construction. Technology can help solve problems, but it also creates new ones. Bob Seidensticker, in his 2006 book *Future Hype: The Myths of Technology Change*, acknowledges the tendency in Western cultures “to focus on the recent at the expense of the old,” but believes “doing so leads to a distorted view of modern technology” (p. 5). This tendency to attribute inevitable progress to newer technologies is considered “technological determinism,” a phrase likely coined by American sociologist and economist Thorstein Veblen in the late 19th or early 20th century (Chandler, 1995). Seidensticker (2006) insists technology can hinder productivity and progress as much or more than it boosts them. Technology can make life easier or harder or both. In *A Critical Theory of Technology*, Feenberg (1991) asserts:

> Technology is not a thing in the ordinary sense of the term, but an "ambivalent" process of development suspended between different possibilities. This "ambivalence" of technology is distinguished from neutrality by the role it attributes to social values in the design, and not merely the use, of technical systems. In this view, technology is not a destiny but a scene of struggle. It is a social battlefield, or perhaps a better metaphor would be a parliament of things on which civilizational alternatives are debated and decided. (p. 14)

In this, Feenberg stresses the ambivalence of technology in contrast to its neutrality. Technology is not some neutral, inevitable march toward a predetermined destiny. Technology, like history, cannot be simplified into linear progress; many paths of development exist leading in multiple directions (Graff, 1987, p. 35). Instead technology is malleable and contested, ambivalent, subject to socio-cultural influences and conditions. Our social values shape our technologies in a continual cycle.

In the recent past, connotations of technology shifted away from the more general sense of tools, processes, and knowledge application to a more specific sense of mechanical, often electronic, equipment (Chandler, 1995). This perspective ignores earlier kinds of technologies without digital or electronic or mechanical components, as well as disregarding contemporary technologies without those components. Technology now implies computers, electricity, motors, power tools, gadgets, and gizmos. In the next section, I explore the interrelationships between technology and gender and their potential consequences.

**Gender and Technology Relationships**


> Issues of gender are complex, far-reaching, and fascinating. As powerful interacting social and physical forces, gender and technology shape our experiences, cultures, and identities –
sometimes in such comfortable and subtle ways that it takes effort to appreciate them; sometimes in such conspicuous and explosive ways that everyone recognizes their importance. Delving into these issues is an opportunity to discover how technology promises or threatens to rewrite our ideas about sex, sexuality, and gender identity. It is an opportunity to debate ethical and legal issues at the core of human experiences — procreation, labor, sex, our bodies. It is the chance to find out how sex role restrictions prevent each of us from using certain technologies or require us to use others.

Examining these topics can be both illuminating and unsettling, particularly because we discover how our lives are and will be affected by shifts in ideas of gender and by changes in technology. (p. 2)

Operating outside gender and technology discourses is impossible. Hopkins (1998) pronounces “the givenness of both technology and gender,” asserting both are “always present in variegated forms… and are … always fundamental to the basic structure and activity of society” (p. 3).

Hopkins (1998) describes four categories for technology and gender system interactions: 1) technology’s association with gender; 2) technology and gender reinforcement; 3) technology and gender systems subversion; and 4) technology and gender alteration (pp. 3 – 9). These categories provide a helpful framework for examining ways technology and gender influence each other.

**Technology and Gender System Interactions**

Historical considerations of technology provide clear examples of these interactions aligned with Hopkins’ (1998) categories. The first two categories agree with Stanley’s (1983) earlier assertions that technology and gender have clear associations that reinforce each other. Stanley also stressed that current constructions of technology, and the history of technology, tend to minimize, erase, or exclude women. According to Stanley (1983), women rarely receive credit for their contributions to the development of significant technology. Also, women’s work and tools are ignored until men begin to dominate an area, and then men often get credit for the technology. Stanley (1983) provides strong arguments for women’s contributions to significant, foundational technologies and concepts: rotation and the wheel, the creation and maintenance of fire, cooking technologies, horticulture, food preservation, and medicine, to name a few (Stanley, 1983). She documents women’s participation in developing the cotton gin, sewing machine, small electric motor, printing press, penicillin stabilized into a reliable medicinal drug, a treatment for polio, and radioimmunoassay – a medical breakthrough that garnered Rosalyn Yarow a Nobel Prize for Physiology and Medicine. The Nobel committee praised Yarow’s work as one of the most significant medical discoveries in decades, and scientists and doctors continue to find new uses for it. Although her work spawned a multimillion dollar industry, Yarow and her partner declined to patent it and instead published their findings freely to encourage widespread access and benefit (Stanley, 1983, p. 28).

Computer technology repeats this pattern. As computing became, and remained, a male domain, women’s involvement in the processes of inventing, improving, and applying computer knowledge conspicuously faded and vanished. This happens despite the vital role of Ada Lovelace in developing what became the computer (Toole, 1992). Ada Lovelace worked closely with Charles Babbage, beginning in the 1830s, to invent the “Difference Engine,” the first computer. In fact, Lovelace is the person who conceived
and then implemented the programming of the machine, making her the first software programmer (Toole, 1992). But this kind of information is not common knowledge. These disappearances and erasures of women’s involvement continue into the 20th century, ignoring such details as the first group of programmers being six women (Holberton, 2003). During World War II, these six female “computors” programmed the newly unveiled ENIAC computer to perform tedious calculations for ballistic trajectories, cutting calculation time from 20 hours to 30 seconds, guaranteeing U.S. dominance in military ballistic strikes (Holberton, 2003). Yet, despite this foundational involvement of women, computers and computing become increasingly masculinized. In the next sections, I consider the increasing disparity between men and women’s involvement in technology and the consequences of this gender disparity, and reasons for addressing this situation.

The gender gap in technology, the erasure of women from computer technology history and development, and the results of this imbalance contribute to Hopkins’ (1998) second category of technology and gender reinforcement. Technology and gender stereotypes often define who can use, and who must use, what technologies (Hopkins, 1998). While women presumably have no skills or interests in technology, many household tasks involve tools and technologies relegated to women: washers, dryers, dishwashers, toasters, ovens, irons, and vacuums (Stanley, 1983). Other technologies become reserved for men: lawnmowers, motorcycles, power tools, automobile repair, and computers. Often, women are required to submit to other technologies that reinforce gender and its relationships with technology. Birth control is primarily a woman’s concern, with birth control pills, morning after pills, and long-term methods like Norplant. While these can be administered voluntarily, their involuntary administration as a means of oppression is historically documented and contemporarily relevant. Consider the political and ethical debates around mandatory birth control implants, or the use of medical sterilization methods, with welfare mothers or female drug addicts (Russell, 1998). Discourses around women and birth control technologies privilege some technologies and prescribe their deployment (Evans & Samson, 2004), while other birth control technologies available for women’s use, such as Plan B, have been stalled in bureaucratic approval procedures and debate, or even restricted through corporations or by individuals refusing to dispense them (Harris, G., 2006; Powderly, 1995; Schoen, 2005). Alternately, although technologies exist for male birth control methods, such as condoms and vasectomies, they receive far less attention, and rarely any discussion of or pressure for mandatory administration to men.

Hopkins’ (1998) third category considers technology and gender system subversion, or how technologies facilitate gender trouble (Butler, 1991). Scientific research and tools continuously challenge our previous constructions of sex. Population stresses and environmental factors can create a multitude of sex possibilities, from organisms with the ability to self-fertilize and reproduce asexually to those able to shift gender and bodily functions as necessary for sexual reproduction (Allsop & West, 2003). Similar variations of sex occur across the human population, too, although perhaps less fluidly. Technologies allow many variations for gender subversion. Mechanical devices can augment physical strength, a traditionally
masculine quality, diminishing or nullifying its value. Reproductive technologies exist that portend the irrelevance of gender in some ways – the ability to harvest and store eggs and sperm, combine them for fertilization, and implant them into males or females for gestation. In other ways, the technologies exist to provide parents with gender and genetic choices (Evans & Samson, 2004). Cloning is a reality. Stem cell research races forward. Technologies can change, conceal, mask, fake, or expose gender.

Technology can also facilitate interactions divorced from physical presence, allowing individuals to perform sex, sexuality, and gender as they desire (Royse, Lee, Undrahbuyan, Hopson, & Consalvo, 2007). Electronic representations contain a degree of anonymity, presumption, performance, and implication. Even though gender categories have never been fixed, technology highlights their slipperiness. Can we ever be sure anyone is really male or female, online or offline? Who do we believe? Where are our lines? As Mitchell (1996) states, I can very easily conceal, leave carefully ambiguous, or falsely signal race, age, body shape, and economic status online. My representation on the Net is not an inevitability of biology, birth, and social circumstance, but a highly manipulable, completely disembodied intellectual fabrication; electronic cross-dressing is an easy and seductive game” (Mitchell, 1996, p. 12).

Hopkins’ (1998) final category for gender and technology investigation considers the ways technology and gender alter each other and their multiple and contradictory effects. How do technologies change the definitions and characteristics of gender? How does gender shape technology? While digital technologies can work subversively to camouflage, conceal, or disrupt gender, technologies can also function overtly to alter gender, by revealing the arbitrariness of gender associations, the performance aspects, and evolving cultural assumptions. The immateriality of digital contact provides the capability to easily separate body from performance (Senft, 1997; Stone, 1999; Suler, 2004). Technologies can blur fantasy and reality, showing how they exist interdependently, how objectivity and subjectivity blend. Online, balding white Wall Street businessmen can present themselves as dangerous, exotic women; simultaneously, dangerous, exotic women can present themselves as balding white Wall Street businessmen. Online self-representation ethics vary. John Suler (2004), a psychologist, refers to this ability to mis- or re-represent ourselves in electronic communications the “online disinhibition effect” (p. 1). Technology can also alter sex biologically to differing degrees; “gender” re-assignment surgery techniques, or sex changes, have improved greatly. Western science races toward embryonic gender selection capabilities (Evans & Samson, 2004), and begins to recognize chromosomal combinations outside the XX/XY binary.

Gender also plays extremely important roles in determining and impacting technology. Many men and women approach technology development and use from different perspectives. Acknowledging the problems with broad generalizations, gender and technology research shows men tend to develop technologies that appeal to, promote, and accept masculine preferences and interests; women presumably enact a similar bias in their technology developments, interests, and uses (Gorriz & Medina, 2000; Margolis, Fisher, & Miller, 2000; Passig & Levin, 1999; Sanders, 2005; Whitley, 1997). In The Journal of
Technology Education, Zuga (1996) criticizes the masculinized aspects of science and technology education and creation and its disenfranchisement of women and feminine qualities, echoing Ortner’s (1974) male/culture and female/nature associations. Although problematic, this essentialist division between men and women approaching and altering technology in some gendered ways does provide a basis for discussing gender and technology’s mutual interdependence.

The documented gender difference in enrollment and completion of computer technology programs and subsequent employment patterns depicts a huge advantage for men in these fields (AAUW, TechSavvy, 2000; Bernstein, 2000; Margolis & Fisher, 2003; Sanders, 2005). Men outnumber women significantly in technology, engineering, and mathematical areas (AAUW, 2000; NSF, 2000). While Turkle (1988) argues that computers have “no inherent gender bias,” this large gender discrepancy in technology education and careers, development, and uses impacts, and is impacted by, gender. Technology serves in many ways to maintain and reinforce the status quo dependent on a clear gender divide of women and men, with women inferior to men (Sanders, 2005). In this case, what are the impacts of primarily males making, teaching, learning, and using technology? What differences does it make?

Technology and the Dissolution of Borders

Donna Haraway (1985/1991), another important feminist gender and technology scholar, discusses ways technology hastens the deconstruction of three borders: the human/animal, the animal-human/machine, and the physical/non-physical. For Haraway, the dissolving human/animal boundary results mainly from sociocultural factors. In technologically advanced cultures, people treat animals increasingly like other humans: providing medical care, insurance, housing, entertainment, specialized grooming, day care, clothing, and expensive toys for them. Technologies allow more time, care, attachment, and resource allotment for domestic and wild animals. Technologies also necessitated justifications for maintaining this human/animal divide, like the mechanization of much cattle and poultry raising and slaughtering, allowing continued exploitation of certain animals to serve human concerns (Haraway, 1985/1991).

But the line between humans and animals is fuzzy, too. Scientific research places humans genetically closer and closer to other animals (Haubold, 2000; Lovgren, 2005). What, exactly, makes us human, more than just animals? This previously clear division dissolves, perhaps the moment of the first doggie sweater. What does this boundary breakdown mean? Briefly, the breakdown also reifies the stronger connection between women and animals and nature, again based mainly on women’s reproductive functions and roles. Men exist mostly separated and distanced from many processes of reproduction. Men escape the primal bodily functions of gestation and child-bearing; they are never such prisoners of their physicality. Again, men are culture, women are nature (Ortner, 1974).

The breakdowns of the other two barriers (Haraway, 1985/1991) are more directly significant for this study. The breakdown of the animal-human/machine boundary creates the possibility, and now reality, of cyborgs - a combination of cybernetic technology and biological organism. Hook (2002), the Director of
Ethics at the Mayo Graduate School of Medicine, notes that in 1960, Manfred Clynes and Nathan Kline
“coined the term ‘cyborg’ (for cybernetic organism) to refer to the blending of humanity and technology –
or man and machine. Their speculations resulted in a 1963 NASA report, ‘Engineering Man for Space: The
Cyborg Study’” (Para. 2). These cyborgs are hybrids of human and machine, like people with pacemakers
and prosthetic limbs, or even contact lenses and braces, people in diving gear, or people driving cars
professor and “cybernetics pioneer,” recently:

 taught a class of 20 students how to use and ‘blend with’ special ‘personal imaging and
photoquantigraphic image processing’ devices which allowed the wearers to remain in contact
with the internet and with each other…16 of the 20 students did not return their ‘xybernaut’
computers at the end of his course. (Para. 3)

As humans increasingly blend with machines, cyborgs become more science than fiction, more reality than
fantasy. The possibilities are exciting, but also frightening.

Balsamo (1999) observes this discomfort around the mechanization of humans/animals, noticing
that cyborgs and the discourses surrounding them recall “ancient anxieties about human difference” (p. 18),
exposing fears that combining humans with too much technology is dangerous. We might create something
powerful that could eventually overcome us, technology that finally rules, exploits, escapes, threatens, or
disregards us. This is the cultural fear at the root of Frankenstein (1818), the Matrix (1999) film trilogy, I,
Robot (2004), and many other fantasy works. We are afraid of the possibility of more sophisticated,
dangerous, exploitative, or powerful beings than us. We are paranoid about unleashing technological might
beyond our power, able to control us. We fear angering the gods of technology with our impudence,
arrogance, and ignorance.

Haraway (1985/1991) also asserts technology’s impact on dissolving the physical/non-physical
boundary. Like Hopkins’ (1998) category about technology and gender’s mutual, multiple, and
contradictory interrelationships, Haraway (1985/1991), and Judith Halberstam (1991), stress technology’s
ability to expose and deconstruct assumptions of gender and identity, mainly through exposing their
construction, fluidity, and shifting assumptions. Like Hopkins’ consideration of the mutual subversive
potential of technology and gender to minimize the importance of, or even alter, the physical, Haraway
emphasizes technology as a means to transcend the physical/non-physical divide.

As McLuhan (1964) famously said, “the medium is the message.” In technological
communication, we are machines and messages, both ephemeral and solid, and yet neither. Technologies
allow simultaneous disembodiment and communication: virtual connection. We can talk from opposite
sides of the globe; we can stream live video online; we can show ourselves naked or hide our identities
completely. We can buy, sell, trade, scheme, and swindle worldwide without leaving our actual homes. As
our societal use of computer technologies increases, how does gender impact our messages and media? Us?
The current predominantly heterosexual white male population of computer technology skews technology’s
recognitions, understandings, and representations of genders, sexualities, races, ethnicities, classes, and
many other identities. This situation also impacts marginalized populations’ access to these technologies to represent themselves and to benefit from using newer technologies. What happens when female technological representations are limited to hypersexualized female characters populating electronic gaming culture, comic fantasy films, and the internet staple, porn (Royse, Lee, Undrahbuyan, Hopson, & Consalvo, 2007; Kennedy, 2002)? What other identity roles are available to women? What roles for men? What roles exist that question, disrupt, or ignore this gender dichotomy? These roles impact who uses what kinds of technology, who feels welcome and who marginalized, who pursues technology education, use, and design, and who benefits from technology and how.

In the next sections, I revisit, define, and illustrate the technology “gender gap,” the discrepancy between males and females studying and working in technology. Then, I consider the consequences of this gender gap. Following that, I examine obstacles and myths around women’s participation with computer technology and then explore possibilities for addressing the gender gap in computer technology and other STEM fields.

The Gender Gap

Across the past few decades, researchers have amassed considerable data documenting significant gender inequity, or a “gender gap,” in Science, Technology, Engineering, and Mathematics (STEM) fields. Margolis & Fisher (2003) believe this documented gender inequity in STEM fields is particularly troubling as computer technology has become a primary cultural medium. Even as technology plays an increasing role in our lives, researchers explore the contemporary positioning of girls in relation to technology as reticent (Healy, 1999; Huff, et al, 1992; Turkle, 1988), negatively valued (Badagliacco, 1990; Patterson, 1984), and distanced or minimally present (Klawe & Leveson, 1995; Margolis & Fisher, 2003; Spertus, 1991).

In the Introduction, I provided charts using 2001 gender and STEM data from the National Science Foundation. Because it is beyond the scope of this study to consider and analyze all STEM fields, below I focus on gender and technology as separate from other STEM disciplines. According to the U.S. Department of Education’s National Center for Educational Statistics (2007) and the National Center for Women & Information Technology’s NCWIT Scorecard 2007: A Report on the Status of Women in Information Technology, women in 2006 received 11% of Computer Engineering, 15% of Computer Science, 21% of Computer and Information Sciences, and 28% of Information Science Bachelor’s degrees.
In 1985, women earned approximately 15,000 of 40,000 Bachelor’s degrees in computer science; in 2006, women earned less than 10,000 out of 45,000 Bachelor’s degrees. According to the NCWIT Scorecard (2007), “data show that in computer science, the core discipline that prepares students for information technology creation, women’s representation remains lower even than in computer and information sciences,” with women dropping from earning 37% of Bachelor’s degrees in 1985 to 25% in 2004. The gender discrepancies, or gaps, are visible with materially significant and pronounced outcomes, while the underlying issues are multiple, subtle, and complex. Understanding the complex interacting factors requiring continual research, accumulation, and analysis of data on gender and technology. While this gender gap is real, current, and persistent, feminist research and pedagogy provide some tools aimed toward gaining insights and developing possibilities for practical change (Clarke, 1992; Hesse-Biber & Gilbert, 1994). In this Digital Animation case study, I applied feminist research principles, questions, and techniques to verify, question, and generate new data and theories about addressing this gender gap successfully. In the next sections, I discuss why this gender gap matters, its consequences, and ways to counter it.

What Causes the Gender Gap in Technology?

In a 2005 paper entitled “Gender and Technology in Education: A Research Review,” Jo Sanders credits James Johnson’s 1982 article “Can Computers Close the Educational Equity Gap?” (p. 2). Johnson (1982) hypothesizes computer science could offer women new possibilities for entering technology in larger proportions, but even as women’s participation increased in other STEM fields, their participation decreased in computer sciences by over a third across two decades (Sanders, 2005, p. 2). In Sander’s 2005 meta-analysis of gender and technology educational research, she lists the main culprits against women’s success as: parents and their (un)conscious biases; culture; race and ethnicity, or “the double discriminatory burden of femaleness and minority status” (p. 6); socio-economic status; unequal access to technology and
educational resources; age; and the media (p. 6). Other obstacles dampen women’s success in technology: the “male culture of … computing” (p. 6); the invisibility and unawareness around computer technology careers; the negative stereotypes around computing as a profession; and gender and occupational stereotypes (Sanders, 2005, p. 6). Sanders (2005) reports gender disparities around experience with computers; the comfort, confidence, and curiosity of the learner; the absence of female peer group members; and gender factors in using computers in public versus private settings. Wasburn & Miller (2005) provided evidence of women in a college technology program reporting professors’ treating male and female students unequally. Scholars continually document teachers’ sexist beliefs about their female students’ computer abilities (Sanders, 2005, p. 19).

From this gender and technology research meta-analysis, Sanders (2005) concludes that as scholars, “We have not been successful in approaching the computer gender gap, and indeed in approaching any gender gaps, systematically” (p. 13). Instead, Sanders (2005) emphasizes that:

Most research has focused on female deficits: their lower experience levels, less positive attitudes, and failure to persist and perform well in educational programs, as compared with males. Research on gender and mathematics, science and engineering, further along than technology, repeatedly points to the value of including ‘different’ people — women, people of color, people with disabilities, and others — to expand the scope of the questions asked and paths followed. How do the technological disciplines change if they are approached from different points of view, with different desired outcomes, indeed, with different understandings of the disciplines themselves? We need to re-imagine technology, to shift it from what it can do to what it can serve, and in so doing to free ourselves from the conceptual constraints posed by business as usual according to the male model. (p. 23)

We have come to the point as a scholarly community, and society, where we recognize this technology gender gap, but we do little to remedy it directly or systematically. In schools like Carnegie Mellon, research-based efforts to change the gender equity in the computer technology programs have succeeded (Margolis & Fisher, 2003); we need to continue to pursue ways to increase the levels of gender equity in computer technology.

While this gender gap in technology is very obvious with many different causes, what does it matter? What does the gender of computer scientists, information technology experts, and technology designers matter? Does it really affect anything? Do we need to do anything about it? Women have the right to choose not to go into technology, right? Should we pressure them to do something in which they aren’t interested, good at, don’t like, or don’t want to do?

Since the Cold War, the United States government has continuously emphasized our need for qualified STEM field graduates in order to remain competitive globally. We never seem to have enough scientists or engineers. In 1983, the National Science Board's Commission on Pre-college Education in Mathematics, Science and Technology unfavorably assessed U.S. pre-college education in these subjects (NSB, 2007, Para 1). Almost a quarter of a century later, according to the National Science Board’s A Companion to Science and Engineering Indicators 2006, the United States “is now well into the 21st century and not since the Soviet Union’s launch of the Sputnik satellite—47 years ago—has the need to
improve science and mathematics education in America been as clear and as urgent as it is today” (NSB, 2007, Para 3).

Also in 1983, the National Commission on Excellence in Education, created by Secretary of Education T.H. Bell, released the report *A Nation at Risk*. In this report, the commission warns that “Our once unchallenged preeminence in commerce, industry, science, and technological innovation is being overtaken by competitors throughout the world” (Para. 1). The commission believed our nation’s diminishing levels of education in STEM fields threatened our “intellectual, moral, and spiritual strengths…which knit together the very fabric of our society” (Para. 7), and that people without “the levels of skill, literacy, and training essential to this new era will be effectively disenfranchised, not simply from the material rewards that accompany competent performance, but also from the chance to participate fully in our national life” (Para. 7). *A Nation at Risk* (1983) also reported that in international comparisons, the “Average achievement of [United States’] high school students on most standardized tests is now lower than … when Sputnik was launched” (Para. 2). In practical terms, the 2007 National Science Board used government data from the Bureau of Labor and Statistics, as well as previous National Science Board reports (NSB 2003), to argue:

> [C]hanging workforce requirements mean that new workers will need ever more sophisticated skills in science, mathematics, engineering and technology. Scientific and engineering occupations are expected to continue to grow more rapidly than occupations in general, with a projected 70 percent greater increase by 2012 (26 percent versus 15 percent overall), or 1.25 million additional science and engineering (S&E) jobs. Long-term the growth in S&E occupations has far exceeded that of the general workforce—with more than four times the annual growth rate of all occupations since 1980 (NSB, 2007, Para 6).

According to the National Commission on Excellence in Education, high-quality, equitable education is vital to our economy and society” (*A Nation at Risk*, 1983).

While both these reports stress the importance of STEM fields, they also both recognize the importance of critical and creative thinking skills that also result from exposure and experience with the arts and humanities. In *A Nation at Risk* (1983), the commission expresses concern that schools will increasingly overemphasize:

> such rudiments as reading and computation at the expense of other essential skills such as comprehension, analysis, solving problems, and drawing conclusions. Still others are concerned that an over-emphasis on technical and occupational skills will leave little time for studying the arts and humanities that so enrich daily life, help maintain civility, and develop a sense of community. Knowledge of the humanities, they maintain, must be harnessed to science and technology if the latter are to remain creative and humane, just as the humanities need to be informed by science and technology if they are to remain relevant to the human condition. (Para. 15)

The national educational reports from the early 1980s focus on the threats to our nation from falling behind internationally in STEM field education, research, and progress. They stress the imperative of equitable, high-quality education. Today, many educators bemoan the gender gap as a key problem in maintaining international scientific and technological viability. Robert Birgeneau, chancellor of the University of
California at Berkeley, laments the lack of women in university computer science departments and the technology field as “embarrassing” and “an astonishing waste of talent in an increasingly competitive world” (Mearian, 2007).

Since its inception in 1957, the National Science Foundation’s has used data about STEM education, degrees, and employment to “provide a new kind of measurement of national economic strength” (in National Science Foundation’s 1957 annual report). Beginning in 1972, the National Science Board published a biennial report on Science & Engineering Indicators, a “chronicle of key trends in science and engineering research and education” (NSF, S&E Indicators, Introduction, 1998). The NSF’s data collection, analysis, and reporting evolved to include “greater elaboration and disaggregation of many of the previous data trends,” and provided a more refined picture of the participants, trends, and “impacts on the broader society” (NSF, 1998, Introduction).

Also since its inception, the National Science Foundation reports have communicated a sense of urgency in their reports regarding the United States’ positioning and progress in science and technology fields compared internationally. These reports present a consistent crisis rhetoric: the United States of America is continually falling behind in terms of technology education, employment, research, and development. According to the NSF, our country is continually vulnerable to international challenges and dominance in technology fields. A major threat includes other countries’ abilities to increase their natural sciences and engineering capacities, including recruiting and graduating college-aged youth in increasingly large increments while the United States’ rate remains low and relatively stagnant (NSF, 2002).

The NSF also continually highlights other countries that are providing “support for broader access to higher education, and an emphasis on [natural sciences and engineering] training” (NSF, 2002). As a result, the NSF believes “a shift to more market-driven economies” and “liberalized investment and labor markets” could create “new world-class centers of excellence around the globe,” benefiting governments that have already “adopt[ed] specific policies to imitate and improve on aspects of other [countries’ science and technology] systems and practices” (NSF, 2002).

These fears create longer term worries that the United States could “face increased international competition for highly educated personnel” even as its “relative attractiveness” fades in comparison to other developing industrialized countries and their development of international recruitment efforts (NSF, 2002). Sophisticated science, engineering, and technology “functions” may increasingly occur outside of the United States, as foreign-born scientists and engineers choose to return to their home countries. The NSF fears this could have a tremendous negative impact on the United States’ eminence in STEM education, employment, research, and development, as this eminence results from large numbers of foreign-born STEM students, scientists, and employees choosing to remain in the U.S. after graduation (NSF, 2002).

**Overlooking and Underestimating Women**

The national crisis dialogue about the welfare of our country based on STEM education, degrees,
and employment continues, perhaps even deepens, as we enter the 21st century. This crisis rhetoric stands in sharp contrast to the documented exclusion, discouragement, and indifference women face in terms of pursuing education and employment in technology. By discouraging or diminishing women’s involvement in these fields, we considerably reduce the pool of potential technology candidates. The erasure, absence, silencing, and exclusion of women in technology has many negative consequences. According to Rasmussen & Hapnes (1991), by creating a technology culture that excludes women, society loses out on “the resources of scientific talent that women possess” (p. 381). We fail to tap women’s potential contributions, their viewpoints, their energy, their efforts, and their concerns (Plant, 2000). As I noted earlier, *A Nation at Risk* (1983) emphasized that our “economy and society” depend on “the twin goals of equity and high-quality schooling;” it also insists that neglecting either of these facets “[denies] young people their chance to learn and live according to their aspirations and abilities.” Gender inequity, along with other socio-economic inequities in technology education, deprives our country, society, and increasingly our world, of untold benefits.

In addition to the opportunity costs from excluding over half of our population based arbitrarily on gender, without women’s involvement in technology, there is less effort and resource allotment for using technology to benefit women, children, and other marginalized members of society. Instead, these resources support technological advancements that tend to predominantly benefit men and appeal to male interests. This primarily male perspective can create many blind spots (Stanley, 1983). Most medical research has focused on males, and primarily Caucasian ones, even as diseases such as breast cancer, ovarian cancer, and even AIDS ravaged women (Meinert, 2001; Stanley, 1983). Until recently the heart attack symptoms known to most people included only the ones common to males; women’s symptoms can be quite different. Artificial hearts were initially designed only in proportion to men’s bodies. Air bags in cars used the male body as the default, creating additional injury hazards for women and children. Even voice recognition software initially only recognized male voices (Stanley, 1983). While any one of these specific oversights might seem minor, they represent an overall trend whose cumulative effects conspire to benefit (Caucasian) men, not always at the direct expense of other populations, but definitely compared to them.

The dearth of women in technology serves to reinforce its masculine environment and image, continuing to discourage women’s involvement. Technology environments become turn-offs for women. Turkle (1988) notes that while computers themselves have no “inherent gender bias … computer culture is not equally neutral” (p. 365). Technology’s masculine culture influences technology’s development and applications. Wajcman (1995) insists technology may be used in ways that are helpful and/or harmful to individuals and based on factors such as gender. Birth control technologies can be beneficial for some populations, but forced or mandated infertility or sterilization could be used to control women’s bodies and reproductive choices.
Other factors also contribute to the “computer reticence” many women demonstrate (Turkle, 1988). Turkle (1988) observes women being socialized not to engage with technical machinery because of presumed ineptness or indifference. Also, the competitive nature of computer culture, the violent and aggressive discourses of computing in gaming and general computer lingo, such as “aborting” and “killing” programs, discourages women’s involvement (Turkle, 1988, p. 365). Indeed, Turkle (1988) argues that the virtuoso symbol of computer technology is the presumed-male hacker, the solitary male geek dedicated solely to invading, mastering, and controlling computers (p. 365). Within technology environments, conditions favor male’s success while the masculine environment and individual actions often exclude, disdain, or treat women hostilely. Cumulatively, factors such as these conspire to deter women from entering computing environments and fields.

**Social Justice and Equity Issues Around Gender & Technology**

Women’s absence in technology negatively reinforces societal gender inequity, too. The large gender gap in technology represents strong evidence of a culturally created and reinforced system that benefits some populations while excluding and eluding others. Span (1997) stresses that computer culture retains many gender inequities as a result. From a social justice standpoint, Jensen, Bryson, & de Castell (2003) believe pursuing gender equity in education means “asking questions about how gender, race, class, and sexual orientation are structured by a ‘system’ of education (i.e., policies, curricula, and everyday practices.” How does [gender] identity impact treatment, expectations, and outcomes? Jensen, Bryson, & de Castell (2003) stress that we often confuse equality and equity, but that “what is fair is not necessarily equal.” For example, “removing barriers to [technology] access for girls does not address inequitable treatment once they [have] access, nor does it establish a means of restructuring the existing school culture,” and wider cultural biases against women (Jensen, Bryson, & de Castell, 2003). In this scenario, removing overt, explicit gender obstacles discouraging and preventing women from accessing, using, and learning computer technologies creates the veneer of equality – all individuals are ostensibly now treated equally. While this may seem fair, it is not equitable. Bryson & de Castell (1996) argue that equity in education is a term that, more often than not, has meant “the right to try but inevitably to fail to become white, male, and middle class” (p. 344). Bryson & de Castell (1996) contend that policy often makes identity a prerequisite to equity, thereby paralyzing it even as it constructs normalized, essential categories for difference.

The historical myths that discredit, ignore, or trivialize women’s contributions to inventions continue to undergird today’s technology gender stereotypes. Maintaining technology as a male dominated field impacts women economically, denying them significant employment and wage-earning opportunities. Stanley’s (1983) main argument is that if we truthfully consider women’s worldwide contributions, then effectively “women hold up two-thirds of the sky” (p. 17). But they are compensated poorly, if at all, for performing the bulk of work. Strikingly, technology that ignores women can have little benefit to women. Oblepias-Ramos (1998) provides one example of an aid group introducing mechanical water pumps for
wells in Third World rural areas. In these areas, women are responsible for retrieving water, but the aid distributors only taught men to repair the pumps. When the pumps broke, women had no knowledge of how to fix them. The men, although trained to repair them, believed getting water was women’s work, so they did not fix the pumps. As a result, women reverted to their traditional methods of retrieving water, often now more difficult, complicated by the presence of the installed pump machinery.

Other negative consequences of masculinized technology on women include technology’s lack of economic affordability and access; the creation, policing, and enforcing of gender (as well as class and racial) stereotypes and roles; and the perpetual demeaning images of women within, and through, technology (Braidotti, 1996; Oblepia-Ramos, 1998; Springer, 1991; Haraway, 1985/1991). Although women perform the bulk of worldwide labor, women (and children) consistently and disproportionately bear the brunt of poverty. As a result, many women cannot purchase, or even use, much available modern technology, although projects like the One Laptop per Child, or $100 laptop project, aim to make computer technology access more affordable and widespread worldwide (www.onelaptop.org). Additionally, the National Center for Education Statistics (NCES) Trends in Educational Equity of Girls & Women report recognizes that by 1996 the computer is an important tool in homes, classrooms, and workplaces, and girls who “are less comfortable with this tool or have less access to a computer at home or at school…could be at a disadvantage later in their educational careers or in the workplace” (p. 6).

Even when women have the economic or social resources to afford technology, sociocultural forces often conspire to hinder their access (Sanders, 2005). Many cultures, institutions, and individuals actively police male domination of, and access to, technology. Additionally, much computer technology creates and perpetuates demeaning images, stereotypes, and treatment of women. Video games and the internet are major culprits in this arena, promoting the objectification of women in pornography, relegating them to the background as accessories, and encouraging disrespectful, violent, and aggressive behavior directed toward them. These factors both reflect and perpetuate cultural discourses of sex and gender with their biases against woman/feminine in relation to technology discourses. Since women are “bad” with technology, they obviously should not use it. Since women are not interested in engines, they almost never get a chance to learn about and repair them. Since women are naturally inept with tools, they forfeit any practice in using them.

Finally, Margolis and Fisher (2003) argue that the greatest negative impact of the absence of women in computer sciences “may be on the health of computing as a discipline and its influence on society” (p. 2). Without women’s involvement in computer technology, many of their concerns and perspectives remain unaddressed, ignored, or silenced. Much potential is simply lost. The absence of women impacts us in many untold ways, but one primary function is to construct and maintain technology as “male” and “not for females.” In effect, men claim the technological domain as male and culturally reinforce this positioning. Males can create and apply technologies while females remain unqualified; much electronic technology contains a masculine imprint as a result. Men design technology to appeal to men; women are excluded
from the discussion. As computer technology increasingly impacts cultures, it progressively impacts gender. In the next section, I analyze more deeply the obstacles and myths about gender and technology, along with their effects.

**Technology Gender Gap Trends**

In 1996, the National Center for Education Statistics (NCES) published *Trends in Educational Equity of Girls & Women*, analyzing data about gender issues in computer technology. This report concludes that “females are just as likely as males to use computers at home and at school” and “such fears [about girls being at a disadvantage in using computers at school or work] appear to be largely unfounded” (p. 6). Despite these assurances, *Trends* reports that between 1970 and 1996, even though women earning higher education degrees increased overall, advanced degrees “still tend to follow traditional gender patterns” with “men earning nearly three quarters of the degrees in computer science and a higher proportion in engineering” (p. 9). These trends continue in NCES reports through the present (http://nces.ed.gov/ssbr/pages/trends_educationequity.asp). Although NCES insists boys have no advantages over girls with respect to computer technology, the numbers of women pursuing and earning degrees in computer technology (and engineering) do not reflect educational gender equity. In contrast, in *Women at Work* (2003), the American Association of University Women (AAUW) compiles data about the continuing disproportionately low numbers of women in STEM fields and the problems that portends. Mary Ellen Smyth, President of the AAUW Educational Foundation, acknowledges “that women have made great strides in education and the work force,” but realizes “the bad news is that the new high-tech economy is leaving women behind” (AAUW, *Women at Work*, 2003). Jacqueline Woods, AAUW’s Executive Director, insists that “Education in computer and information technology fields is critical to thriving in the new high-tech economy,” and believes the small number of women in technology education programs signals “a real problem.” AAUW’s data trends indicate that the highest proportions of women with college degrees are still in the traditionally female careers of teaching and nursing (AAUW, *Women at Work*, 2003).

The many obstacles and myths surrounding and affecting technology and gender biases often rely on applying contemporary, or even traditional, male and female gender roles and assumptions around technology. Halberstam (1991) recalls that “In our society, discourses are gendered, and the split between mind and body … is a binary that identifies men with thought, intellect, and reason and women with body, emotion, and intuition” (p. 468). These discourses and assumptions align with Ortner’s (1974) assertion that “male is to culture as female is to nature,” an analogy which provides the bedrock for a male-tilted imbalance of value and power in technology. In a 2005 interview, Annalee Newitz, author of *Revenge of the Female Nerds: Busting Industry Myths about why Women Can’t be Technical*, believes these myths and misunderstandings function to maintain a gender division within technology. Newitz (2005) argues “ancient and pervasive” myths rationalize limiting women’s relationships with technology and consistently reinforce “the idea that women aren't technical.” These myths reinforce stereotypes “that women are not
rational, that women don’t have a good head for figures, that women aren’t tough enough to work in a lab for five days straight” (Newitz, 2005).

From this perspective, culture asserts that men are naturally better at, and more inclined toward, technology than women (AAUW, Tech Savvy, 2000). This logic re-circulates the male-dominated legacy of math and sciences, extending male domination into technology, by association, too. Newitz (2005) believes “this history of women being excluded from certain kinds of professions” continues to contribute to gender inequity in technology, refuting arguments trying “to attribute [the gender gap] to biology or something inherent in women’s makeup.”

Insidious myths and assumptions also paint women as inept, disinterested, computer phobic, and technically inferior (Halberstam, 1991; Newitz, 2005; Pearl, A., M. E. Pollack, E. Riskin, B. Thomas, E. Wolf, & A. Wu, 1997; Turkle, 1988). In “Computational Reticence: Why Women Fear the Intimate Machine,” Turkle (1988) states women constantly face an unspoken cultural admonishment toward technology, some version of “Don’t touch it, you’ll get a shock” as part of continual socialization to be wary of or avoid computers (p. 365).

Another myth of gender and technology relies on the “hopeless female” subject, an every-woman embodying the gender-based inability to understand or use technology. She needs more than help; she needs rescuing, before something really bad happens. Margolis & Fisher’s (2003) interviews with computer science undergraduates document “the computer-impaired mother [as] a stock character in many students’ stories” (p. 21). These techno-klutzes fear computers. The fear of breaking them or ruining them prevents these baffled broads from performing even the easiest technology tasks. These mothers always defer to a more technically adept member of the family, usually a brother or father. Whew.

But all women not pursuing technology cannot fear it. Other gender and technology stereotypes position women without a fear of technology as being disinterested. Margolis & Fisher (2003) believe casual observation reinforces this bias. Many parents perceive sons as showing more interest in computers than daughters, regardless of their actual interest levels. As a result, male domination of technology spaces becomes an assumed norm. Anecdotal evidence reveals computers in homes are most accessible to male household members, in an office or in the room of a son or father. Even when computers exist in home common areas, males still tend to monopolize their use (Margolis & Fisher, 2003).

This trend continues, often magnified, in official educational environments. More males than females take technology classes, especially advanced courses (NSF, 2002). Males dominate the computers in most school technology labs during free time, too. Without active teacher, or parental, intervention, females rarely challenge this status quo; they rarely assert any claim to technology, regardless of their interest or aptitude (Margolis & Fisher, 2003). Newitz (2005) believes these kinds of gendered myths conspire so “women are…encouraged to steer away from what are deemed ‘male’ pursuits,” even as computer science becomes one of the “most important” professions of our times.
The reputation of technology professions also conspires to discourage women’s pursuit. Meszaros insists technology education unfairly characterizes it as distant and unbenevolent for people, more of an esoteric pursuit than an applied science (www.aauw.org). Technology professions retain the stereotype of being solitary, antisocial, sedentary, and passive (AAUW TechSavvy, 2000; AAUW, 2005, http://www.aauw.org/newsroom/news/national05), qualities in careers women tend to avoid. Of course, many women actively choose other educational and occupational interests.

While women are making some inroads into technology, myths, stereotypes, and biases still work to “hold women back from working in the lab” (Newitz, 2005). They also function to create a crisis discourse (Foucault, 1972) around crossing technology gender barriers. These myths question female presence in technology, citing the potential societal damage. Women cannot possibly fulfill their traditional domestic roles, chiefly motherhood, and work in technology. Technology careers seemingly offer women “a stark choice between children and careers” (www.aauw.org; see also Diment, 1995; Schiebinger, 1999). These myths function discreetly, fostering suspicion toward women who do pursue technology, questioning their femininity, branding them as different from other women, weird, implying this difference is negative (Rasmussen & Hapnes, 1991). Newitz’s (2005) examples include “good mothers don’t work all night” and “women who are good with machines can’t also have social lives.” The myths echo earlier assumptions about women’s weaker constitution, making them unable to drive gasoline-powered automobiles (Stanley, 1983) or being too weak to compete in sports like basketball, incapable of running the length of the court repeatedly. The old logical conclusion was that women’s physical weaknesses, of course, mirrored their mental weaknesses, their inferiority to men on that front, too. These cultural biases persist, camouflaged as women being naturally worse than men at math and science and better at them in nurturing and caretaking. Scholars like Halberstam (1991), Stanley (1983), and Haraway (1991) argue that these biases become culturally-assumed truths that function to keep women, and other marginalized populations, oppressed. These oppressive functions often support and encourage males while ignoring and discouraging females.

Computer science curricula and cultural beliefs recognize and value an orientation towards computing in men but ignore and devalue any computer-oriented women (Margolis, Fisher, & Miller, 1999). More recently, Margolis & Fisher (2003) add that culture, society, curriculum, and teachers’ expectations “link interest and success with computers to boys and men,” providing easy entries for “boys’ pathways into computing” (p. 4). Furthermore, culture attributes boys’ computing success to male excellence and superiority and females’ failure and absence to women’s deficiencies (Margolis & Fisher, 2003, p. 4).

In this way, computer culture intensifies cultural predispositions in males’ favor by parlaying these myths into obstacles for women. Computer culture encourages and reinforces sexist gender stereotypes in an effort to continue dissuading women from entering technology, to penalize those who do, and to reinforce technology as boys’ clubs. Masculinity dominates the discourses and culture of computer science with pervasive “images of competition, sports, and violence” (Turkle, 1988). Margolis, Fisher, & Miller (1999) insist that the overwhelming “identification of computing as a male domain is so pervasive
that women suffer more from a mismatch with the dominant [computer] culture than do men” (Margolis, Fisher, & Miller, 1999).

For example, in *Unlocking the Clubhouse Door*, Margolis & Fisher (2003) document technology courses where all class examples, and all the male students’ assignment answers, were sports-based. Girls eschewing sports examples typically faced classmates’ immediate disregard and dismissal; however, in one instance, the predominantly male class ridiculed a girl who tried to use a sports example and mistakenly mixed football and baseball team names. In these ways and others, women in computer technology exist relegated to the margins, invisible, ignored, actively scorned, or as fictional, perhaps electronic, objectified accessories. The status quo computer culture actively and passively rebuffs women. In addition to overt male harassment of female students in computer science classes, Janet Schofield documents the failure of male teachers to intervene on behalf of female students (Margolis & Fisher, 2003, p. 35). The message: women are not welcome here.

Because of cultural biases, men commonly encounter technology environments as much more welcoming than women do. Males receive more support and encouragement, providing them opportunities for exploring technology more intimately. Boys can dissemble and reassemble things. Margolis & Fisher (2003) report much anecdotal evidence of men, often fathers and sons, bonding over tinkering with technology. These men might build computers together, install computer accessories, troubleshoot problems, or explore computer programs and programming. Many female college students in the Margolis & Fisher (2003) study report cultural and familial support for males and technology interests, often describing brothers obsessed with computers, dismantling them, writing personal programs, hacking, gaming, and monopolizing their use. Despite the presence and awareness of technology within their homes, many girls find no easy entry point into technology, and most avoid competing for access (AAUW, *Tech Savvy*, 2000).

Another effective tool for dissuading women from technology is computer culture’s “myth of meritocracy” - an effort to rationalize women’s low participation in technology fields. This myth asserts that individuals succeed or fail in the technology industry due to their own merits and skills rather than due to any systemic advantages or biases in their favor (http://www.businessweek.com). If this is true and women are not succeeding or barely present in the computer technology field, their absence obviously results from their lack of effort or interest. This viewpoint neglects the effects of gender biases throughout our society and our educational systems, along with ignoring the glass ceiling for women in technology fields (“Technology’s too small sisterhood,” 2004). Technology fields support, encourage, expect, and reward certain masculine characteristics and behaviors, while concurrently undermining women’s interest, participation, and success. The collective effect of these thousand little slights female students suffer discourages female interest and pursuit of (Gurer & Camp, 2002; Gatta, 2001; Koch, 1994; Sanders & McGinnis, 1987; Valian, 1998). Nancy Squires, Stony Brook University Chair of Psychology, asserts,
“Women at every step of the way are held back a little, and the cumulative effects are massive” (“You’ve come a long way, baby,” 2005).

Other myths attribute women and girls’ absence from technology to other factors, including gendered attitudes toward and experiences with technology and its uses. A common reason provided for this absence is that women and girls are computer-phobic (AAUW, *TechSavvy*, 2000). Sherry Turkle criticizes this assertion, noting that AAUW’s commission “makes it clear that girls are critical of the computer culture, not computer phobic” (*TechSavvy*, 2000), while Wakeford (2000) challenges researchers to examine the internet to include alternatives to women as technophobic by acknowledging and addressing differences between men’s and women’s internet usage.

Alternatively, Turkle (1988) proposes women are “computer reticent,” likely unforthcoming in their interests or capability with technology, because women see computers as a “personal and cultural symbol of what a woman is not,” and an “object [women] experience as threatening” (pp. 365 - 366). Women also resist the primary images of computer scientists: obsessive geeks or malicious hackers (Rasmussen & Hapnes, 1991, p.382). This female “disinterest and disaffection…[results] from many external influences” (Margolis & Fisher, 2003, p. 5). These factors include: the predominantly male computer culture; the curricular focus on mastery and command; the preference of hierarchical versus rhizomatic conceptual organization; and gender conditioning, including the “gender valence of risk,” or the dis/comfort with and use of risk-taking behaviors (Rasmussen & Hapnes, 1991, p. 387).

Women’s computer reticence may also stem from different priorities and applications for computer technologies. Rasmussen & Hapnes (1991) note the female resistance to the masculine preference of the abstract and their concern with technology’s practical applications for real-world benefits (p. 387). Females use computers more as tools than “toys” (AAUW, *TechSavvy*, 2000), more a means of connectivity and networking instead of as “intimate machines” that can substitute for human interaction (Turkle, 1984). Women “don’t dream in code like [men] do,” either (Margolis & Fisher, 2003, p. 5). AAUW’s *TechSavvy* (2000) reports girls "assert a 'we can, but I don't want to' attitude toward computer technology" as a pursuit. In other words, girls feel capable of succeeding in technology; but they express an unwillingness to pursue technology as an educational or career option.

AAUW also cites a common perception that “girls’ current ways of participating in computer culture are a cause for concern” (*TechSavvy*, 2000) and girls are somehow deficient in relation to technology. This widespread belief is that girls and women need to adapt more effectively to succeed in computer culture rather than changing computer culture to welcome them. In its present incarnations, though, girls find programming classes tedious and dull, computer games too boring, redundant, and violent, and computer career options uninspiring (*TechSavvy*, 2000).

Finally, inequitable gender standards for technological literacy influence the under-representation of girls and women in STEM fields. AAUW’s *TechSavvy* (2000) report notes a transition from an older definition of technological literacy in contemporary “e-culture” (Western, contemporary, electronic culture)
as broader than the traditional grasp of specific productivity software and tools, such as being able to use
the Internet, email, PowerPoint, word processing, and page layout programs to include being able to:

apply information technology in sophisticated and innovative ways to solve problems across
disciplines and subject areas; to interpret vast amounts of information with analytic skill; to
understand basic principles of programming and other computer science fundamentals; and to
continually adapt and learn new technologies as they emerge. (p. x)

The *TechSavvy* (2000) commission recommends that women and girls not be literate “simply as consumers
of end users of technology, but as designers, leaders, and shapers of the computer culture” (p. 4). The
National Center for Education Statistics (NCES) *Trends in Educational Equity of Girls & Women* report
stresses that girls who “are less comfortable with [computers] or have less access to a computer at home or
at school … could be at a disadvantage later in their educational careers or in the workplace” (p. 6). By
constructing girls’ technological literacy inequitably compared to boys’ technological literacy, girls are
relegated to lower level skills and use of technology while boys are promoted as the designers, creators, and
programmers of technology. Lower expectations can create lower achievement for marginalized learners
and employees. If women are excluded from true technology literacy, their ability to fully participate in
technology development and application will be lost.

These gender myths and stereotypes, with their rationalized conclusions, serve to reinforce or even
magnify the gender biases already present in society. This magnification skews toward promoting success
for men in technology while perpetuating the failure and absence of women. These gender role notions and
assumptions form lingering obstacles to women’s full participation in technology. In the next section, I
explore the possibilities for addressing these obstacles and altering the technology gender gap.

**Possible Solutions for Addressing Gender Inequity in Technology**

In AAUW’s *TechSavvy* (2000), Sherry Turkle proposes, “Instead of trying to make girls fit into
the existing computer culture, the computer culture must become more inviting for girls” (p. 19). In her
meta-analysis of gender and technology research, Sanders (2005) insists educators have approached the
gender gap in technology as a means of addressing women’s deficiencies: their lower experience levels,
less positive attitudes, and failure to persist and perform well in technology educational programs, as
compared with males.

Research into technology’s gender inequities also proposes several solutions. Some of the most
popular and common solutions include creating single-sex computer technology educational environments,
having female mentors and role models, creating a critical mass of women in technology environments, and
creating changes in pedagogy and curriculum that supports women’s learning (Sanders, 2005, p. 17 - 19).
Research also suggests making curriculum relevant and appealing to diverse learners and learning styles is
important in improving equity in technology education (Sanders, 2005, p. 19).

The first step in making computer technology curriculum relevant requires acknowledging and
addressing barriers for women (Etzkowitz, Kemelgor, & Uzzi, 2000) and relinquishing some traditions,
such as the foundational focus on programming; emphasis of basic skills versus problem-solving skills, and

106
reserving complex and interesting projects until advanced level classes (Sanders, 2005; Goode, Estrella, & Margolis, 2005). Making technology curriculum relevant requires interdisciplinary projects, and often includes appealing to social and ethical interests (Sanders, 2005, p. 19). Interdisciplinary approaches also involve appealing to diverse learners and learning styles, often using different teaching methods, assignments, and activities. Sanders (2005) reports that interdisciplinary and socially relevant projects for improving technology gender equity via curriculum changes are common interventions, but stresses there is little research or evidence to support them (Sanders, 2005, p. 19). Other of the most popular and common solutions include creating single-sex computer technology educational environments, having female mentors and role models, creating a critical mass of women in technology environments, and creating changes in pedagogy and curriculum that supports women’s learning (Sanders, 2005, p. 17 - 19).

Pedagogical recommendations for women’s success often include addressing classroom interactions, incorporating social interaction and group collaboration, as well as individual and group instructional support (Sanders, 2005, p. 17). To address classroom interactions, educators and the institutions of education need to learn to see and admit their rampant gender inequities. In a 2005 study by Wasburn & Miller, women in a college technology program reported, “professors did not treat male and female students equally” (Sanders, 2005, p. 19). Scholars continually document teachers’ sexist beliefs about their female students’ computer abilities (Sanders, 2005, p. 19). Sanders (2005) insists all educators need training to develop an awareness of ways all of us enact cultural beliefs and biases, and ways they can actively address these biases in their classroom practices.

We have come to the point as a scholarly community, and society, where we recognize this technology gender gap, but we continue to do little to remedy it. In schools like Carnegie Mellon, research-based efforts to change the gender equity in the computer technology programs have succeeded (Margolis & Fisher, 2003), but there must be more efforts to increase the levels of gender equity in computer technology.

Scanning the Horizons: Analyzing the Gender & Technology Landscape

Gender and technology research reveals a complicated, sometimes conflicting, landscape for women entering technology, from the near-desperate pleas for immediately and immensely increasing the number of technology college graduates (Furger, 1998; Jensen, Bryson, & de Castell, 2003) to the constant discouragement and disdain for women still permeating these fields. Analyzing the intersections of gender and technology in education provides information for more fully understanding “the ways in which gendered experiences and interpretations of education shape and are shaped by economic, historical, and cultural tensions” (Jensen, Bryson, & de Castell, 2003). Gaining a more sophisticated understanding of gender inequity in technology involves “avoiding ‘answers’ for inequity … cast in concrete oppositional terms,” “resisting ‘solutions’ … in ascribing ‘success’ to intervention projects whose positive outcomes do not outlast the presence of the researcher,” and embracing complexity and attending to contradiction (Jensen, Bryson, & de Castell, 2003).
In “A Chip on Her Shoulder?” Bryson & de Castell (1995) present a “strategy for unpacking the complex relations between gender, in/equity, and tools” by critically analyzing “the conceptualization of gender in contemporary discussions of equity” (Para. 7). Their strategy involves using four different conceptions, or perspectives, for analyzing gender and technology: positivistic, (social) constructivist, critical, and postmodern (Bryson & de Castell, 1995, Para. 7). Using these multiple categories produces a multi-dimensional perspective of gender and technology’s multi-layered relationships. This overarching perspective does not simplify the gender and technology relationships, but instead uncovers obstacles and strategies for addressing them as a starting point for increasing females in technology.

The **positivistic** framework accepts the premise of our cultural gender division binary, and, like foundational feminist educational theorists Belenky, Clinchy, Goldberg, & Tarule (1986), asserts women learn and know differently from men. One key difference is the idea that women learn more through “connected” rather than “separate” knowing (Belenky, Clinchy, Goldberg, & Tarule, 1986). Other constructivist factors in creating educational environments where women are more successful include fostering collaboration over competition, understanding over memorization, and valuing experience as knowledge (Belenky et al, 1986). Other scholars name constructivist characteristic of successful educational practices for women’s achievement as the preference for learning practical skills through applying them to real-world issues in authentic efforts to create positive change (Clarke, 1992; Hesse-Biber & Gilbert, 1994; Margolis & Fisher, 2002; Rasmussen & Hapnes, 1991).

Educational trends such as community service and work-based education provide opportunities for learning that is practical and applicable (hooks, 1989; Relke, 1994; Orner, 1996), a key support for women’s participation and success in technology. Other important supports for women’s learning from this constructivist perspective are teaching in a more holistic and social context by including multiple, diverse people, their experiences, and their perspectives (Ortner, 1974; Ritchie, 1990).

The **social constructivist** framework also accepts a foundational binary gender split. A social constructivist approach considers gender disparity to be the result of intact, sometimes unquestioned, socio-cultural power relations among white males, females, and other minority populations (Bryson & de Castell, 1995). Social constructivist strategies for decreasing the technology gender gap include creating an awareness of this discrepancy, its results, and the underlying stereotypes and actively addressing the problem.

Bryson & de Castell’s (1995) **critical** category examines how gender disparity, in access and power, perpetuates the cycle and maintenance of gender inequity. The myths, stereotypes, and boundaries around gender and technology conspire to keep women out, through active and passive exclusion and discouragement. Countering these critical aspects of the gender gap requires women and other minorities to have hands-on educational opportunities as well as unfettered access to technology. Equity for women and minorities in technology fields requires explicit changes to counter their male-dominance. Successful strategies for addressing critical aspects of gender and technology inequity require creating a culture and
specific mechanisms to support women, including mentors, role models, career guidance, and the creation of support networks for women. Images of women in technology also help counter past and present cultural messages discouraging or omitting them.

Finally, Bryson & de Castell’s (1995) postmodern category deconstructs essentialist theories and discourses about gender, and other identity markers, to expose their racist, hetero/sexist, classist, and Western assumptions. This deconstruction involves questioning whether (all) women and (all) men learn differently, and also whether the masculine/feminine gender binary is even valid (see Chapter 4 on feminist poststructuralist pedagogy).

In “Gender Differences in Computer-related Attitudes,” Bernard Whitley (1996) insists the questions previous researchers asked actually created the impression of a gender gap in attitudes toward computers. His study found that male and female college students only have small to moderate gender differences in attitudes toward computers “in the areas of anxiety, negative beliefs, and computer-related behaviors.” In a 1997 follow-up, “Gender Differences in Computer-related Attitudes and Behavior,” Whitley’s meta-analysis includes acknowledgment of larger gender differences in attitudes for sex-role stereotyping, self-efficacy, and outcomes with men and boys seeing themselves as more competent on computer-related tasks than females and computers as more appropriate for males (p. 1 - 22).

Jensen, Bryson, & de Castell (2003) understand postmodernism as involving the compulsion to consciously pursue and question instead of accepting or ignoring, the details of everyday life with its inherent contradictions, complexity, and nuance. Several strategies can address postmodern gender and technology concerns. A major strategy is to actively structure and conduct high quality technology programs and environments that support all learners, particularly women and other minorities. To do this, educators need to explore their cultural and internalized gender biases. Jo Sanders (2005) insists we all have and perform internalized gender biases; the keys to changing these biases are recognizing and confronting them. Recognizing women as individuals, unbound by gender limitations and cultural expectations, and celebrating their accomplishments also serves to counter powerful cultural messages and images.

While these perspectives provide several avenues for analyzing the technology gender gap, they are by no means complete. Bryson and de Castell (1995) criticize critical and postmodern discourses for failing to recognize the agency, resistance, technophobia, and voice of marginalized groups, such as women. Bryson and de Castell (1995) also criticize the postmodern tendency for theorists to “expect to be able to liberate or emancipate others from a distance.” Instead, they advocate, like others, for finding “sites of intervention” for acts of agency, where female and other minority students make spaces for themselves in relation to educational technology (Balsamo, 1999; Braidotti, 1996; Butler, 1991; hooks, 1989). They argue these sites, and deliberate spaces, can directly enable liberatory, revolutionary changes.

Revolutionary changes, research shows, will need to happen to achieve gender parity in technology. Usefully, the success factors for female learning and achievement benefit other marginalized
The kinds of strategies that support female student success promote success for all students; working to narrow the gender gap in technology will work to narrow other disparities, too. Educational environments must support a range of learners and learning styles without continuing to privilege a select, predetermined few (Jensen, Bryson, & de Castell, 2003). Gender and technology research documents and describes a clear gender gap, but the research also presents suggestions for structuring environments and opportunities for women to succeed in technology. In the next half of this chapter, I provide and analyze information and examples of Digital Animation’s attempts to address the technology gender gap, using Bryson & de Castell’s (1995) categories of gender and technology research. The examples investigate a key concern of this research - the interrelationships among feminist poststructuralist pedagogy, gender and technology research, and visual culture art education. In the findings chapter, Chapter 6, I pursue those complications and their implications more fully.

**Digital Animation: Attempting to Address the Gender Gap in Technology Education**

Because of the multitude of ways technology influences gender’s definitions, constructions, performances, as well as the ways gender influences technology, women need to be included in technology’s development, creation, application, and access (Oblepias-Ramos, 1998). Research needs to theorize, test, and evaluate ways of increasing the proportion of women becoming and remaining involved in computer science and technology. Planning for increasing women in technology should include sensitivity to women’s perspectives, particularly in developing technology for women (Bryson, & de Castell, 1995; Margolis, Fisher, & Miller, 1999).

To change the status quo of gender inequity in computer technology, women must assert their agency (Braidotti, 1996; Butler, 1991). Rasmussen & Hapnes (1991) accept the premise that women combine a “fear of computers and lack of self-confidence,” and insist these are the “main obstacles” to women’s presence and success in technology (p. 381). As one solution, they advocate encouraging and supporting individual women in entering nontraditionally feminine careers (p. 381). To change the status quo, computer science education programs must also change (Margolis & Fisher, 2003). Because of the huge power differentials operating with respect to gender and other differences, education programs should not attempt to treat all people as having had equal access to and encouragement to use resources. Technology education environments that promote gender equity must be participatory, challenging, harassment-free, and hostility-free for many girls and women to succeed (Kramarae, 1997; Rasmussen & Hapnes, 1991). As an example, Carnegie Mellon’s program changes increased the percentage of women enrolling in their computer science degree programs from 7% in 1995 to 42% in 2000. Positive changes are possible.

**PART TWO: APPLYING A GENDER & TECHNOLOGY LENS TO ANALYZE DIGITAL ANIMATION**

The second half of this chapter builds on this body of gender and technology scholarship, using it to background and frame an analysis of the philosophy, structure, and implementation of the Digital
Animation summer program. Because of the strong feminist alignment of this research, I apply Bryson and de Castell’s (1995) four categories for analyzing gender and technology, acknowledging their mismatches and limitations. Then, I document and analyze the efforts of Palazzi and others to use gender and technology scholarship and experience to structure and implement a program to decrease the technology gender gap. I also investigate ways Digital Animation program data exceeds and disagrees with gender and technology research. I discuss ways gender and technology data relationships may be shifting and possible implications. Finally, I conclude by foreshadowing ways gender and technology research connects with feminist pedagogy, the subsequent theoretical lens covered in Chapter 4 of this case study.

Bryson and de Castell’s (1995) categories for analyzing “the complex relations between gender, in/equity, and [technology],” while somewhat limiting, prove useful in organizing a systematic analysis of Digital Animation’s philosophies, structures, and functions - theoretically and practically. Additionally, this approach presents a fuller understanding of Digital Animation’s multi-faceted effort to influence young women to consider and pursue technology training and careers. In the following four sections, I explore Bryson & de Castell’s (1995) analytical categories: positivist, constructivist, critical, postmodern. I consider ways these categories position gender, technology, gender and technology scholarship, and critically consider each category’s implications for suggestions to resolve the technology gender gap.

I begin each analytical category with a scenario from the Digital Animation program that resonates with it. After the scenario, I revisit and expand the definition of each analytical category, apply it to Digital Animation data, examine the relevant gender assumptions, hypothetical gender gap causes, and proposals for countering the gender gap in technology from this perspective.

A Positivist Perspective of Digital Animation Data

I don’t know if we should pick a new group of girls each year. Part of me keeps thinking what we really should be doing is bringing the same girls back next year and the year after. Like, should we just stop … and say what we’re going to do is focus on these13 girls for the next four years? Would they come back and go through the camp? Could we say, “Ok, we did this thing from last year and then we’re going to do the next advanced thing when they come back again. But I just don’t know if there’s too much disconnect between summers. Maybe what it really needs to be is during the school year - send the mentors to schools. It seems like the girls would have to all be at the same school, but it seems like then you could really see if it made a difference. I think we’d have to let go of one to do the other, so it’s just deciding which one makes more sense. Do you just keep doing this little smattering [each summer]? I mean we do get emails from girls saying, “So you know I’m really thinking about this because I came to the program. I’ve been thinking about this as a career, looking at different colleges, and what colleges would you recommend?” That sort of thing.

I think that’s the big thing for me to look at. Do we want to keep going through this thing where all these people apply and we sort of pick names out of a hat, or do we want to see if we should simply keep the same participants? I think that’s the kind of stuff we’ll actually have to ask. That would probably have to be part of our longitudinal study, asking the girls, “Would you come back again if we invited you?” (MP, INT, 15Feb05)

Bryson & de Castell’s (1995) first category for analyzing gender and technology relationships, ‘positivism,’ promotes an essentialist conception of gender as a given binary division into male or female,
corresponding to the appropriate biological sex binary of man/woman. A positivist perspective assumes essential, innate differences between genders, and assumes these differences account for some technology achievement and participation gaps. Bryson & de Castell (1995) argue that from this viewpoint, the technology gender gap is only a “numerical” discrepancy, hinging on the “under-representation of female students in computer science classes, computer camps, in-class computer centres,” and other technology environments due to inherent gender differences (Para. 9). This quantitative approach focuses on equality more than equity, often employing the gendered technology literacy double-standard (Bryson & de Castell, 1995). If females can theoretically use the computers in equal numbers to males, this model assumes everyone is equal and the situation is equitable, or fair. In contrast, a qualitative examination of ways females and males use technology often offers a more meaningful sense of ways the gender gap spreads and persists, defying any pretense of equity. Using a computer for word processing, browsing the internet, online shopping, chatting with friends, and online gaming is very different from using the Adobe® Creative Suite of high-end graphic design software, writing original programming code, creating digital movies, composing music, designing and operating robots, or disassembling and reassembling computer hardware (Wilson, 2003). While females may be advancing statistically toward equality in computer use, they still lag behind qualitatively. While computer literate males have advanced technology knowledge, skills, problem-solving abilities, familiarity, and practice, computer literacy for females often connotes end-user experiences: using computer software, engaging with the Internet, or chatting online.

A positivist orientation also attributes the numerical gender discrepancy to “female resistance” of new technologies (Cooper, 2006, Bryson & de Castell, 1995; Turkle 1998; Wilson, F. 2003). This resistance emanates from inherent female (in)abilities, attributes, and psychological characteristics, “such as fear, insecurity, social conditioning,” as well as from some innate female disinterest in technology (Bryson & de Castell, 1995; Cooper, 2006; Wakeford, 2000; Wilson, F. 2003). In short, women are just different from men, and technology reflects those naturally occurring, gender-based differences. Typical of a positivist approach, Collis, a school counselor researcher, advises school counselors to help increase the “numbers of female ‘users’ [by] eliminating their apparent” inherent disinclination toward new technologies (Bryson & de Castell, 1995). From one perspective, this positions girls as naturally deficient but possibly trainable. If counselors only fix girls’ attitudes and encourage them to try technologies in the right way, more girls might take classes in it, do o.k. with it, develop technology skills, and maybe even eventually learn to like it. From another perspective, this advice clumsily recommends counselors encourage a change in technology education pedagogy that recognizes and supports females by building on their natural skills, abilities, and interests and teaching in ways that interest girls more (Siann, 1997; Henwood, 2000; Wilson, F. 2003).

Additionally, a positivist model considers the absence of female images or role models in technology a significant gender gap influence (Bryson & de Castell, 1995; Wilding, 2001). In effect, more women in technology would encourage more women to enter technology. Currently, instead of positive,
plentiful images of female role models and potential colleagues, technology perpetuates and re-inscribes essential gender differences and the resulting absence of women in technology. Demeaning, marginalizing, and objectifying images and stereotypes of women abound within computer culture. Digital technology astronomically increases the rate, range, and resonance of these images, and increases their potential power through the ease and volume of reproduction and repetition. This convergence of technology with essential gender beliefs, aligning *male* with technology and *female* opposite, reinforces the gender and technology status quo. Margolis & Fisher (2003) believe a necessary step in narrowing the gender gap involves challenging the status quo, refuting the acceptance of girls as naturally incapable, uninterested, or unqualified with technology.

The official title of the summer program, *Digital Animation: A Technology Mentoring Program for Young Women*, invokes the assumptions of positivist gender binary. Young women are the target audience for this program. The program’s short-term goal is to provide the participants with a positive, successful, interdisciplinary technology experience and increase their interest in technology and likelihood of pursuing future technology education and training. The longer-term goal is increasing the number of women in STEM fields. From personal experience, Maria Palazzi continuously sees the absence, or pittance, of women in technology education programs (see research reports from AAUW, NCES, and NSF) mirroring and ensuring women’s continuing low representation in technology. She wants to improve this situation, but the possible solutions present tough programmatic decisions. Palazzi struggles with the “little smattering” of participants the *Digital Animation* program serves each summer, a number that fluctuates between 15 and 18 (Palazzi Interview, February 15, 2005). In the interview excerpt above, Palazzi wonders if working with a single cohort across several summers is a better approach. Would developing more advanced technology skills across a longer timeframe increase participants’ likelihood to pursue technology education, training, and employment? The answer is unclear. The smattering of students each summer, while small groups separately, does grow cumulatively over time. Across six program summers, *Digital Animation* has directly involved approximately 100 young women in exploring computer technology, and by proxy, other STEM fields. Across the same time span, *Digital Animation* has included 35 female college students involved with digital technology. Palazzi notes a few participants do email her, expressing a desire to study technology or animation and asking for advice on colleges and programs. Mentors also report a range of continuing contact with previous participants (Farah, PC, Y1, Y2). While these contact numbers are small, they represent only the former participants voluntarily re-contacting ACCAD. After Year 2, I developed a longitudinal study with Palazzi and Kathy V. for *Digital Animation* to use to solicit more feedback about whether or not the program was achieving its goals.

In addition to email feedback, some former participants later return as college students majoring in technology to work as program mentors themselves. They note their experiences in the program inspired them to pursue technology and to contribute by encouraging and supporting other women’s technology interests and experiences (Alyse, INT July05; ON in 2006). While the summer program may not be solely
responsible for their educational and occupational choices, these participants see it as a key influential factor in their choices. Additionally, former participants who returned as mentors reported the program’s impact on their desire to help other girls like the program helped them. Hopefully additional longitudinal survey data will also eventually provide a fuller sense of the program’s positive, negative, and neutral impacts on participants’ subsequent interests and pursuits.

The design and operation of Digital Animation reveals acknowledging and attempting to respond directly to gender binaries and the resulting inequities in technology from a positivist paradigm. Palazzi’s personal and professional experiences with the well documented technology gender gap and her belief that many young women really are, or would be, interested in computer technology drives her to seek solutions starting at the most basic level: how can she help attract and retain women in computer technology? Can a computer animation program provide the vehicle to do this?

Digital Animation specifically targets “young women,” a term I explore further in Chapter 4. Palazzi leverages all her available resources and deploys them deliberately and directly to a select population of young women. Palazzi wants women equitably represented in technology education, employment, and development instead of the paltry presence they currently exert (NCES, Trends, p. 9; NSF, 2004). The goal is to counteract the negative effects on women of positivistic gender assumptions. The program confronts positivistic stereotypes about women’s ingrained attitudes, skills, and behaviors toward technology; the gender double standard for technological literacy; the negative images and absences of women in technology, and the continuing male domination of the field. The program’s approach echoes call for using girls’ interests to engage and educate them in technology (Bryson & de Castell, 1995). Maybe young women need different points and methods of entry.

Digital Animation directly confronts positivistic gender stereotypes around women’s technology attitudes. Bryson & de Castell (1995) emphasize that earlier gender and technology scholarship strongly positions females as technologically deficient and advocates working to fix their attitudes toward technology and entice them to embrace new technologies as constant improvement and continual salvation. Maria Palazzi does not share the perspective that girls are/have a problem with technology that needs to be “fixed.” Instead, Palazzi believes technology education’s problematic attitude toward girls, and other marginalized learners, is what needs to be “fixed” (Margolis & Fisher, 2003). Palazzi believes technology capabilities and interests are not predetermined by gender at birth. As a result, Digital Animation intends to increase the proportion and number of women in technology by exploring ways to generate and retain young women’s interest in and success with technology (NCES, Trends, p. 9; NSF, 2004).

Digital Animation also employs several strategies to counter the positivistic myths around women’s negative attitudes and disinterest toward technology. First, while the program philosophically challenges inherent cultural gender biases against women in technology, it simultaneously assumes traditional gendered learning preferences and proposes using the arts, specifically the digital arts, as the means of engaging young women with technology. The program attempts to appeal to young women’s
interests, offering them the chance to use the same artistic software as professional animators. The applicants know the digital animation medium through popular movies, cartoons, and video games. Also, Digital Animation acknowledges the disparity of women’s access to, and training with, technology. Without access or practice, girls “are less comfortable with [technology and] ... could be at a disadvantage later in their educational careers or in the workplace” (NCES, 1999, Trends, p. 6). The summer program provides individual access, support, and training with sophisticated technology many “young women” might never encounter or consider.

The Digital Animation summer program design also contributes toward countering the limits of current images, absences, and options for women in technology. Again, gender inequity creates a double standard for technology literacy. In Digital Animation, young women learn to use technology to create and communicate, to see themselves as makers and not just users of technology (MP INT, July05). They learn advanced, complicated computer technology skills. Simultaneously, Digital Animation contradicts the negative images and the absences of women in technology. The program structure includes an all-female staff: college-aged mentors, assistants, instructors, director, and researcher. The reporters and photographers who visit the program each summer are female, too. There are women involved with technology at all levels (ONY1; ONY2). Successful women. Not just women as objects, possessions, outsiders, outcasts, or victims. Instead, these women are technology students, professionals, academics, and administrators. The all-female technology environment disrupts and reconfigures gender and technology assumptions; it shows women in technology at all levels and encourages young women to consider it themselves. The Digital Animation women are interested, skilled, qualified, capable, and successful in technology (Margolis & Fisher, 2003).

Much of the essentialist gender binary of positivism is suspect, based on slippery biology and gender concepts, but it prefigures and greatly influences Bryson & de Castell’s (1995) other analytical categories. This absolute natural divide may only insist men and women are different, but this division presents the conditions for positioning genders as binary opposites, valuing them hierarchically, and aligning other binary terms accordingly. The following section uses constructivist concepts to examine ways cultural divisions of these binaries impact the relationships between gender and technology, and applies this information to Digital Animation data.

A Constructivist Perspective of Digital Animation Data

Constructivism accepts positivism’s foundational gender binary and then examines how cultures construct each term, female and male, and the differences between them. From this perspective, we think, “Ok, sure, men and women are different, but how?” For starters, the gender binary male/female becomes an analogous structure for other binaries, implicitly assigning each a gender, and by default, a relative value.
An examination of the categories demonstrates the relative value of each binary term, with culture assigning more value to “male” and less to “female.”

Constructivism asserts culture’s active role in creating, assigning, and ranking these binaries, privileging the masculine term. These gendered associations do not just (always already) exist, cultural forces conspire to establish and enforce them (Butler, 1990). Then gender stereotypes and roles serve to dictate and limit individuals: men create, women use; men are good with numbers, women are not; women are nurturing, men aren’t; women do housework, men don’t. Cooks & Isgro (2005) stress the need for carefully examining the social construction of gender categories. Stereotypes like these significantly impact the relationships between gender and technology, but how? From this perspective, cultural constructions are a primary cause of the technology gender gap. In a culture that privileges male over female, male characteristics, qualities, attitudes, and behaviors become the more valuable, successful, and emphasized attributes; women’s interests, skills, and experiences can be ignored or completely excluded. As a result, traditional technology education and training favor males and male learning models.

These traditional approaches rely on models that assume male excellence and female deficiency in technology (Margolis & Fisher, 2003). According to the AAUW (2000), computer technology classes are “bastions of poor pedagogy” (p. 41), with practices often skewed toward “male-dominated interests and activities, such as sports statistics and card and number tricks,” ignoring anything remotely interesting to girls in classes, and sometimes encouraging or allowing sexual harassment of girls who intrude (Margolis & Fisher, 2003, p. 36). These attitudes, environments, and biases impact girls’ confidence with technology, desire to use it, and ability to benefit from it (Orenstein, 1994; Whitley, 1996; Whitley, 1997).

Additionally, Margolis and Fisher (2003) note, “Although computing is integrally linked to critical investigations in medicine, environmental science, famine control, art, and music,” computer
science teaching materials “focus primarily on technical details” and fail to attend to “application and impact of the technology in meaningful interdisciplinary problem-solving assignments” (p. 37). Many women see this as a turn-off to entering the computer technology field, instead preferring the idea of using technology to solve larger societal problems (Margolis & Fisher, 2003). AAUW reports like *TechSavvy* (2000), as well as meta-analyses of gender and technology research, such as that of Jo Sanders (2005), emphasize the importance of altering computer culture, environments, and courses to attract and welcome females. Girls perceive technology education, especially programming classes, as tedious and dull; computer games too boring, redundant, violent, and misogynistic; and technology career options uninspiring (AAUW, 2000). Grouping computer technology with math and science may cause additional problematic for girls, according to Margolis and Fisher (2003). Even as girls take increasingly difficult science courses in larger numbers, girls’ confidence in their math and science abilities falls, discouraging them from taking computer science courses.

Females face a technology and gender catch-22: technology fields exclude and ignore women and their interests, and women resist the masculine cultural associations of technology. Most females eschew technology as too competitive, violent, aggressive, and mechanical, but female absence leaves masculine influences and interests unchecked. Also, culture constructs technology careers as solitary, antisocial, sedentary, and passive (AAUW *TechSavvy*, 2000), while feminist constructivist research asserts females prefer social, collaborative, inter/active, positive, productive, and participatory learning practices (Kramarae, 1997; Rasmussen & Hapnes, 1991). Too, females disdain the main technology stereotypes: the rebellious hacker with his invade, master, and control focus or the obsessive, socially-awkward, slightly outcast computer geek (Margolis & Fisher, 2003). Instead, constructivist gender and technology research emphasizes women’s desires for balance between technological and non-technological pursuits, the desire for human contact and interaction, and the desire to aid instead of invade (Margolis & Fisher, 2003). Females face the rationalization that their exclusion from technology results from their inherent disinterest, but this exclusion hinders women developing an interest in it and dampens the interests of women who do.

While I focus on feminist pedagogy in Chapter 4, feminist theory plays an instrumental role in recognizing and documenting culturally-constructed gender differences. Earlier feminist pedagogy advocates for gender-differentiated approaches to learning aimed at increasing females’ successes (Belenky, et al, 1986; Wheedon, 1987). Gender and technology research examines and applies feminist pedagogy principles in order to alter technology pedagogy and evaluate the results. A constructivist approach involves including “women’s ways of knowing” (Belenky, et al, YR), challenging the gender status quo in technology education and culture, and disrupting traditional gender associations and abilities (Margolis & Fisher, 2003; Schiebinger, 1999). Constructivist gender and technology research applies feminist pedagogical recommendations and investigates the impacts. While not a conclusive list, gender and technology research employs feminist pedagogy concepts and recommendations in order to confront and counter negative constructivist influences. As a result, the program explicitly favors learning as a
communal process of collaboration over competition, understanding over memorization, experience as well as objectivity (Belenky, et al, 1996; Wheedon, 1987). Additionally, the program stresses the feminist pedagogical emphasis on the useful application of knowledge, or learning with practical value. May women want their work to be useful and create actual positive change. Feminist pedagogy encourages community service and work-based learning to meet these gender preferences. Feminist pedagogy also encourages teaching in a more holistic and social context, more situated and subjective than removed and objective.

An important constructivist tactic for altering the gender gap in technology education involves challenging the myths of girls’ disinterest or inability with technology (Margolis & Fisher, 2003; Schiebinger, 1999). One approach researchers suggest is explicitly linking success with computers “to girls and women, too” (Margolis & Fisher, 2003, p. 4). Turkle proposes, “Instead of trying to make girls fit into the existing computer culture, the computer culture must become more inviting for girls” (AAUW TechSavvy, 2000). Females need opportunities, encouragement, and support to make effective inroads into technology. Margolis & Fisher (2003) recommend reconfiguring curriculum, teachers’ expectations, and culture to promote girls’ pathways into computing and to recognize and value the technology skills, interests, and preferences women tend to favor, such as networking, communication, and personal expression (p. 4). Squires (2005) argues that technology needs active intervention strategies to support, encourage, expect, and reward feminine characteristics and behaviors. Women need institutional and individual support to counter the cultural “cumulative effects” of being held back, or discouraged, “at every step of the way” (“You’ve Come a Long Way, Baby,” 2005).

According to TechSavvy (2000), in our society today, “the computer is no longer an isolated machine,” but “a centerpiece of science, the arts, media, industry, commerce, and civic life” (p. ix). As such, “the question is no longer whether computers will be in the classroom, but how computers can be used to enhance teaching and learning – ideally in ways that promote full involvement by girls and other groups currently underrepresented in many computer-related endeavors” (TechSavvy, 2000, p. ix). Girls often find no easy entry points into technology and most will avoid competing for access (TechSavvy, 2000, p. ix). Digital Animation: A Technology Mentoring Program for Young Women attempts to increase gender equity by providing an alternative opening into technology, using the arts to entice, support, and encourage young women’s technology interests. The program stresses technology’s creative and practical possibilities instead of its abstract aspects.

Maria Palazzi believes girls are interested in technology and its potential uses, but recognizes that most regular technology education favors male participation and interests. Palazzi designed Digital Animation as a feminist response to standard technology education and the gender gap. The intent is to include and interest women more in technology. During Years 1 and 2, participants validated Maria’s beliefs. Each year, the participants demonstrate wide-ranging interests in and experiences with technology. During breaks, and eventually during group work, participants chatted eagerly about technology - their home computers (or lack thereof), video games, movies, television, music, email, cell phones, and favorite
websites (ONY1; ONY2). But the participants carefully distinguished themselves from technology stereotypes, noting brothers who memorized the names and technical specifications of all the space transport vehicles in *Star Wars* or addictively play video games or learn to speak Klingon (ONY2). The participants make sharp distinctions between their own technology enthusiasm and the obsession they observe in males (Margolis & Fisher, 2003). But these participants exhibit strong signs of geekiness at times, too. One participant spends two days creating a CD-Rom of hundreds of sounds for possible group use, another spends hours at night working on Maya at home, several share thorough knowledge of darkly humorous online games, and several each year express an incredible background interest in animated movies and artists (ONY1, ONY2). The mentors provide examples of geeky female techies – discussing and demonstrating their interest and expertise with video game history, mechanical engineering and art, animation, programming, graphic design, anatomy, and more (ONY1, ONY2).

The all-female staff also helps link technology success with girls and women (Margolis & Fisher, 2003, p. 4). The college-aged female mentors, as well as the instructors, staff, and administration, provide physical evidence that women and technology are not mutually exclusive – that some women are interested, pursue, and succeed in technology fields. This program strives to provide girls with the opportunity, encouragement, and support to make effective gender equity inroads into technology. Palazzi follows Margolis & Fisher’s (2003) recommendation to use *Digital Animation* as an opportunity to reconfigure technology curriculum, instructional expectations, and culture to recognize and promote female presence and pathways into computing (p. 4).

Palazzi uses constructivist aspects of gender and technology research to shape the *Digital Animation* instructional model in many ways. First, the program involves small groups of all female participants working together with an assigned college mentor to produce animations about local environmental issues. Next, the participants all have access to the wealth and range of ACCAD technology resources to create their animations. Additionally, everyone in the program has direct access to everyone else in the program. While a hierarchy does exist, the program minimizes its presence and mobilization. The direct interpersonal contact helps diminish traditional institutional and instructional power structures. During Years 1 and 2, Palazzi knows each student by name, learning them with me using my notes; she interacts individually with each one, too. The mentors have constant input into the planning and operation of the program during daily staff meetings, from a week of planning, during the two weeks of the program, and through the post-program week (ONY1, ONY2). *Digital Animation*’s elision of traditional educational power differentials promotes a sense of autonomy, agency, and responsibility among all people affiliated with the program’s operations. Everyone is a resource for everyone else; everyone plays an active, important role.

This equity effort reflects Palazzi’s commitment to promoting a learning environment that supports female learning preferences and strengths and counteracts traditional technology classroom biases against women. Palazzi wants to construct technology as a place for women and encourage women to enter it, stay, and exert their influence. To do this, she emphasizes aspects targeted to appeal to females. She
constructs the program, and hopefully technology, as social, collaborative, inter/active, positive, productive, and participatory (Kramarae, 1997; Rasmussen & Hapnes, 1991). She emphasizes important gender and technology pedagogy factors that favor women: collaboration over competition, experience as well as objectivity, creating actual positive change through service learning, and learning in a holistic and social context.

Palazzi believes using mentors is a key factor for supporting female interest and success in technology, as well as increasing overall female retention in technology fields. During the program, the mentors directly support their small group and each individual within it. Everyone gets personal attention and can receive instant instructional review, remediation, assistance, and encouragement. Perhaps more importantly, Palazzi sees the mentor component of the summer program as a model for generating a support network for women in technology to counterbalance the male predominance of the field. From gender and technology research and experience, Palazzi knows men in technology enter a male-friendly field where they find ample support and camaraderie. Women entering the technology field face many disadvantages, but a strong, if deliberate, mentoring and support network could begin to rectify this imbalance. Palazzi notes:

*This idea about mentoring to me is also just really important. It’s important that our graduate students have the experience in mentoring that makes them want to do it. And that these younger students see that it’s important to have the expectation of being mentored, whether it’s your teachers or your older sister or your whatever the situation. So it will be their expectation when they go into the working world that someone’s going to take the time to mentor them, and they should grow up and learn to do that for other people, too. It’s really like that pass-it-on mentality.* (MP, INT, 15Feb05)

Palazzi’s efforts at creating a self-perpetuating cycle of mentoring already show a measure of success. In surveys, participants, and parents, stress their appreciation and affection for the mentors (Participant postsurveys 04, 05; Parent post-survey Y2). Several participants have already returned to the program as official mentors, too (ONY2; ON 2006). The program mentors see themselves in this cycle, too. In survey questions about their mentors, they sometimes mention other mentors in the program, but most also consistently list Maria Palazzi, too (Mentor Postsurveys 04; 05). She explains, models, and enacts, the system she wants to create.

According to Cook & Isgro (2005), when technology is separated from, and emphasized over context, pursuing technology “is viewed as constructing and determining human progress, culture, and relations.” From this perspective, “the presumption often exists that contexts could and should change, but that [Information and Communication Technologies] and uses of them do not” (Para. 12). *Digital Animation* addresses constructivist gender equity issues in technology instruction through focusing on situated learning. According to much gender and technology research, young women want “computing with a purpose” - to connect “computing to other fields and [work] within its human and social contexts” as a way to “make the study of computer science compelling and meaningful for them” (Margolis & Fisher, 2003, p. 52; Sanders, 2005). Young women want their work with technology to happen in context, to have
some actual result, or practical worth (Jensen, Bryson, & de Castell, 2003). Women also tend to prefer holistic, contextual learning, where learning relates to, incorporates, and affects their personal lives. Women want to learn technology not as an end in itself, but as a component, a tool, for learning and doing other things. AAUW’s *TechSavvy* (2000) argues that technology should be “integrated across the curriculum, into such areas and disciplines as art, music, and literature, as well as engineering and science” because this integration “supports better learning … [and] invites more girls into technology through a range of subjects that already interests them” (*TechSavvy*, 2000, p. xii). *TechSavvy* (2000) stresses the need for “multiple entry points … while we remain sensitive to activities and perspectives that are appealing to girls and young women” (p. xii).

*Digital Animation* offers examples of women succeeding and doing interesting work in technology, primarily through mentors with wide-ranging interests in science, dance, engineering, archaeology, instruction, hardware, and programming - all with shared interest in 3D animation. Palazzi believes the arts, specifically digital arts, can serve as an important easy entry point (AAUW, *Tech Savvy*, 2000) for young women into computer technology. Palazzi agrees with AAUW’s prediction that technology will increasingly permeate our culture and lives, that in the future, “All jobs, including those in the arts, medicine, law, design, literature and the helping professions, will include more and more computing” (*Tech Savvy*, 2000). Also, AAUW forecasts technological careers will increasingly draw on the humanities, social science, and people skills,” traditionally more feminine areas (*TechSavvy*, 2000, pp. xii – xiii).

Interdisciplinary skills in language, design, aesthetics, problem solving, organization, and follow-through equal, or surpass, creative computing’s reliance on quantitative data and analysis (Margolis & Fisher, 2003, p. 57). Interdisciplinary skills are important ones in an increasingly knowledge and technology-based society. The arts depend on and develop interdisciplinary ideas and processes; they stress the value of creativity, interactions, connections, multiple possibilities, divergent thinking, and communication (Eisner, 1982, 1991, 1994; Greene, 1980; Greene, 1994). Art stresses the value of production. These skills can be used to address relevant issues and create actual change.

The *Digital Animation* program attempts to recruit young women with a strong interest in the arts who might benefit from seeing how they can connect their interests with technology education and career possibilities. Palazzi and the mentors stress the importance and prominence of visual communication throughout the program. Mentors work with their groups to ensure each animation has a sense of coherence and communicates clearly about their topics (ONY1; ONY2). Some instructional sessions focus on the impact of accurate visual representation. In one lesson, participants work with a darter fish model to make it swim in a realistic manner (ONY2); in another, they modify the model’s mouth movements to match the dialogue (ONY1; ONY2). Fire proves continually difficult to represent, and groups rely on sound effects to reinforce the visual illusion (ONY1; ONY2). Participants leverage their own knowledge, skills, and interests. Gabby can draw people, so she sketches several figures; Raquel likes fashion design, so she adds their clothing; Betsy knows songs they might use, so she finds and downloads audio files on the Internet.
Anna outlines quick storyboard scenes, Lydia facilitates a group discussion, and Dee and Ronda troubleshoot an animation segment. Each participant clearly contributes; her interests, effort, creativity, and skill receive recognition and validation. Digital Animation’s program model allows each group and individual to contribute to creating a meaningful work of art, using interdisciplinary methods and information to successfully use sophisticated computer technology.

Digital Animation: A Technology Mentoring Program for Young Women attempts to increase gender equity in technology by using the arts as an alternative entry point into technology, one that may better entice, support, and encourage young women’s interest and success. This approach presumes males and females exist and their culturally established gender differences contribute significantly to the technology gender gap. Palazzi structures Digital Animation partially in response to this assumption, by trying to counteract cultural biases against women in technology and by adopting pedagogy and materials more aligned with female interests and learning preferences (Gorriz & Medina, 2000).

Digital Animation’s instructional focus is to teach participants to use Maya 3D animation software to produce animations for web publication. Participants increase their knowledge, skills, and confidence in math, science, and problem solving (Margolis & Fisher, 2003, p. 37) by using interdisciplinary skills and knowledge, as well as creativity. The program recognizes, values, and facilitates networking, communication, personal expression, and the desire to work for change. Constructivist approaches accept the gender divide and attribute biases against women to differences between the ways men and women learn and use technology. In Digital Animation, Maria Palazzi addresses constructivist concerns by employing strategies geared to support female technology success, like small groups and individualized instruction. Simultaneously, Palazzi’s efforts reveal a desire to negate constructivist assumptions about girls and technology, to prove girls do like technology, get math and science, work with computers, think rationally, and can succeed in technology environments.

A Critical Perspective on Digital Animation Data

Bryson & de Castell (1995) use “critical” as their next category for analyzing gender and technology relationships. While a constructivist orientation reveals the technology gender gap and attributes it to socially-constructed gender differences (Silverman, 2001), a critical orientation questions these constructions. A critical orientation investigates ways constructions of gender create and perpetuate a hierarchy that values what we consider masculine (and masculinizes what we value) while it denigrates what we construct as feminine (and feminizes what we devalue) (Margolis, Fisher, & Miller, 1999; Schiebinger, 1999; Wajcman, 1995). The critical category of gender and technology research questions this power differential and encourages measures to rectify it. In the next section, I use this critical perspective on gender and technology to examine Digital Animation’s philosophy and pedagogical approaches.

Critical gender and technology research combines constructivist perspectives with critical theories. Constructivism continually exposes and describes culturally produced gender differences and their impacts on male and female learning, but this constant focus on binary gender differences inadvertently naturalizes
it. As Bryson & de Castell (1995) state, this perspective only increases “the number of legitimated ‘ways of knowing’ from one to two” (Para. 19). Critical approaches to gender and technology question how social relations, institutional power, and the mechanics of oppression dynamically respond to key markers of difference including gender, race, class, age, and sexuality. These fluctuations indicate the ceaseless, sometimes insidious, subconscious socio-cultural efforts to “create, reify and consolidate differences” (Para. 19). Instead of constructivist descriptions, critical gender and technology research attempts to recognize then understand “existing inequities, or oppressions,” and question the structures that create and maintain these discrepancies” (Para. 21). Critical gender and technology research documents “systematic inequities” in technology distribution, access, and use for women and members of other marginalized groups (Para. 22). It also interrogates ways people (and populations) in power “adapt and channel innovation in order to retain control” of older and “emerging forms of knowledge” (Para. 22). Bryson & de Castell (1995) believe critical gender and technology research asks who benefits from these cultural and gender power hierarchies? How do they persist or adapt? Who suffers? How? Why?

Foucault’s works, mainly Discipline and Punish (1978a) and The History of Sexuality, Volume 1 (1978b), create the necessary theoretical background for later feminist and other critical theory analyses of gender and power, and later, technology. But gender remains remarkably absent in Foucault’s works, even as his archaeologies of power provide a power feminist critical lens. Foucault’s (1969) work provides a basis for countering the notion of the subject as a rational, singular, unified being with a fixed core or essence.

Critical theory concerns with societal, institutional, and internalized power hierarchies and systems frames critical gender and technology scholarship. Societal power is the exertion of cultural norms, expectations, and roles to produce acceptable behaviors and attitudes. As an example, most cultures designate clothing norms; these usually vary by gender and sometimes by situation. Suits and ties are for men; dresses are for women. Both de Beauvoir (1988) and Bordo (1996) emphasize the importance fashion plays in supporting and reinforcing gender ideals and norms. Society ensures we know and (mostly) abide by these rules.

Institutional power involves the dominant group’s ability to enact, authorize, justify, and perpetuate prejudice against members of less powerful groups. In Homophobia: A Weapon of Sexism, “The Common Elements of Oppression” by Suzanne Pharr (1988), she describes the existence and impacts of institutionalized power:

People of color simply do not have institutional power to back up their hatred or bigotry or prejudice and therefore cannot be deemed racist. In the same way, women do not have the power to institutionalize their prejudices against men, so there is no such thing as “reverse sexism.” How do we know this? We simply have to take a look at the representation of women and people of color in our institutions. Take, for example, the U.S. Congress. What percentage of its members are people of color or women? Or look at the criminal justice system which carries out the laws the white males who predominate in Congress create: how many in that system are people of color? And then when we look at the percentage of each race that is incarcerated, that is affected by these laws, we see that a disproportionate number are people of color. We see the same
lack of representation in financial institutions, in the leadership of churches and synagogues, in the military. (p. 53).

Pharr’s examples translate easily to gender. Who holds most of the CEO positions in Fortune 500 companies? Who controls most of the economic wealth and resources in most countries, regions, and industries? Who profits the most? Who are the executives in technology companies?

Institutional power often involves a real or nebulous sense of authority, regularly accompanied by a sense of entitlement. The police can detain, question, and arrest individuals or groups with little to no evidence for suspicion of wrongdoing. Politicians have the authority to act on the behalf of their constituency to create laws, policies, and projects, ostensibly to benefit the greater good, but Pharr (1988) questions this arrangement:

How much does it cost to run a campaign to be elected to the House or Senate? One does not find poor people there, for in order to spend the hundreds of thousands of dollars that campaigns cost, one has to be either personally rich or well connected to those who are rich. And the latter means being in the debt, one way or another, of the rich. Hence, when a congressperson speaks or votes, who does he (occasionally she) speak for? Those without access to wealth and resources or those who pay the campaign bills? (Para. 6)

How do marginalized individuals and groups penetrate these institutionalized barriers? How does authority perpetuate itself? Imagine how institutional power affects gender. Those who control the majority of wealth in the United States, and globally, are males. This wealth translates into power and control in many, if not most, circumstances.

Another important form of power that impacts gender and technology research are internalized power hierarchies. These internalized power hierarchies create cycles of self-censorship and self-regulation that enact, or even exceed, societal and institutional rules and expectations. Men do not cry. Women do not interrupt or disagree. Fat people cannot be athletic. Young people cannot lead. Often these forces act in unison, creating a near-invisible structure of rules, regulations, and expectations that work to maintain the status quo. Pharr (1988) believes internal oppression can manifest as “horizontal hostility,” or a transference of “disrespect and hatred [that] can easily be extended to [an] entire group” (Para. 17), even a group to which one belongs. Pharr (1988) believes that “Sometimes the internalized oppression leads people to be reluctant to associate with others in their group. Instead, their identity is with those in power” (Para. 17), like the Stockholm syndrome where oppressed people appropriate the beliefs of their oppressors or captors. As Pharr also notes, “When the victim of oppression is left to believe the negative views of the oppressor, this phenomenon is called internalized oppression” (Para 16).

Digital Animation Addresses Critical and Constructivist Gender & Technology Issues

Digital Animation addresses many key critical and constructivist gender and technology issues erupting from, and reinforcing, the gaping divide between gender equity in technology. In the following paragraphs, I present and analyze data from the Digital Animation program in relationship to critical theoretical perspectives, particularly those around gender and technology.
Digital Animation’s structure and implementation corresponds with many findings from almost three decades of gender and technology scholarship. The Digital Animation program aims to confront current societal, institutional, and internalized power hierarchies that impede women’s entry into technology fields. Four major gender inequities in technology include: the distribution of technology education resources, access to new and developing technology, use of new and developing technology, and technology power and expertise. These inequities, in turn, influence power hierarchies.

**Digital Animation’s Distribution of Technology Education Resources**

Digital Animation equitably distributes ample technology and material resources to its participants. In terms of material support, each year the program provides all participants and groups with a full range of technical supplies to use during the program including blank video tapes, DVDs, small memory cards, digital cameras, tripods, and batteries (ONY1, ONY2). In contrast with what Pharr (1988) identified as the “myth of scarcity” (Para. 5), program supplies are abundant; there is no rationing, no shortage, and no competition for them. Each participant has an individually assigned personal computer and workstation. Each participant can print from her station to a networked printer. Participants can create, scan, alter, and produce copies of documents, images, sounds, and movement.

Digital Animation also supplies ample technology educational support personnel, including mentors, instructors, assistants, ACCAD staff, and local naturalists. By Year 1, the program shifts from having a set of free-floating mentors to mentors with specific group assignments for their individual and group assistance. Mentors work directly with the participants to monitor their progress and understanding throughout tutorial lessons. Mentors offer assistance, reminders, encouragement, and additional information as necessary (ON 04; ONY2). In a typical instance, Xin, a mentor, watches Anna’s animation segment then offers constructive criticism and some specific feedback and advice. Xin also asks Anna for permission to demonstrate an animation task. Anna assents and Xin shows her how to make the suggested modification (ONY1, Day 6, p. 26). Often the two program instructors also provide individual assistance, too, by constantly circulating throughout the classroom, directly interacting with groups, mentors, and participants.

Traditionally, in educational settings, males tend to command most of the instructional resources (AAUW, TechSavvy, 2000; Margolis & Fisher, 2003; NSF, 2002; Newitz, 2005). They garner most of instructors’ positive and negative attention, and most of their assistance (Margolis & Fisher, 2003; Turkle, 1988). Females adapt to the bias, relying on extra personal effort and good, acceptable behavior instead of receiving individualized attention and support (Margolis & Fisher, 2003). Digital Animation is Maria Palazzi’s attempt to use ACCAD’s resources, and whatever others she can solicit, to provide and distribute technology and educational support deliberately and directly to yearly cohorts of young women. Palazzi targets the hierarchy of resource distribution, and hopes deliberately providing young women with technology resources and access can help create a more equitable gender distribution of technology resources and, eventually, technology careers and development. Palazzi believes this kind of intervention
represents “a radically different approach” to technology education with respect to gender; increasing the number and percentage of women in technology could increase the benefits to society as a whole, especially for women, children, and other marginalized populations (MP INT 15Feb05).

**Digital Animation’s Access to New and Developing Technology**

Another critical gender and technology criticism involves inequitable access to new and developing technologies. Palazzi knows, through experience and continual observation, that most “boys” in technology environments feel entitled, and “hog all the resources,” taking the best computers and technology accessories, like digital cameras, audio equipment, and gaming controls (MP, INT, 15Feb05). Palazzi confesses, “girls operate at a disadvantage, generally, in computer technology,” and “get the worst, oldest, and slowest computers.” When technology resources are scarce, “girls feel it first” (MP, INT, 15Feb05). In the Digital Animation program, Palazzi insists the participants not have to compete for resources; they all have direct, individual access to new professional grade media technology, including graphic design and animation software. The Digital Animation participants also have access to other cutting-edge forms of technology. In Years 1 and 2, participants have the opportunity to go to the Motion Capture (MoCap) lab, wear a special suit and participate in a motion capture session (ONY1, Day 8, p. 31; ONY2, Day 5, p. 37). In Year 2, participants use virtual reality technology and equipment, too. Participants also access ACCAD’s high-tech sound equipment and a state-of-the-art facility for their animation presentations.

These software and hardware resources are inaccessible to many participants except through the summer program. They can be prohibitively expensive for individual purchase and use. Additionally, graphics programs are notoriously large and require increasing amounts of storage and processing space. Parents mentioned the size and expense of programs. Palazzi encourages interested participants to consider downloading student and trial versions of the software for home use and self-education. Most are free or cheap, and the program size is significantly smaller. In reality, many participants may be unable to access these options, too. Digital Animation briefly negates those obstacles for a cohort of girls each summer, spanning the digital divide of gender access to technology.

**Digital Animation’s Use of New and Developing Technology**

Critical gender and technology scholarship also exposes a huge discrepancy in ways gender biases impact the use of technology. A wide distribution of technology resources encourages greater access, but neither access nor distribution ensures equitable technology use for males and females. Scholars acknowledge gender double standards for technology literacy and note gender differences in technology use, even when access seems comparable (AAUW, 2000; NSF, 2002). Margolis & Fisher (2003) recognize subtle factors, like the locations of computers in homes, often promote, encourage, and communicate the expectation of male access and use.

Digital Animation allows female participants to experience technology very differently. They cast off passive techno-voyeurism and spectatorship for more active roles, using technology as a creative tool.
Touching it. Learning to use it for their own purposes and pleasures. Each instructional tutorial at ACCAD involves participants following along manually, doing the steps themselves, on their own computers. As Palazzi builds a talking clam from shapes, the participants watch and work (ONY2, Day 5, p. 37). They struggle at times, but they receive abundant individual support to succeed. Palazzi encourages mentors to let the girls complete as many of the tasks themselves as possible, to offer them assistance, but to have the participants do the actual work, touch the machines, make the decisions, cause things to happen (ONY1, ONY2).

Groups divide technical tasks: taking photos, scanning images, online research, creating documents, graphic design, sound collection, and animating. Mentors assist their group members, but the members have direct use of the technology and equipment. In the MoCap lab, some participants wear the special suit and enact scenes, creating a set of data that can be translated into a skeletal prototype for different kinds of movements in digital animation (ONY1, Day 8, p. 31; ONY1, Day 10, p. 34; ONY2 Day 5, p. 37, ONY2, Day 9, p. 49). The mentors show participants how to use different equipment and then have participants use it. Critical gender and technology research questions the ways gender influences who uses what technologies, how, and the results.

Digital Animation’s Technology, Power, and Expertise

Additionally, critical gender and technology research queries ways power manifests and adapts, and who benefits and suffers accordingly. Power in our society already carries a strong masculine bias. This continues, and even intensifies, with regards to gender and technology. Technologies possess gender associations, with the more powerful or valuable technologies becoming masculine while the less valuable and weaker ones become female (Gray, 1995; Plant, 2000; Scharf 1998; Wacjman, 1991). In this situation, men also maintain domination of technology by not recognizing women’s technologies and skills, such as the number of machines most women master and manage in a contemporary kitchen (Gray, 1995; Wacjman, 1991). Gender and technology stereotypes also serve to promote and maintain male leadership of technology as CEOs, administrators, educators, inventors, and managers. Few women enter technology, and even fewer pursue and attain leadership positions (Rosmarin, 2007). These power differentials actively benefit men through perpetuating a system favoring males, while continuing to dissuade and exclude females. The status quo has material consequences in terms of who benefits and loses economically from technology as well as tangentially, in social prestige or recognition.

Digital Animation responds directly to critical gender and technology scholarship’s exposure of the dearth of women in positions of power with regards to technology. Maria Palazzi uses her position as a technology educator and administrator to contradict the false image that women are not good with technology and cannot be successful leaders. Maria Palazzi serves as a key example for the participants as well as the mentors. Her position as the director of a top computing and design program clearly demonstrates how women can and do succeed in technology. Palazzi also deploys mentors as strategic proof that women can be good with technology and can lead. These mentors showcase their computer skills
and interests while developing and demonstrating leadership and administrative skills. The program instructors, Maria Palazzi and Vita, are both female ACCAD faculty members, officially professors in the College of the Arts. In Year 2, Palazzi highlights a long-term collaboration between ACCAD and the Burpee Museum of Natural History to create animations depicting dinosaur environments, physical characteristics, and behaviors. Karli, and other mentors, plays active leadership and participant roles in this effort. Palazzi continues to network and recruit women in leadership roles in technology to speak during the program, as well as provoking conversations within the field, acknowledging “I’m talking to Dreamworks right now about doing some kind of symposium on why there aren’t women or any minorities in this field. They’re really interested in doing it with us” and working on how to address this technology and leadership gender gap (MP, INT, 15Feb05).

These primary categories for gender inequity - distribution of technology education resources, access to new and developing technology, use of new and developing technology, and technology power and expertise – are deeply embedded within our social, institutional, and individual assumptions about technology, gender, and power. In the next sections, I analyze how Digital Animation intersects and interacts with the realities of a male-dominated technology environment.

_Digital Animation_ strives to address critical research about the technology gender gap and to counter the power of images, stereotypes, and hierarchies that install and maintain male domination of technology fields. One of the primary ways the program counters stereotypes is through its all-female staff. This staff inscribes a powerful, visceral image of women involved, interested, and succeeding in technology at all levels. The program runs during summer break, making the program participants and staff the primary population of ACCAD then. This direct contradiction of gender and technology stereotypes reveals their façade and undermines their power. But there are also a few times and places where males do play a role in the program’s operations. Are these intrusions important? In the next paragraphs, I present and critically analyze several examples where males play a visible role.

One program area with persistent male presence is technical support. In Years 1 and 2, a male ACCAD staff member, Grant, performed the few technical support tasks the program required. In Year 1, I recorded technical difficulties and subsequent support at the start of participants’ second day, noting, “The server was somehow down and the girls weren’t able to log on. Grant was called in to remedy this and managed to have the system up and running by 9:15 a.m.” (ONY1, Day 2, p. 15). Grant returned later that morning to help a small group with technical problems, and again later, Palazzi “gets Grant to come into [the fishbowl] because of some computer/web problems” (ONY1, Day 2, p. 20). In Year 2, the program assistant “encounters some glitches – the girls can’t access the folder she wants them to use,” and has Grant work with another guy to “set it up so the girls can access the folders” on the shared server space (ONY2 Day 2, p. 19). Midway through the Year 2 program, the system “goes down” and Grant comes to the classroom to help restart it. Maria Palazzi makes an aside to me about “how the man has to come in and fix it.” (ONY2, Day 2, p. 19)
Palazzi’s remark is funny, and she means it to be within the context, but it is also tinged with truth, acknowledging areas within technology where the gender gap persists even more deeply. Grant does fulfill the overwhelmingly male tasks of providing computer system technical support and solving hardware and software performance issues. His presence within the otherwise all-female program environment is initially slightly jarring, but his quiet demeanor and economical social interactions minimize his interruption. Grant represents the struggle between providing participants with a completely female technology environment or ensuring, as one mentor stresses, that participants have experience working with males because men predominate the field and women need to learn to work with them and succeed within that environment (ONY2).

Grant’s presence and actions further complicate the power/gender differential by reinforcing Maria Palazzi’s position of institutional authority as ACCAD Director. While Digital Animation strives to minimize and level staff hierarchies, Grant clearly works at ACCAD and with Palazzi in a different paradigm and institutional hierarchy. Grant only enters at Digital Animation staff request and exits upon task completion. Theoretically, Grant’s presence contradicts the program’s values, aims, and power dynamics, but in practice, his presence complicates and reinforces them. He provides evidence of women succeeding in a traditionally male environment, even as leaders.

A second scenario that interrupts Digital Animation’s all-female environment involves another male ACCAD staff member, Byron. Byron is ACCAD’s full-time Motion Capture (MoCap) lab manager and instructor. Both years, he introduces Digital Animation participants to the MoCap lab and its technology, operation, and potential. The MoCap sessions expose participants to cutting-edge, experimental, and developing technologies through their creative possibilities. One strong contrast between the Maya 3D animation sessions and the MoCap experience is the level of participants’ involvement. In the Fishbowl, Palazzi stresses the importance of participants doing the technical tasks, using the technology personally, even if they need a lot of individual support. The MoCap experience initially echoes this philosophy, with participants choosing active dramatic or technical roles. While the dramatic roles do involve lots of physical action, the technical ones remain primarily theoretical and passive. A Year 1 MoCap episode demonstrates and reinforces passive roles for females with technology:

Nichole will be the ‘operator.’ Byron explains the software they’ll be using and how to manipulate the controls. He then has Nicky click a button, shows her how to get to the starting point for doing a T-Pose. Byron describes how to start with a T-pose and then what to do for the actual motion capture session. Byron tells Vera B. [the instructor] they’re ready in the operation booth. Vera B. gets Laura ready for what she calls a T-pose. Carly moves around clearing props from the floor. Byron shows Nichole how to zoom in and assign markers, but he does it all himself. Byron troubleshoots a missing marker and corresponding digital image. Byron also explains more about the software, then he has Nicky take over the system. Byron and Nicky are ready, so Vera B. coordinates the start of the action. Carly rides the “horse” while Anna chases and whips, jumps on the trampoline, etc... The other group members stop to watch. Girls decide they like this, so Laura goes to take off the suit. Vera B., Carly, and Nicky assist her. Byron saves the work on the computer. Vera B. explains that Byron will now “clean up” the data to speed up the animation process. (ONY1, Day 8, p. 32)
In these notes, Byron ostensibly places female participants as active technology users, but he proceeds to do much of the technology work himself. Even though Byron has Nicky “take over the system,” her actual duties then involve little more than pushing buttons to start and stop the data capture process. Byron performs the bulk of the MoCap experience’s actual technology work.

Again this situation complicates Digital Animation’s attempt at all-female technology environments to temporarily erase male-dominated gender power hierarchies. Byron’s expertise substantially increases the efficiency of the MoCap experiences – a quick set-up, initial troubleshooting, software calibration, technology operations, and data conversion. He demonstrates some of these steps for participants, but they perform few actual technology tasks. This MoCap experience offers potential sites for participants actively to use technology and question its designation a masculine field, but that potential mostly evaporates in practice. Does Byron’s male-ness and institutional authority reiterate the real-world gender and technology status quo? Does his reluctance to relinquish operational control re-inscribe conventional gender and technology hierarchies? Are these two mutually reinforcing? Overall, does the exposure to MoCap outweigh the impact of Byron’s technology authority? Is this a way for participants to learn effective ways of working with males in technology? Do the girls benefit (enough) from experiencing the technology without operating it? In Year 2, the staff discuss these MoCap issues and decide they had enough expertise among them to run the MoCap experience themselves. On the day of the MoCap experience, though, a key mentor is absent for personal reasons, necessitating Byron’s involvement.

While Byron’s presence is not offensive or overtly damaging to the participants, his gender does impact their MoCap experience. The MoCap suits are form-fitting black body suits with small reflector attachments. Program participants commonly express reluctance to wear the suits, especially in Byron’s presence. In a Year 2 mentor meeting, one mentor reports her whole group wants to try the MoCap facility, but another says, “None of my girls wants to go anywhere near a skin-tight suit.” (VM05, 24June05, p. 9) The mentors all laugh, but another mentor reports none of her girls want to wear them either. While Byron may not intend to discourage their active participation, he inadvertently does. His presence stokes their gender insecurities around appearance and exhibition. Perhaps his performance of all the MoCap technical tasks does, too.

While these instances do not demonstrate the program’s overall impact and influence on gender and technology, they provide useful, and practical, complications. Reducing the gender gap will likely take multiple approaches, and men will have to be a part of any necessary changes. Women will have to find entry points into technology fields, and men should find meaningful ways to promote and support their inclusion, even if it sometimes requires they forfeit a bit of control. Digital Animation does not intend to show how men function in predominantly female technology environments, or how even minor male presence can impact an otherwise all-female technology environment, but these ruptures provide some evidence, nonetheless.
In the next sections of this chapter, I analyze how critical gender and technology research exposes value judgments about both gender and technology. I explore how these value judgments and stereotypes develop, adapt, and persist as well as their impacts individually and culturally.

**Critical Gender and Technology Research, Stereotypes, and Value Judgments**

Gender associations imply value judgments, a culturally and linguistically ingrained power hierarchy. Critical gender and technology research considers ways constructivist gender stereotypes dynamically manifest and maintain themselves (Bryson & de Castell, 1995). Stereotypes and behaviors converge to position women in negative relationships with technology, as inept, irrational, weak, disinterested, computer phobic, and technically inferior (Halberstam, 1991; Margolis & Fisher, 2003; Newitz, 2005; Turkle, 1988). Unsurprisingly, then, women are these things. Well, some women.

A critical perspective examines how these stereotypes develop, adapt, persist, and impact behavior and culture, as well as questioning who benefits from these stereotypes and how. For example, the stereotype that women naturally fear computers socializes women to fear them; the assumption women do not want computer technology interaction contributes to a computer technology culture that ignores or excludes women; and women who like computers are suspect or weird (Turkle, 1988). In sharp contrast, technology stereotypes for males insist all men have a “magnetic attraction” to computers (Margolis & Fisher, 2003); love gadgets, toys, and mechanical activities; prefer traditional kinds of individualistic, competitive educational environments; and those men who fear technology, or do not love it, can also arouse suspicion. A critical research framework questions why some characteristics become masculine and some feminine. Why do women fear computers while men love them? Why are women technologically incompetent while men all have a knack for machinery?

**Digital Animation and Gender and Technology Stereotypes**

Critical gender and technology research considers ways cultures and stereotypes develop and adapt to maintain the power status quo. People with power and privilege, through choice or by chance, are often loath to relinquish it. An example in technology is the creation and adherence to educational practices that favor males in courses and computer culture. For example, Margolis & Fisher (2003) note computer science teaching materials “focus primarily on technical details” and fail to attend to “application and impact of the technology in meaningful interdisciplinary problem-solving assignments” (p. 37). Also, “although computing is integrally linked to critical investigations in medicine, environmental science, famine control, art, and music,” grouping computer technology with math and science can create additional problems for girls and advantages for boys (Margolis & Fisher, 2003, p. 38). Even as girls take increasingly difficult science courses in larger numbers, their confidence in their math and science abilities falls, potentially decreasing their likelihood of taking closely associated computer science courses (Margolis & Fisher, 2003, p. 38).
Digital Animation and the Persistence of Gender and Technology Stereotypes

Tailoring traditional technology education toward mostly male interests, concerns, and learning styles facilitates men’s natural “knack” for technology and women’s natural “lack” of technology interest and skill. Again, these skewed representations can create many gendered gaps, oversights, flaws, and problems, from voice registration software that silences/ignores women’s voices to mechanizing women’s roles in food production that “traditionally provided the only source of income to many poor, landless women, particularly widows and divorcees” (Millennium Ecosystem Assessment, 2005, p. 184).

Additionally, the computer technology field expends a great deal of energy and resources on designing entertainment aimed at a predominantly male audience, including violent, misogynistic video games. Many women see these aspects as turn-offs for entering the computer technology field, instead preferring the idea of technology being used for solving larger societal problems (Margolis & Fisher, 2003).

In these ways, and many others, social conditioning reinforces culturally established gender divisions. Males and females, almost by decree, must approach technology differently, even as gender characteristics, values, roles, and limitations fluctuate. Bryson & de Castell (1995) argue that women often play key roles in the invention, development, and application of technologies, but if, or when, they become valuable, men generally appropriate them. Women develop and practice herbal remedies and treatments, but when the role of doctor becomes a scientific profession, medicine becomes a male domain; women become nurses and assistants. Computers are no exception. Women served during World War II as the first real computer programmers (‘computors’); afterwards, men assumed the field. Gender and technology biases determine which technologies ‘count,’ when something becomes a technology, technology’s relative value, and who gets/has to use certain technologies (Bryson & de Castell, 1995).

Digital Animation and the Costs and Benefits of Gender and Technology Stereotypes

Critical gender and technology research documents ways certain people profit from these hierarchies to the exclusion or detriment of others. Male interests, skills, instructors, and technologies determine the pedagogy, content, and success rate in most technology education opportunities. Women’s interests, skills, and technologies often receive scant attention; domestic technologies become feminine and lose their status as technology, like sewing machines, vacuum cleaners, dishwashers, toasters, microwave ovens, and washers, and dryers (Gray, 1995). They don’t count. They are chores or tools, wonder gadgets that require so little effort they almost do housework themselves! They practically free women from household tasks, liberating them. Except the results of domestic technologies often function counter-intuitively, requiring less physical labor in exchange for the time, energy, organization, management, and maintenance involved in operating them. Even though household technologies have proliferated, the end results provide mixed benefits. In contrast, masculine technologies are important and valuable, like automobiles, power tools, entertainment systems, computers, rockets, and plumbing (Bryson and de Castell, 1995; Scharf, 1998). Most computer technology developments, products, and practices primarily target a male audience. Biased gender and technology assumptions continually reinforce the male/female divide.
In addition to being the primary audience and creator for computer technology, most degrees, jobs, and higher education positions in technology go to men. In a 2007 Forbes article, “Tough, Tech-Smart – And Female,” Rosmarin fears women’s advances in “the tech sector … may be on the wane,” with their presence decreasing across technology fields from 2000 to 2006 (Paras. 1 - 2). In contrast, men populate technology environments as star students, CEOs, programmers, animators, management, and general employees. The technology dress code is even typically casual male (Kiava, 2000). Men already have primary fiscal control over this increasingly profitable and vital component of the United States’ economy. Men own technology companies, invent technology components and processes, find investors, develop software, provide tech support, and pursue technology education. Again, Rosmarin (2007) notes that a few “tech-minded women … launch start-ups and seek venture capital funding,” admitting “only 4.08% of venture funding in 2006 went to tech start-ups with female chief executives--that's down from 5.72% in 2001” (Para. 9). Sadly, Rosmarin (2007) insists women are “still holding their own at the top of the [organizational] chart” because percentages of females as “chief information offers--the top IT rank at most companies--increased to 9% in 2007, up from 7% in 2000” (Para. 3) and because a “handful of high-profile female executives at tech companies” like eBay, Oracle, and Yahoo! “makes it appear that women are gaining more ground in” technology executive administration (Rosmarin, 2007, Para. 4).

In contrast, men have a vast network to tap for career assistance and advice. Victoria Usherenko, a managing partner at a technology headhunter agency, reports she can call her contacts in an attempt to find women to fill high-level technology positions but that 99.9% of the time, her contacts are “men who recommended their golfing buddies.” Usherenko believes “Women have no such network for recommendations,” and this “artificially [keeps] the number of female IT executives down” (Rosmarin, 2007, Para. 14 – 16). This is in addition to other multiple and persistent barriers women encounter in technology, from exclusion, low expectations, and invisibility to objectification and harassment.

The technology gender gap resulting from these imbalances of power creates a glaring inequity, but members of other marginalized groups face even more obstacles and resistance. Critical gender and technology scholarship acknowledges that in addition to gender, technology disparities based on race, class, age, ethnicity, and other characteristics can create exponentially more complications (NSF, 2004; Nelson, 2002; Novak & Hoffman, 1998; Sanders, 2005, p. 6; Span, 1997). A critical gender and technology perspective suggests seeing one’s self “represented,” or acceptable, is a crucial component in influencing an individual’s technology education and employment choices (Shashaani & Khalili, 2001; Jorgenson, 2002). People who see representations of their selves in technology are more likely to engage with technology (Bebbington, 2002; Jensen, Bryson, & de Castell, 2003; Packard, et al 1997; Manicom, 2002).

Technology as a field faces the difficult tasks of integrating women and other minorities in order to change the white male status quo. Challenging gender and technology roles and stereotypes often meets much opposition, overtly and covertly. Continuing individual and institutional efforts, shifting societal stereotypes, and market forces are gradually changing and diversifying technology, even with some
backsliding along the way. This diversity should push technology to benefit more members of society not just an elite few. It is important to remember that in our society today, “the computer is no longer an isolated machine,” but rather “a centerpiece of science, the arts, media, industry, commerce, and civic life” (AAUW, *TechSavvy*, 2000, p. ix). As such, “the question is no longer whether computers will be in the classroom, but how computers can be used to enhance teaching and learning – ideally in ways that promote the full involvement by girls and other groups currently underrepresented in many computer-related endeavors” (*TechSavvy*, 2000, p. ix).

Perhaps the most important cost to our society of this gender gap in technology is what economists call the “opportunity cost,” or the value of the best alternative to any choice or course of action. By not welcoming women and other marginalized populations into the pool of technology students, practitioners, and administrators, we forfeit the best things these people could contribute to these fields and to society. We ignore their potential and value. We lose their opportunities to contribute.

Overall, *Digital Animation* acknowledges the gender gap, questions its causes, and re-creates and re-presents technology as inclusive, inviting, and rewarding to women. Palazzi intends to recast females in technology as present, active, competent, successful, and equal to men (Braidotti, 1996; Butler, 1991). In the next sections, I analyze *Digital Animation’s* attempts to address critical aspects of gender and technology equity by changing the visual image of technology, creating a more supportive environment for women, and altering the possibilities of what women can be and do with technology.

**Changing the Visual Image of Technology from a Critical Perspective**

*Digital Animation’s* all-female composition contradicts the image, visual and conceptual, of male-dominated technology environments. Representation, particularly of marginalized populations, carries substantial weight. As the program director, Maria Palazzi works diligently to fill staff and participant openings with all women, and hopefully with a diverse range of women. The chart of this demographic information is located in Chapter 2 on Methodology. In Year 1, one mentor is from China; in Year 2, one mentor is African American; both years, one administrative staff member is also African American. While these numbers are small, they represent some success. Since women with multiple minority identities encounter more and larger obstacles in entering technology fields, the pool of possible minority mentor candidates is even smaller. Participant diversity is challenging, too. In Year 1, out of 14 participants there are 11 Caucasians, 1 African American, 1 Asian American, and 1 Latina. In Year 2, out of 18 participants, there are 12 Caucasians, 2 African Americans, 1 Asian American, 1 Latina, and 2 Bi-racial (Caucasian and African American) individuals. While these demographics do not accurately reflect the local urban population, the presence of minority females in technology programs at all represents a measure of success.
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<th>Caucasians</th>
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Figure 18: Racial Demographics for Digital Animation, Years 1 - 2

Digital Animation also questions ways technology environments are and are not supportive to women and the results. Margolis & Fisher (2003) assert traditional technology education approaches rely on models that assume male excellence and female deficiency in technology. Technology is taught in abstraction or using irrelevant subject material. Students compete to win. The environment excludes, ignores, and denigrates women (Margolis & Fisher, 2003). The summer program questions these conditions. Why do males benefit from this traditional model while females lose? What approaches support women?

Digital Animation’s operation hinges on all participants and staff adopting positive, supportive mindsets and behaviors. I pepper each year’s observation notes with frequent mentions of the positive interactions among all program participants and staff (ONY1; ONY2). The mentors provide a near-constant stream of support and praise to their group members and the other participants. One mentor, Farah, excels, always positively reinforcing participants with compliments like “you’re fast,” “good,” and “you did a good job with that” (ONY1, Day 6, p. 26). Mentors model collaboration by working with each other and other groups’ members, too. Participants support each other, leaning over and offering advice and support during tutorials or group working sessions. Mentors shape a technology environment that promotes positive engagement and interaction. These interactions also serve to create interpersonal connections, the basis for a growing female technology network (Rosmarin, 2007).

The program also criticizes traditional methods of instruction and content, positioning technology not as an abstract end, but as a practical means for achieving other, meaningful goals. At ACCAD, the participants use technology as the medium for communicating interdisciplinary information, educating others, and creating a positive environmental impact. An interdisciplinary approach allows females to capitalize on each individual’s knowledge and skills, as well as promoting personal connections with knowledge. An education environment that promotes interdisciplinary learning supports female learning styles and learners, emphasizing connections over isolated facts, use over theory, and application over abstraction, ideas I explore further in Chapter 4. Several Digital Animation components respond to these critical issues. Digital Animation encourages experiential, subjective learning with field trips to the local environmental sites and also through individual and group research into different subjects around the main environmental focus, including site geography and geology, biological species, historical significance/meaning, environmental threats, and recommended actions. The subject matter encourages
participants to access their knowledge in biology, history, earth sciences, sociology, and anthropology. The technology medium promotes participants’ use of science and math knowledge as well as their creative skills in narrative, design, and visual communication. They can also employ their knowledge of popular culture. These opportunities provide support for these individual young women to make multiple connections with the program’s subject, content, and technology. These connections reinforce participants’ experiences of technology environments as supportive of women.

**Altering the Possibilities of What Women Can Be and Do With Technology**

Perhaps *Digital Animation*’s most important response to a critical perspective of gender and technology education is its direct challenge of gender and technology stereotypes. Cultural forces work to dictate what technologies women can use, how, when, and why (Bryson & de Castell, 1995). *Digital Animation* data contradicts traditional notions of what women can be and do with technology. The program challenges women’s lack of a knack for computers. When women receive support and encouragement, like they do in *Digital Animation*, people often express amazement “at how much the girls learn and how quickly” (ONY1, Day 6, p. 27; ONY2, Day 8, p. 48). When ACCAD nullifies the message girls don’t do technology, young women find they can, and do, learn and develop technology skills rapidly, too.

Another critical *Digital Animation* contradiction of current gender and technology hierarchies involves questioning women’s presumable lack of interest and confidence in technology that hinders their potential enjoyment or success. Palazzi argues that women are interested in technology and uses *Digital Animation* to investigate ways to cultivate this confidence along with enjoyment. The completely supportive program environment encourages these young women to persist in learning to use sophisticated technologies which increases their confidence. Maria Palazzi wants the mentors to ensure each individual participates, talks, and “feels confident” during the program (ONY1 Preprogram Mentor Meeting, 17 June 04, p. 4). My Year 1 observation notes reflect success:

*All the girls seem confident in their ability to do the tasks. Even when they need help or repeated instructions, they reveal no frustration (that Zen thing). When something doesn’t work “right” for them in a program (like “paste” not working from the edit menu but working as CTRL+V), the girls and mentors work through it or around it in a cooperative fashion. (ONY1, Day 2, p. 23)*

As the mentors and program staff support the participants’ successful technology interactions, the participants begin to develop and increase their confidence with technology. They understand that success may require different approaches and assistance, but participants realize they can achieve it.

Palazzi also expresses skepticism of women’s natural dislike and disinterest in animation, countering that "There is something very magical about making animation" that women find appealing with the opportunity and sufficient support (McClintock, 2006). She expresses doubt that women do not like technology based on her own experience of computer animation. Palazzi states, “For me, I loved what I did, and I couldn’t figure out why it wasn’t appealing to other women” (MP, INT, 15 Feb 05). *Digital Animation* is her attempt to challenge the validity of these cultural gender and technology assumptions and change them.
Each year, the program provides evidence that clearly contradicts women lacking confidence, interest, or the inclination to enjoy technology. One Year 1 participant, Gabby, serves as a prominent example of this contradiction. Throughout the two-week program, Gabby continually communicates her verbal and nonverbal responses throughout any lesson or task, usually representative of a majority of participants’ attitudes. Gabby often enthusiastically blurts “awesome!” or “cool!” during tutorials, and usually “seems confident and engaged” (ONY1, Day 6, p. 25). Gabby works with a group member to revise an animation segment, trying to fix a talking dandelion where “the lips look weird just floating around.” After her partner “shows her how to move the lips on the flower head, Gabby is impressed, saying ‘That looks cool!’” (ONY1, Day 8, p. 31). Gabby also reacts when she succeeds independently. During the program, sometimes Gabby “stares intently at the screen then performs a task, then smiles, seems satisfied, and moves to the next task” (ONY1, Day 6, p. 25). Other participants echo this process, too.

Gabby’s confidence, interest, and enjoyment do not result from a false sense of simplicity. Gabby encounters technology problems, too. Often, when Gabby has trouble achieving a specific animation task, she requests help from her mentor or other participants. Instead of wanting others to just fix a problem for her, Gabby “wants to know why something isn’t doing what she wants it to do,” and asks others “to explain what was causing the problem” and “explain the options” for correcting it (ONY1, Day 2, p. 16). Gabby also has times when she strays from direct animation work, sometimes reading between tasks, while waiting for help, or while waiting for others to finish. These off-task behaviors do not necessarily indicate procrastination, frustration, fear of failure, or impatience; rather, they function more like professional work breaks. Gabby’s responses reflect her general confidence, interest, and positive attitude toward technology. She is slightly more verbally and visually responsive than most other participants, but her attitude and behaviors represent overall participant sentiment. Wittsock (2005) reports that reactions like these prove ACCAD’s “summer workshops are helping a new generation discover … technology can be fun” (Para. 9).

Like Gabby, all participants encounter problems as they work, some more than others. The mentors do, too. And the instructors. Digital demonstrates women’s abilities to resolve many technology issues, with and without help from others. When participants do need help, they “seem very comfortable asking each other questions and getting help” (ONY1, Day 2, p. 16). This process requires participants to use higher order thinking skills to:

- apply information technology in sophisticated and innovative ways to solve problems across disciplines and subject areas; to interpret vast amounts of information with analytic skill; to understand basic principles of programming and other computer science fundamentals; and to continually adapt and learn new technologies as they emerge. (TechSavvy, p. x, 2000)

Participants learn to apply the skills and knowledge they accumulate in new and creative ways, often as a result of encountering difficulties. These problem-solving opportunities allow participants to develop and practice their own skills and resourcefulness.

The program staff does struggle with how to best work with participants when they encounter problems. Sometimes mentors feel like a participant does not completely understand a key concept, such as
3D spatial arrangement and needs additional help as a result (ONY2, Post-program Mentor Meeting, p. 55). Other mentors sometimes resolve issues themselves, preferring the efficiency or modeling how to try different possible solutions. When the mentors and instructors encounter problems with the animation software, they often develop what they call “hacks,” or “work-arounds” (ONY1, Day 6, p. 26), which are alternative or unconventional ways to solve a problem. Palazzi does this during a tutorial where she cannot create a specific effect. The controls do not perform the task in the manner Palazzi expects, so she begins trying different tactics, narrating her thought processes and choices to the whole group (ONY1, Day 5, pp. 35 - 36). Mentors sometimes repeat this process with their groups, too.

Mentors regularly revisit how to let the participants approach technology problems. In a Year 2 post-program staff meeting, I recorded the following dialogue:

Palazzi: What about when the girls are frustrated during production work – is it a turnoff?
Kristy: It has to be frustrating and then overcome-able. The girls need to learn to overcome – their confidence levels are based on how to overcome.
Palazzi: It’s not easy [to let participants get frustrated].
Palazzi: And when people leave not interested in animation, is that the wrong thing?
Kristy: Girls need a more realistic view of the field.
Elena: We should let the girls know Maya was hard for us, too and they should ask for help…
Caren: We show collaboration.
Elena: We need to make it explicit. (VMY2, 7July05, 32min)
The staff wants the participants to get a realistic view of animation, but they also want the participants to succeed and enjoy animation. Palazzi worries about participants who might feel too challenged or frustrated by technology problems. She also contemplates the value of having participants leave the program knowing they are not interested in animation. In the end, all staff members want the participants to feel challenged yet successful and to seek and get support when they need it, whatever their future education and career choices (ONY2). Being able to problem solve, independently and cooperatively, provides additional kinds of power and confidence, too. As I note earlier, program personnel sometimes ask Grant for assistance with computer system issues. Asking a male for help is not necessarily capitulating to men’s superior problem solving ability, rather sometimes problem-solving involves the power to access and use available resources.

Digital Animation challenges the traditional advantage masculine approach to technology as abstract, scientific, and mathematical and showcases technology’s creative and practical applications. When technology is a means rather than an end, women’s interest and engagement increases. Rasmussen & Hapnes (1991) promote the value of exploring “technology in practice” by “applying computer technology to solve practical problems” (p. 387), an approach that benefits women. Digital technology’s more feminine aspects and uses often initially receive scant attention, much like communications technology such as telephones evolved from a rather trivial feminine pastime to a digital, almost invisible component of our everyday lives. Digital Animation recognizes and values using technology in creative ways for practical
reasons. 3D animation is an important contemporary medium for communicating information to others (ONY1, Day 1, p. 8). Women gain a degree of power with access to technological communications tools such as these, and Digital Animation provides proof and gives young women the chance to experience this firsthand.

*Digital Animation* also critically responds to the stereotype that women are not successful within technology. This stereotype discourages women from trying, exerting cultural power through exclusion and absences. Maria Palazzi wants to use this program to demonstrate women’s chances, abilities, and successes with technology. Again, Palazzi herself, the mentors, and research provide powerful examples and symbols of women’s potential success in technology, at many levels and in many capacities. Palazzi wants these examples to provide young women with an alternative to the traditional technology paradigm. Palazzi reflects, “I think [Digital Animation] gets them thinking about this or even confirms their thinking that they do want to pursue this as a career. I want them to consider this as a discipline as they look toward college. The industry, of course, needs more women” (McClintock, 2006). Palazzi believes successful women in technology beget more successful women in technology. As women’s presence in technology increases, the fiction they cannot succeed or it is not for them continues to unravel.

**Using Digital Animation as a Form of Resistance**

*Digital Animation* also provides a means for resisting dominant power paradigms around gender and technology. *Digital Animation* is an institutional intervention aimed at increasing women’s presence, position, and impact in technology. It confronts societal messages and assumptions and intends to provide alternative relationships between gender and technology. Some women oppose the stereotypes about gender and technology, women’s limitations, and women’s treatment within computer culture. AAUW’s research reveals a major way girls actively resist technology stereotypes and power structures is through deliberately avoiding any pursuit of technology. Girls reflect Turkle’s (1998) computer reticence in their “I can, but I don’t want to” attitude. They excuse themselves based on assumptions, experiences, and expectations. This form of resistance works partially because gender and technology stereotypes are so pervasive no one expects girls to be interested. While *Digital Animation* does not directly address this critical power consideration, it produces a growing number of women who *can* use technology and *do* want to. They question and resist the stereotypes and provide new possibilities.

**The Importance of Representations of Image and Identity in Gender and Technology**

Again, even within a direct attempt to address gender and technology equity issues, other sociocultural and identity characteristics complicate their intersection. Identity and identification are important variables that impact how individuals and group members understand themselves and others with respect to technologies. Mercier, Barron, & O’Connor (2006) argue that “identifying as a member of a discipline has been noted as an important factor in … disciplines that have a gender composition similar to computer science” (p. 336). Mercier, Barron, & O’Connor (2006) assert that a cultural stereotype exists with males as de facto computer users. When an individual does not perceive herself as belonging, or
represented, in a discipline or field, this has a strong impact on the person’s likelihood to pursue this field. Mercier, Barron, & O’Connor (2006) find “engagement in technology is a complex relationship between students’ experiences, their perceptions about others who are engaged in the field, and their personal identity in relation to the field,” and that these findings echo earlier emphasis on “the importance of understanding the relationships between students’ identities, their goals, and their achievement behaviours across domains” (p. 345).

From this more complicated conception of multiple characteristics and experiences impacting student identities, perhaps addressing only gender disparity in technology environments is not enough. The data from Year 1 and Year 2 of the Digital Animation case study provide preliminary support for the necessity of addressing other marginalized identities within programs aimed at increasing gender equity in technology. In Year 1, the only African American participant struggles with her program experiences, deciding by the end that her enthusiasm and further interests in pursuing technology decreased (ONY1 Participant Pre- and Post- Survey comparison). In Year 2, the only Asian American student reports similar experiences and feelings. In both years, these minority students were the ones most obviously unrepresented in the mentor and instructor population (ONY2 Participant Pre- and Post-Survey comparison). Mercier, Barron, & O’Connor (2006) propose that “Identification with a discipline is partly the result of how one perceives other people within that discipline and an appraisal of whether one is or is not like them (p. 336).” If minority participants do not see themselves reflected more specifically in the mentor and instructor population, do they experience the program differently? Given the small participant sample size, I do not have enough solid evidence to demonstrate that these factors directly correlate, but I remain interested in the possibilities this data suggests. Mercier, Barron, & O’Connor (2006) claim “these findings have implications for the wider educational community, echoing researchers who stress the importance of understanding the relationships between students’ identities, their goals, and their achievement” across disciplines (p. 345).

Visual culture – magazines, advertisements, television shows, movies, commercials, songs, plays, performances, and any other media – has a profound influence on societal and individual conceptions of identity. Schroeder & Zwick’s (2004) research on identity in advertising images leads them to believe the “interactions of identity, consumption, and representation represent one of the critical imperatives of contemporary consumer culture” (p. 47). Schroeder & Zwick, (2004) believe identity, entwined with visual culture, “must be understood as the result of changing social and cultural practices” and that contemporary and historical representational practices and norms “in advertising as well as art” construct, constrain, contest, isolate, and codify consumer identities (pp. 22 - 24). Advertising, as a form of visual culture, creates meaning outside the realm of marketing, informing and influencing culture while culture informs and influences advertising (Schroeder & Zwick, 2004, p. 24). Advertising actually “mobilizes formal artistic conventions of portraiture—pose, symbol, style—as well as techniques borrowed from painting, photography and film to represent identity” (Schroeder & Zwick, 2004, p. 29; also Sturken and Cartwright,
2001). Through visual culture, images become acceptable, presumably accurate, forms of identity representation, equal to or even surpassing other forms of identity representation; Schroeder & Zwick (2004) insist “we consume … identity with our eyes, bodies, and minds (pp. 30 - 34). Deviously, the visual culture of advertising creates representations and mechanisms that simultaneously reinforce, conceal, and normalize traditional notions and certain preferred forms of identity (Schroeder & Zwick, 2004, p. 27).

Identity, as a critical concept, is complicated; myriad forces construct and influence it. From a postmodern perspective, identity becomes even more complicated. In the next sections, I analyze how complicated postmodern constructions of gender and identity impact gender and technology scholarship as well as the Digital Animation summer program.

A Postmodern Perspective of Digital Animation Data

Following their critical category, Bryson & de Castell’s (1995) fourth conceptual category, postmodern, positions gender as “a non-cohesive, open-textured ‘pastiche’ of characteristics, aptitudes and dispositions whose ongoing construction and reconstruction is a central task” (Para. 7). Gender is a self-perpetuating tautology – dependent on itself for continual redefinition (Bryson & de Castell, 1995; Butler, 1990; Gatens, 2000; de Beauvoir, 1949). A postmodern perspective challenges critical theorists’ ability to reveal oppression and its pedagogies from a distance and their authority to suggest changes to ‘liberate’ or ‘emancipate’ learners. Postmodern research seeks to expose racist, hetero/sexist, classist, and other oppressive “underpinnings of Western … thought” (Bell & Russell, 2000, p. 189) and then challenge their existence, assumptions, and validity. In terms of gender and technology, this means questioning the relevance and viability of gender categories and stereotypes (Britzman, 1993; Butler; 1990). Does learning to use or create technology really require skills or abilities only males possess? In terms of gender and technology education, this means questioning the binary gender division of learning preferences. Not all female students fail in competitive learning environments, and not all males succeed in them. Being female does not prevent scientific, abstract, or objective thought, just as being male does not ensure it. Being female does not ensure a preference to work in groups; being male does not preclude preferring group work, either. These sharp divisions cannot be the only possibilities.

While critical theory recognizes and dissects ways power manifests unevenly across gender, and other minority identities, postmodernism questions the identity categories themselves. Bryson & de Castell (1995) believe postmodernism deconstructs essentialist theories as “fundamentally raced, heterosexist, classed, and probably politically unproductive.” Identity categories enact and legitimate the very power inequities they critically oppose through naming, defining, and reacting to them (Foucault, 1972). Postmodernism actively doubts categories, binaries, and hierarchies, working to document the cultural filtering of everything we encounter, think, experience, and notice.

Irvine (2003) states postmodernism “is associated with” the “tendency to dissolve binary categories and expose their arbitrary cultural co-dependency” (Para. 18). Postmodernism attempts to destabilize classifications and hierarchies. What does it mean to be weak or strong? How do we define
‘weak’? ‘Strong’? Can someone only be one or the other? Can anyone be both? Neither? Something else entirely? We trap ourselves with our language. Postmodern theories examine ways to expose this, critically analyze it, and work toward active change, again ideas I explore more fully in Chapter 4. Bryson & de Castell (1995) use Donna Haraway’s (1991) metaphor to describe these postmodern attempts as “about being in the belly of the monster and looking for another story to tell.” How do you operate outside cultural, linguistic limits and filters?

Postmodern concerns also build on critical theory concerns around identity markers, assumptions, and values. Postmodern research rejects the idea of having a single, fixed identity, instead preferring subjectivity and its fluctuating, slippery, contingent, contested, and multiple identity facets (Anderson, 2007). Postmodern theory examines whether claiming a cultural identity or voice “entails the inevitability of essentialism,” and if claiming marginalized identities and voices can offer viable theoretical or political strategies (Bryson & de Castell, 1995). Postmodern approaches augment these questions with an appreciation for diverse, fluid, non-binary possibilities. Bryson & de Castell (1995) also embrace Haraway’s (1991) “dream not of a common language, but of a powerful infidel heteroglossia” which entails “building and destroying… identities, categories, and relationships.” Haraway (1991) theorizes about ways technology and gender do and might impact one another, particularly as we use technologies in lieu of our bodily presence and integrate them within our bodies, creating and becoming cyborgs, a combination of human and machine. In some ways, Haraway (1991) understands the intersection of gender with technology to offer possibilities for reconsidering the need and importance of gender in terms of (cyborg) identity - ways technology might change gender or render it obsolete. Bryson and de Castell believe postmodern theory “brings about a significantly different set of possibilities,” explodes dichotomies, disrupts practices, and requires “technologies assume novel forms and functions” with/in reconfigured sets of social relations and practices. Haraway (1991) highlights her personal preference for the postmodern possibilities rather than the fixity of modern gender constructions, asserting she “would rather be a cyborg than a goddess” (p.181).

Postmodern investigations into and naming of systems of power, a la Foucault (1972), have created a critical awareness of sociocultural power differentials and, increasingly, calls to address them, often beginning with the institution of education. Efforts toward changing a normalized, rationalized cultural system built on an inherent and silenced system of privilege and exclusion are difficult. The whole system lumbers forward, with untold momentum, in an effort to maintain the status quo, glacially resistant to change.

As Audre Lord (1981) argued, “the master’s tools will never dismantle the master’s house” (p. 99). In other words, culture and language dictate what ideas and actions are possible, excluding those that might threaten the system. The dominant culture seeks to perpetuate itself ad infinitum. According to Best & Kellner (1991), early in Foucault’s career he “stigmatizes …rationality, institutions, and forms of subjectivity as sources or constructs of domination,” (Para. 13), while he later “gesture[s] towards a
positive reconstruction of subjectivity” (Para. 64). Eventually, Best & Kellner (1991) conclude subjectivity “moves into the forefront of Foucault’s a concern with ethics and technologies of the self” (Para. 64). Foucault’s accessions to subjectivity lead him to the figurative edge of postmodern understandings of individuals and their multiple, shifting, subjective selves.

If Lorde is correct about the master’s tools, how can the master’s house be changed? Or erased? Important to this case study, a postmodern research goal is to push critical reflection further, to create positive change in the discourses around terms like gender, technology, and difference that articulate and enact new relations with/in technology. These postmodern approaches attempt to merge critical theory with uncertainty and pedagogical practice in an effort to create change from within a cultural system.

Postmodern theories also present transformative opportunities for education through acknowledging limitations of binaries; recognizing multiple possibilities; encouraging connection as knowledge; and utilizing appropriation. Postmodern pedagogy’s acceptance of appropriation and alteration allows students to become agents, actively redefining, re-emphasizing, criticizing, parodying, and eventually reconstructing power hierarchies. Bryson & de Castell (1997) explain that postmodernist pedagogy involves salvaging icons, images, and artifacts from within their original socio-historical context, “then [reinserting] them into another, where the ‘detritus’ can take on a new, significantly greater cultural value.” Postmodern pedagogies value using art, science, popular culture, and personal experiences as subject matter, authorizing openings for women and other minorities. By creating openings for “others,” including women, postmodern theory advocates “truly disrupting hegemonic relations between learners and technology,” including along the lines of gender (Bryson & de Castell, 1995). In the next sections, I develop subcategories based on Bryson & de Castell’s (1995) postmodern pedagogy and use them to analyze examples from Digital Animation data.

Postmodern theory suggests a non-traditional pedagogical framework and characteristics. As with Bryson & de Castell’s (1995) previous categories, the Digital Animation program clearly responds to postmodern pedagogical concerns and exemplifies many postmodern characteristics and pedagogical influences.

Postmodernism’s emphasis on expanding and exploding boundaries presents clear support for interdisciplinary learning. Disciplinary divisions exist as artificial boundaries to create somewhat arbitrary bodies of knowledge. What is Physics without Math? Social Studies without Geography? Without History? As DeZure (n. d.) states, “Simply put: life is interdisciplinary” (Para. 6), and the boundaries created between disciplines collapse under scrutiny. Digital Animation adopts a postmodern stance toward integrated, holistic learning as a focal organizing principle for the program. Maria Palazzi clearly believes in the importance of interdisciplinary and ‘connected’ learning. She notes, “The introduction of graphics technology allows us to experience underlying ties to math and science that are critical to the preparation for school for the message and meaning-makers of tomorrow” (MP, INT, 15Feb05). She also stresses the importance of making these interdisciplinary connections explicit:
I think we do the science part, because of the subject matter. But we probably don’t talk enough about this idea that everything they do in Maya is about math and say “This is why your math class isn’t boring.” If you know that, it makes it much easier to do [animation]. If you understand the underlying theoretical components, then you can understand the programming aspect. I’m intrigued by the idea that math could be fun because it wasn’t very fun for me growing up. (MP, INT, 15Feb05)

*Digital Animation* deliberately crafts its mission around projects that span the disciplines of science, mathematics, social sciences, language arts/communications, fine arts and design, and others.

Using a wide range of subjects and skills provides participants with multiple points of entry into technology, multiple uses for it, and greater awareness of knowledge as connection and construction. In a very postmodern way, interdisciplinary undertakings allow individuals to create, contribute, and share their own knowledge. Interdisciplinary learning creates spaces for diverse interests, talents, abilities, and (gender) identities. It makes learning relevant. In terms of technology and gender, interdisciplinary learning counterbalances the traditional secluded, abstract, narrow view of what technology is, what it can do, and who can do it. Palazzi insists technology is “this big thing, not this little thing,” and that wants girls to “see themselves as technology producers, inventors, artists instead of just end users” (in Wittstock, 2005).

Palazzi believes this limited view of technology, as well as its associations with and focus on math and science, serves to exclude females. In response, *Digital Animation* aims to address postmodern concerns around gender and technology pedagogy by expanding technology’s possibilities to help “build girls’ skill, interest, and success in those areas where girls typically find discouragement or struggle” (Wittstock, 2005).

Postmodernism, too, expands who learners can be, what counts as knowledge, and who authorizes it. Postmodernism complicates our classification and organization of knowledge, its uses, and its users. The postmodern concept “pastiche” recognizes the value of appropriation, aggregation, and alteration. Pastiche involves collecting information, knowledge, images, and analytical strategies, selecting from them, deconstructing them, and then using them to reconstruct and redeploy meaning. Several postmodern pedagogical characteristics evolve from this process: experience and hands-on learning, focused investigation, collaborative group work, and producing a meaningful, usable end “product.” The following sections delve further into these postmodern characteristics, related issues, and their pertinence to *Digital Animation* through program examples.

**Digital Animation and Play as Postmodern Participatory Pedagogy**

According to *Merriam-Websters* dictionary, play can be:

- a recreational activity; especially the spontaneous activity of children
- absence of serious or harmful intent
- gambling, gaming
- an act, way, or manner of proceeding; maneuver
- deal, venture
- the state of being active, operative, or relevant
- brisk, fitful, or light movement
- free or unimpeded motion
While these statements around play appear benign and non-gendered on the surface, many have inherent gender biases around who accesses them and how. Margolis & Fisher (2003) believe these gender biases impact technology and technology education. Traditional computer (education) contexts often give boys free rein to dominate computer use in and outside of class. Boys just love technology and computers; they cannot get enough. Boys get to “tinker” and “play” with computers in ways girls rarely do (Margolis & Fisher, 2003). Most definitions for play reveal strong masculine associations, positioning it as active, unimpeded, relevant, competitive, and risky.

Our cultural gender division creates what Bryson & de Castell (1995) call “the gender valence of risk,” or the dis/comfort with and use of risk-taking behaviors. They believe females face extreme socio-cultural conditioning to avoid risk-taking behaviors, that for many “women students,” sometimes “the price of competence is just too high, and the risks of success far too great, to permit oneself to ‘master’ gender-anomalous learning tasks.” Women are discouraged from experimenting and trial-and-error attempts through expectations of failure and fear of success. “Women and girls are actively being prevented from developing competence” because “To develop competence is to violate the unwritten law of gender” (Bryson & de Castell, 1995). Much technology knowledge results from experimenting – applying known concepts to new situations, trying hunches, or guessing. Experimentation and application are powerful pedagogical tools, promoting self-confidence and independent learning. Their risky status, however, can deny women access to them.

_Digital Animation_ recognizes and employs the pedagogical value of play as a postmodern strategy that benefits all learners, not just boys. In the summer of Year 2, Maria Palazzi informs a small group of regular ACCAD male students who begin gathering in a student lounge area to play video games that the female program participants have priority for using the gaming console. Instructors and mentors encourage the participants to “play with” the Maya software controls, the virtual reality (VR) equipment, digital cameras, video equipment, internet research, other software programs, and computer games. During tutorials, instructors often led and direct participants through a series of steps to perform a task and then ask participants to do the next, similar task on their own “by playing around” and “trying things out” (ONY1; ONY2). For example, Maria teaches participants how to import sound and match it with animated movement. She then directs them to a sound file and has them try to import the phrase “Feed Me!” and match it to a clam opening and closing. Participants like playing with this function. Sound file research, recording, playing, selecting, and sharing are continuous, mostly spontaneous program occupations after the “Feed Me!” lesson.

Play also serves as a method for developing familiarity and comfort with technology. The most obvious forms of playing with technology, video and computer games are overwhelmingly male-oriented in terms of interests, actions, visuals, and competition. While gaming may seem like a frivolous pastime,
increased time using technology contributes to developing increased confidence and competence with technologies. Greater access to and use of computers allows males more opportunity to play with them than females (Margolis & Fisher, 2003). Familiarity and comfort can support a sense of entitlement where individuals with skills and access use these to maintain control over skills and access.

During Digital Animation, all participants play with computer and video games to differing degrees. Some play simple online games where the object is to launch and throw different funny items the farthest, like Slingshot Santa. Some play the default games included with the computers, like Solitaire and Minesweeper! Some play the video games, but not many and not often. The participants talk about video games, complaining about the violence and degradation of women as well as praising and discussing ones they enjoy. The trends toward increasing video game violence may be declining as the fastest increasing demographic of online gamers becomes adult females and as non-competitive games, like The Sims, see increasing popularity (CNET, 2002; Lombardi, 2006). Online interactive and Role Playing Games (RPGs) like Final Fantasy, Halo, and Second Life, may also be shifting or dissipating the gender bias.

The participants are clear to distinguish their gaming habits and technology interests from those of stereotypical computer geeks – guys with an unhealthy technology obsession. Program participants play games with computers, but not the ones that traditionally dominate the market. Some participants during both summers express interest in learning to create videogame animation and graphics (ONY1; ONY2). One mentor wants to use videogame technology and tools for educational and instructional purposes (ONY1; ONY2). While video games are not a focus of the program either year, they are a constant subtext, common interest, and cultural touchstone.

Playing as a technology education tactic, although not necessarily with video games, provides opportunities for creativity in using and designing software and hardware. Comfort using technology leads to increased technology use, which increases comfort, which leads to confidence, which provides a foundation for creativity. Confidence and societal permission also allow males to write new programs and create new machines to do and create more things they want, in much larger numbers than females. Even creative functions and forms of computer technology remain largely void of female influence. Gender and technology research strongly advocates letting females use computers as “toys,” encouraging them to play, too (AAUW, TechSavvy, 2000). Digital Animation recognizes play as a tool to increase female comfort and confidence with technology, a first step in the process of becoming skilled, creative computer technology users and designers. All participants in the summer program get the opportunity, support, and encouragement to play with advanced technology (ONY1; ONY2). Participants respond by edging toward free and unimpeded motion, toward being technology producers as well as consumers. Sure, now the participants may be playing computer pinball, flinging fictional cows, shooting invaders, or role-playing a character, but they are developing skills and attitudes that improve and encourage their subsequent technology interactions and efforts.
Playing can also function as a viable, divergent, critical problem-solving strategy. Playing involves testing different strategies, using different media for inspiration, and working with others. Much computer technology involves logical processes and strategies similar to gaming, using the resources and rules available to achieve an end goal. Mentors often lead their groups through problem-solving processes by reviewing their storyboards and questioning shots, images, and connections. Participants strategize solutions.

Another important use of play as a hands-on learning method is as a break or stress release. Palazzi declares her desire for participants to see “technology as playful, fun, and experimental” (ONY1). During the program, the participants work intensely, but they play, too. Many times participants take short game breaks where they play a few hands of Solitaire or rounds of Snood and then return to their actual work (ONY1; ONY2). Mentors in Year 1 and Year 2 noticed that the participants almost all spend some amount of time each day playing games on their computers, and some mentors express considerable concern during mentor meetings (ONY1; ONY2). Some mentors even want a plan to address and curtail these diversionary activities. Should girls get additional tasks or exercises if they proceed faster than other group members? Should game playing be banned except during lunch or before program hours? Should online be off limits except for program-related research?

The mentors are conflicted about the participants’ playing. Sometimes any “play” that consists of off-task behavior annoys or disturbs them; other times they express frustration the girls are not playing with the center’s resources enough. In one staff meeting, Charlotte says she was “frustrated because the girls are not used to freedom and unstructured time, especially on the last day. They have all these resources and but they don’t use them in their spare time” (Post-mentor meeting, Y2). Interestingly, these issues and tensions remain unresolved during Year 1 and Year 2; Palazzi listens to the concerns from both sides of the debate but never intervenes.

My Year 1 and 2 observation notes support the mentors’ assessment that participants often take impromptu game breaks, but they also convey my impression of these breaks as brief and minimal, like short work breaks common in most business environments. In one instance, I pondered a participant’s game playing: “Michelle plays solitaire, a few minutes later she asks Shanda [her mentor] a question about how much she needs to wait to do in terms of working on her roots model. So, was the solitaire off task? Time filling? Necessary down time?” (ONY2). During a Year 2 staff meeting, Kristy, one of the mentors, expresses a sentiment several of us share, that “the girls need” the games, email, instant messaging, and online reading as a break (ONY2, Post Mentor Meeting). Kristy remarks that all of us, the mentors included, take, and need, short breaks and do those kinds of things, too.

Postmodern theory accepts play as a legitimate educational process, one of many viable learning approaches. Play encourages creativity, humor, connections, inspiration, and fun. Play is learning as an active, open-ended, experimental, inquisitive process. Even with some trepidation and hesitation,
Animation addresses this postmodern gender and technology discrepancy around play by allowing and encouraging play as a beneficial, legitimate educational and recreational process for everyone.

**Reflexivity as a Component of Postmodern Pedagogy**

Another important postmodern pedagogy component is reflexivity. Reflexivity involves critical self-examination, individually and collectively. Reflexivity includes a willingness to constantly evaluate what you are doing, the results, and changes to make. Giddens (1991) posits that reflexivity is a continual cycle of individual and collective self-monitoring, analysis, and action (p. 28). This process involves always wondering, questioning, tweaking, and reflecting. Postmodern processes such as reflexivity press for constant attention to issues of power, equity, discrimination, representation, limitation, and absence. Foundationally, Digital Animation is a response to these issues – an attempt to patch the “leaky pipeline” for women in technology (Angier, 1995; Camp, 1997; Margolis & Fisher, 2003). To support postmodern pedagogical practices of reflexivity, Palazzi gathers program data, evaluations, participant and mentor responses, and considers her own experiences and observations. Using these, Palazzi decides which main issues she wants to focus improvement efforts on for the next summer’s program. The evolving role of mentors is a prime example of Digital Animation using postmodern reflexivity for continual improvement. Before Year 1, the six or so program mentors ‘floated’ in the fishbowl classroom, helping any group or individuals as necessary. After reflecting on this use of mentor resources and its impact, Palazzi redeployed mentors the next summer, assigning each one to a specific group of three to four participants. This realignment of resources created an explicit connection between each participant and a specific mentor, creating a clear channel of personal support, attention, and connection. In this way, rearranging mentors represents a reflexive attempt to adapt this technology education environment for the female participants’ benefit rather than continuing to expect the participants to adapt to technology education environments (AAUW, TechSavvy, 2000). Mentors focus on their group and its progress, primarily, but they help each other, other groups, and any other participants as necessary. In this new arrangement, mentors formed closer personal bonds with their group members through more focused and consistent interactions. Mentors increased their depth of knowledge about their group members as well as maximizing their ability to support participants’ efforts (ONY1; Farah, PC Y1).

Mentors also provide tangible, visible proof of diverse female success across a spectrum of technology interests. Palazzi reviews the Year 1 evaluation data and considers what it could mean that some participants still report they do not know successful women in technology even after their program experience (EVY1). In Year 2, Palazzi works harder to counter this. She has mentors formally introduce themselves to the program participants and present information about their experiences and interests in technology. She encourages mentors to find ways to connect their technology interests and abilities with those of the participants. In the Year 2 post-program surveys, participants report an increase in knowing women successfully involved in technology.
By creating this awareness of women working successfully in technology, Palazzi builds the framework for a growing network of connection and support for women interested and working in technology. Palazzi intends for the program to instill an expectation of mentoring by and for women in technology – that women entering technology will expect mentoring in the beginning and expect to serve as mentors later, themselves (MP INT 15Feb05). Palazzi sees evidence of initial success in building this support network, but she continues reflexively considering other potential changes that might increase the program’s impact and success. Past evidence of success includes the return of previous participants as program mentors, younger siblings applying as program participants, and the participants who maintain or re-initiate contact with program staff.

Palazzi confesses continually considering what might happen if she changed the current participation model. Should she change the locus of her intervention to teachers and participants in schools during the school year? Palazzi considers how public schools acquire, provide, and teach using current technology resources, with the specific aim of supporting female integration into technology education programs and environments, and the influence *Digital Animation* could have on those processes (MP, INT, 15Feb05; ONY2, Mentor Post meeting).

Palazzi is particularly concerned with the duration of participation in the current program model. In the introductory scenario, Palazzi wonders if young women need more sustained experiences with technology than a two-week summer program, or if they would benefit more from extended program terms or repeated program participation with digital arts technologies. She contemplates incentives for continuing participation, noting “It would be really great eventually to have some sort of stipend for them to come back when they’re juniors and seniors” (MP, PC, Jul05). Palazzi ponders providing technology resources and supports for young women in public schools by redeploying the program during the academic year and at public schools:

Maybe [the program] really needs to be during the school year, where we send the mentors out to schools. But it seems like the girls would have to all be at the same school. We’d have to just pick one school, work with 15 girls, have contact with them through the year. It seems like then you can really see if it made a difference over time (MP, PC, Jul05)

In addition to the long-term impact of ACCAD programs, Palazzi reflects on ways *Digital Animation* might help provide increased, viable technology hardware, software, and instructional resources to more female students in public schools:

We’re doing a lot of stuff here that it’s not like [participants] couldn’t at their schools if they had the software for it, or if [the schools] would invest some money. It wouldn’t cost very much and maybe we could write some grants with them. I don’t think anything [is too expensive], except for our motion capture lab, which is way too costly to do. But you know, they [participants from public schools] could run around in our virtual sets [at ACCAD] and see what that’s like. And they should play virtual theater. They should do all that stuff to figure out how it relates to them, their work. (MP, PC, Jul05)

The possible long-term impact through public schools resurrects research concerns around high quality technology program implementation for females. These concerns reinforce *Digital Animation’s* own
problems trying to provide training and resources for teachers to increase the quality and range of technology education in local public schools. During Year 1, *Digital Animation* included an unsuccessful teacher training component. The plan was to have five teachers train concurrently with the summer program student participants. Although the training was provided free of charge, only two teachers attended, and their attendance was sporadic, at best. Also their technological progress was minimal, and their overall contributions to the program were meager and only tangentially related (ONY1). Even providing student access, school resources assistance, and high quality training and support for program implementation may not be enough. Palazzi considers the potential value of being able to offer teachers actual course credit, and even professional stipends, for attending training and then providing technology programs for girls in their own schools and communities (MP, INT, 15Feb05). Would this be enough?

One of the toughest and most beneficial qualities of reflexivity as a postmodern pedagogical process is its lack of finality. The questions are never finished; the answers are never complete. Palazzi’s commitment to reflexive pedagogy emphasizes her insatiable curiosity and desire to improve gender equity in technology. In revisiting the participant selection process again, at the end of Year 2, Palazzi asked about keeping the current admissions review and selection, “Do we want to keep going through this thing where all these people apply and we sort of pick names out of a hat. Or do we want to see if we can simply…but I think that kind of stuff we’ll actually have to ask” (MP, PC, Jul05). Palazzi is willing and able to embrace the postmodern approach of continually considering other perspectives and possibilities, as well as developing new questions to ask, new resources to tap, and new tactics to try.

A postmodern gender and technology perspective includes reflexive practices as a key component. Postmodernist pedagogy encourages critical self-evaluation, self-doubt, and responsive changes. Instead of just criticizing the status quo, dissecting its problems and biases, and theorizing about them, postmodern pedagogy insists on action, reflection, evaluation, and revolution. In these ways, Bryson & de Castell’s (1995) postmodern gender and technology research category resembles poststructuralist and feminist poststructuralist theory, topics I cover in more detail in the next chapter.

*Digital Animation* Discrepancies with Postmodern Theory and Practices

The Year 1 and Year 2 data provide unmistakable, copious evidence of *Digital Animation*’s core commitment to postmodern pedagogical concerns. There are times, however, when *Digital Animation* data provides a more complicated perspective of its pedagogical practices, times when the program conflicts with its own postmodern perspectives, sites of internal philosophical struggle. While postmodern pedagogy questions and challenges boundaries, categories, and processes of exclusion, the program is a direct intervention in technology education available to females only. Within this limitation, Maria Palazzi acknowledges her disappointment that program applicants and participants do not yet reflect the diversity of the public school district and general population. Before the Year 1 program, Palazzi worked with a district-level educational administrator to recruit minority female students, but the efforts produced little increase in minority participation. Palazzi also acknowledges the difficulties finding diverse mentors each
year. She recruits almost all of the women affiliated with ACCAD’s graduate programs, but the number of females in those is already small, with the number of minority females even smaller. *Digital Animation* attempts to open technology to more females and to more female minority candidates, but this kind of paradigm shift can be slow. Building a critical mass for change takes time.

*Digital Animation* also struggles somewhat in providing multiple entry points into technology for young women. While the program uses digital animation and art as different entry points into technology, the Year 1 and Year 2 programs limited participant groups to creating 3D animations on an assigned topic. Remember Palazzi’s struggle with allowing more participant choice in what technology they use and for what purposes? She worries the directive to produce animations limits the girls’ options, dulls their creativity, and reinforces the false impression of technology as narrow and confining (MP, PC, July05). To counter this, Palazzi includes exposure to an array of technology interests and occupational possibilities, partially as an attempt to supplement the program’s focus on animation. Mentors reference their personal technology interests and projects, animated movie posters with ACCAD alumni signatures hang on walls, framed digital art prints line hallways, program research includes artists using technologies – all providing evidence of the unlimited potential uses, and entry points, for technology, even though opportunities may still seem a bit abstract and impractical to participants.

Another site of struggle around multiple entry points involves the program’s application and selection process. ACCAD publicizes the program and recruits participants online through its website, in local newspaper ads, informally through independent teacher contacts, and word-of-mouth. Several staff members review applications and select participants, creating a waiting list of subsequent strong contenders as alternates. The application includes minor self-evaluation with computer experience and skills, but the artistic and written components are the most important portions. The selection criteria are subjective and implicit, but not necessarily bad or unfair. In postmodern pedagogy this process of exclusion and selection is known as “gatekeeping.” Again, without immediate judgment, postmodern pedagogy calls for critical consideration of processes like these. After accepting one alternate participant in Year 1 and two alternates into the Year 2 program, Palazzi wondered about how the selection process is actually working, and why they selected some applicants and not others. The alternates each year were very successful in the programs, and Palazzi wonders why they did not merit initial selection, and if this reveals a problem for her to address (ONY2).

Another postmodern tension for *Digital Animation* involves long-term reflexivity. Palazzi accumulated three years of program data from the program’s inception through Year 1 of this study. She shared her frustrations about the usefulness, and relevance, of the early data (MP, PC, 04). Palazzi originally dismissed the first two years of data, questioning their long-term reflexive value. Even though the 2002 and 2003 data is thin, misdirected, somewhat irrelevant, and seemingly useless in term of program improvement and assessment (MP, PC, 04), its reflexive value resides in being a springboard for developing assessment strategies and organizing data collection around clear program goals, grant funding
criteria, and national technology standards. This aggregated data provides Palazzi greater scope on Digital Animation’s progress, problems, and areas for improvement. Her comprehensive reflection on the program’s first three years including research data and evaluations helps clarify Palazzi’s purposes, her research goals, what questions to ask, who to ask, and how to improve the program based on this information. By Year 2, Maria and I developed a longitudinal survey to distribute to previous participants. Hopefully combining this long-term data and assessment with the yearly research data will continue to provide reflexive insight into viable, variegated pedagogical approaches targeting diverse, shifting, morphing, and marginalized populations, fueling continuous program improvement.

**Challenging and Disrupting Postmodern Gender and Technology Research**

*Digital Animation’s* data serves to complicate postmodern gender and technology research and pedagogy, providing data and experience about the shifting relationships between gender and technology in education. Palazzi believes most girls make deliberate or default career and education decisions involving technology by middle school. Claudia Morrell, executive director of National Center for Women & Information Technology at UMBC insists:

> Reaching girls in middle school is critical because that’s when they’re making academic decisions that can be critical to the future of their high school career. A decision made in middle school about whether to take an advanced math class can determine wither a student is on track to take an Advanced Placement calculus class in high school. And that course can set a student up for a successful college career. (Zibel, 2005, Para. 9 – 11)

For Year 2, Palazzi shifted the program applicant age range lower to reflect this younger age decision-making. Palazzi reviewed the data, noticed what the young women say and do around technology, and developed a personal sense that these participants reflect changing attitudes toward gender and technology, with girls expressing more comfort and interest:

> I think we are getting a population that does think technology is part of their lives, you know? So do we want to ask them sort of what their, does it broaden their view of what they can become, sort of, after being in this [program]? It gets clouded by all this research that’s out there, but sometimes you read the research and you talk to the girls and those two things don’t really match. What people’s impression is of what girls think about themselves and their relationship to technology doesn’t, isn’t really the same. (MP, INT, 15Feb05)

The participants often report comfort and explicit interest in computers, even while recognizing male advantages with technology. One participant claimed “boys [her] age might be as good as girls on computers,” while another acknowledged the subtle cultural transmission that while boys may not actually be any better than girls at technology, “boys are expected to be better at technology than girls” (Participant Pre-Survey, Y2). The program data also contradicts AAUW’s 2003 assertion in *Women at Work* that girls are unprepared with the basic levels of technological literacy needed to progress past entry-level computer technology use. This may partially result from participant’s self-selection and application. Participants enter this program with different backgrounds, experiences, and levels of computer comfort and literacy. Each girl reports feeling successful, and almost all girls report an increase in skill and ability by the program’s end (Participant Post-surveys Y1, Y2). Does this evidence really communicate a shift, or is the
application and selection process creating a skewed representation of the general population? Palazzi wants to review the process to decide whether these discrepancies seem coincidental or more a result of bias, even when program application materials stress computer experience is not a key factor in selection. Regardless of gender and technology research stereotypes, the participants demonstrate how quickly, almost naturally, girls can learn technology information and develop skills.

Overall, the summer program participants report feeling generally comfortable with technology, even without a lot of experience, although some do have extensive technology experience. They all express an interest in using technologies. Some participants show a real knack, some learn quickly, some steadily, and some struggle toward their eventual success (Post-surveys Y1; Y2). With some encouragement, permission, and guidance, participants do not feel inept or unwilling to play with technology; instead, they are mostly eager and adventuresome. Perhaps most importantly, the participants represent a growing sense among some girls that they can overcome sociocultural biases, find support, and be successful in technology (Participant Post-surveys Y1; Y2). They believe they can succeed in technology, and they are starting to do so.

Gender and Technology Conclusions

The Digital Animation program builds on the large body of research by the AAUW, NCFS, and NSF, among others, that demonstrates the failure traditional forms of technology education have been for women, and how these traditional technology education pathways tend to “weed out” interested girls through a lengthy “leaky pipeline” (Angier, 1995; Camp, 1997; Margolis & Fisher, 2003). In contrast, programs like Digital Animation build on this research, addressing factors from multiple theoretical and practical perspectives and demonstrating ways non-traditional approaches to technology education can benefit women. Digital Animation, with its successes and struggles, generates valuable data about young women and how to interest them in technology, build their confidence and skill levels, and support them throughout the education and career pipeline. This data becomes part of the larger body of knowledge about gender and technology and postmodern pedagogies. It also provides a non-traditional educational model using arts to interest young women in technology.

In many ways, the Digital Animation Year 1 and Year 2 data does not capture evidence supporting the program’s overall aim of increasing the likelihood young women will be interested in and pursue technology education and careers. The hope behind a program like this is that once we pass a tipping point where females manage to enter and remain in technology, the more equitable the gender representation in these fields will become. With respect to these goals, Digital Animation seeks to address earlier research data and redress gender inequity in technology education. Digital Animation wants to ensure that women account for an equitable percentage of technology degrees, rather than maintaining the significantly lower percentage they currently receive (NCES, Trends, p. 9; NSF, 2004). Digital Animation seeks to provide the impetus for changing technology education and occupations to counteract their gender biases through implementing successful supportive practices. By doing this, along with engaging in systematic program
documentation and evaluation, *Digital Animation* seeks to participate in developing a more collective and comprehensive set of strategies and practices to advance technology gender equity (AAUW, *Under the Microscope*, 2004).

While the main catalyst for the *Digital Animation* program rests in the gender and technology inequities exposed by research and scholarship, the main framework for the program to address these inequities develops from the traditional of feminist research and pedagogy. Feminist pedagogy, at its heart, aims to provide women, and other minorities, access to the same resources and opportunities as men and other majority populations. In many ways, gender and technology research evolves primarily from a feminist theory background – an interrogation into who gets to access technology, how, and for what ends. Haraway’s (1991) “Cyborg Manifesto” signifies a clear imperative to examine the ways women did, do, and can interact with, program, use, and design technology. Feminist theory, of course, begets feminist pedagogy. In the next chapter, I explore feminist theory and pedagogy, with respect to gender and technology research, as a foundational organizing and analytical principle for *Digital Animation*. 


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CHAPTER 4

FEMINIST POSTSTRUCTURALIST PEDAGOGY AND DIGITAL ANIMATION

Program Day One

The Trip to Big Darby Creek

The girls come to ACCAD’s program to learn about computers and animation. After the creative introduction, the first two days contain vaguely school-like elements: instruction, research, presentation, practice, and remediation.

But the ACCAD environment and program depart significantly from school. ACCAD’s classroom is called “the Fishbowl,” with the side and back walls formed by windows, allowing visitors to see the space, equipment, activity, and instruction inside. In stark contrast to typical fluorescent classroom environments, the fishbowl is dark and always a bit too cool. Charcoal grey baffling nestles into the farthest, darkest corners of the room, dampening sounds. The room absorbs noise and emits quietness.

On the third morning of the program, things change. The sky is already a crisp, clear blue and the chill in the air is evaporating by the time participants arrive. The girls mill about inside; the mentors do, too. A couple of people drift into the Fishbowl to log into their computer accounts briefly, but no one lingers long. Groups of girls, mentors, and staff ebb and flow, shift, disappear, reform. Our bus idles in front of the building. The sweet, oily scent of sunscreen spreads. Sunglasses, sketchbooks, pencils, markers, paper backpacks lie ready nearby.

Shortly after 9:00 a.m., without direct instruction, participants board the bus and take seats, anywhere, with anyone. No one mentions any rules for the ride, field trip, or site. None. As the bus rolls onto the road, the riders start to chatter. Socializing seems so easy. The conversations pulse and scatter. Questions. Laughter. Sketching. Group singing erupts – Disney songs. Choruses peppered with chuckles. The excitement and enjoyment is palpable.

The city fades in our wake. Flat farmland begins to fade toward encroaching wilderness, and the trees, flowers, grasses, and brush line curvy roads beckoning us into the woods. In moments we enter the large, empty parking lot of the Big Darby Creek watershed ranger station and park. The bus stops and we unload under a picnic pavilion. We wait for the Ranger/Naturalist, Ted, to meet us.

When Ted arrives, he gives us a quick verbal introduction to the site then shows us pictures and preserved specimens of local native wildlife. He points to a wooden box mounted above our heads, open across the bottom and dark inside. It’s squeaky. Bats. Bats fill the box, chirping, waiting for dusk, and the effect is both mesmerizing and creepy.

Ted opens a supply closet and begins distributing gear to the group: large and small nets, buckets, containers, and clipboards. We carry the equipment down a wide, dusty trail to the Big Darby Creek watershed outdoor classroom, a clearing with a small, square, weathered stage surrounded on one side by simple, rough-hewn wooden benches.

Ted provides an orientation to the area and an explanation of the tasks and data collection we will conduct today. Ted solicits volunteers and they demonstrate how we will use nets in the creek to capture specimens and transport them to the stage area. On the surface of the stage, they demonstrate how to sort,
document, and store the specimens, and, afterwards, how to release them into the creek. As soon as the demonstration finishes, most girls scramble with their group members toward the nets and into the creek with little encouragement. The mentors mostly follow their lead, enthusiastically stomping into the creek. One mentor and a staff member resist the rapid rush to plunge in and wait, temporarily, on the shore.

But not Maria and me. We shed our stuff and splash into the slightly chilly water sparkling in the midmorning sun. When someone falls into the creek, everyone laughs. It happens several times. I join a group and we end up chasing a swarm of fiery-red flecked minnows from a patch of underwater grasses into the creek’s rocky middle. They flash in sharp sparkling bursts as they dart from our herding and into our net. The moments of discovery invigorate us. In cycles, we take our samples, sort them, count them, record the tally, return them, and repeat the process. Kathy digitally documents the process, specimens, and participants.

Ted finally stops us. We slosh out of the creek and gather on the benches. We discuss the issues facing the Big Darby Creek watershed and the larger context of the data we’ve gathered today. Participants ask questions, take notes, and sketch in their small black books.

When the discussion ends, we hike the short distance back up the trail to the picnic shelter for storyboarding. The girls and mentors grab their box lunches and huddle with their groups in spots around the picnic site. Each group discusses what they have seen and done, and they brainstorm ideas related to their topics. They use sketchbooks, markers, pencils, and pens to develop a storyboard - a visual outline - for their animation by drawing key scenes as reference points. The next hour is a blur of chatter and laughter and drawing and writing.

When the bus returns, we board again spontaneously, willingly. We are wet, dirty, tired, and enthusiastic. The ride back is lighthearted and easy. The girls will be ready to work more tomorrow.

(Program Day Three, Y2)

To use feminist poststructuralist pedagogy as a theoretical framework for analyzing the ACCAD summer program data, I will first define my use of the terms feminism, pedagogy, and poststructuralism. Afterwards, I propose a synthesized list of common characteristics and qualities of feminist poststructuralist pedagogy and use these to analyze Digital Animation data.

Defining Feminism

Feminism often carries lingering, negative, inaccurate impressions of man-haters and butch anarchists revolting against society. Feminism does not necessarily involve man-hating or bra-burning, but it does aim to deconstruct current inequitable social hierarchies and beliefs. In 1948, Simone de Beauvoir, a French philosopher, published the foundational feminist work *The Second Sex* (trans. 1953). In this work, de Beauvoir recognizes the cultural construction of “man” and “woman” as categories and the resulting societal consequences, famously arguing, “one is not born, but becomes a woman.” De Beauvoir examines ways men become the norm and women become the “other,” a factor she considers crucial in women’s oppression.

Later theorists apply de Beauvoir’s ideas in other fields. Sherry Ortner (1974) adapts de Beauvoir’s arguments to anthropology in an attempt to explain the universal devaluation of women (p. 25). Ortner attempts “to locate and expose the highly persuasive nature of the logic of cultural thinking that assumes the inferiority of women,” as well as its pervasive presence and constant reification (p. 22). She hopes showing “the social and cultural sources of that logic” will create “the potential for genuine change,” resulting with “as much of the range of human potential open to women as is open to men” (p. 21 - 22). Ortner concludes a major factor in women’s devaluation results from a predominant, and perhaps universal,
identification or symbolic association of women with nature and men with culture (pp. 26 – 27). According to Ortner’s research, women’s reproductive functions clearly demarcate their “natural” roles in giving birth and mothering. As a result, women’s biological functions provide justification for socially-dictated roles of nurturing and cultural transmission, relegating women to domestic contexts (p. 33). But Ortner believes one problem with this model persists: women cannot be completely suppressed from culture. They can be closely associated with nature, “lower on the scale of transcendence than man,” but women exceed the limits of nature and exist within culture, too (p. 31). Women have subjectivity and agency. As such, Ortner proposes that women occupy “an intermediate position between nature and culture” that marks them as less transcendent and positions them as “translators between nature and culture” (p. 40). To complicate matters, Ortner argues that participating fully in culture demands women adopt the cultural biases against women. Consequently, many women come to accept their (lack of) status and domestic duties as natural and necessary, perpetuating and validating cultural misogyny, even to their own detriment.

Monique Wittig also appropriates and extends de Beauvoir’s argument in her influential essay “One is not Born a Woman” (1981), drawing heavily on the idea of woman as myth. Wittig (1981) investigates ways culture naturalizes the categories of “women” and “men” and then uses these cultural definitions and expectations to (re)construct current and historical evidence of the differences between them (p. 221). Subsequently, Wittig contends the myth of “men” and “women” as naturally occurring, distinctly different categories serves political and economic ends by camouflaging class divisions and discouraging conflicts between genders (p. 225). To Wittig, being a feminist involves fighting for “women” as a class of individuals while also fighting for the disappearance of this class (p. 223). In other words, the oppression of women is real and needs active attention, but the natural inferiority of women and even the overriding category of “woman” are cultural constructs. Wittig calls for “the destruction of heterosexuality as a social system based on the oppression of women by men…which produces the doctrine of the difference between the sexes to justify this oppression” (p. 226). Then Wittig recommends “destroying the categories of sex, ending the use of them, and rejecting all sciences which use these categories as their fundamentals,” as the means to moving beyond the binary division of men and women (p. 223). While these seem like extreme measures, they might be necessary to achieve equality.

These scholars aim to expose and intercede in issues of gender inequity. They recognize that the binary opposition between “men” and “women” is the result of cultural construction rather than existing as a purely natural occurrence. Foundational feminist ideas like these crossed into mainstream pop culture in 1963 with Betty Friedan’s book, The Feminine Mystique. This book resulted from Freidan’s qualitative research on women’s frustration and unhappiness with trying to fulfill the image of the then-current culturally ideal woman, the “housewife” – a superhuman and super-happy wife, mother, and housekeeper. Freidan argues the pressure to conform to such extreme cultural dictates forces women to forfeit their identity in service to their family. The “feminine mystique” is Friedan’s term for the ineffable quality of
Feminisms as Plural

While _The Feminine Mystique_ (1963) and feminist theory crossed into mainstream awareness, aided by visible feminist icons such as Gloria Steinem, Germaine Greer, and Jane Fonda, feminism began facing its own internal contradictions and problems. Women of color began voicing their concerns about being marginalized, invisible, and silenced within the bounds of feminism, highlighting the de facto focus on white, middle-class women and the glaring absence of women of color and from different socio-economic and cultural groups. Scholars including Audre Lorde, Gloria Anzaldúa, bell hooks, Maxine Hong Kingston, Alice Walker, Cherrie Moraga, Patricia Hill Collins, and Angela Davis argued that feminism must recognize, include, and validate diverse viewpoints and experiences, including those of people of color, instead of repeating and reifying the exclusionary practices of dominant cultural paradigms. As a result, feminism was no longer a singular, fixed set of beliefs, but became plural: feminisms. Feminisms recognizes previously ignored and marginalized groups of women, not just middle class, heterosexual, Western, white ones (Anzaldúa, 1987; Collins, 1991; Davis, 1981; hooks, 1989; Mohanty, 1991). Feminisms attend to gender, but also advocate awareness, sensitivity, and consideration of other identity categories such as socioeconomic status, race, ethnicity, nationality, sexuality, and locality. Feminisms aim to emancipate all marginalized women, regardless of gender. Throughout this paper, I use feminism to represent the plural concept of “feminisms,” to recognize the diversity and commonalities of women’s existences and experiences.

In addition to attending to multiple marginalities, feminist research strives to be socially responsible, emancipatory, action-driven, and critical of ingrained epistemologies and methodologies (Malson, 1998). According to Balsamo (1996), feminist research includes questioning discourses and their “historical legacy” of women as “bodies,” or conceptual placeholders (p. 35). Feminist principles challenge these (naturalized) constructs and create potential space for re-envisioning and re-constructing society based on more inclusive criteria and discourses. In terms of action as a necessary component, Garber (2003) remarks that in feminism, “social action moves academic theory into the realm of the experiential, commitment, and social change” (p. 58). Some feminist scholars believe this approach is “threatening to male systems of knowledge” (Balsamo, 1996, p. 35) and this can create tremendous resistance, but most agree that change is worth the discomfort, effort, and backlash (Balsamo, 1996; Faludi, 1991).

For many reasons, a broad understanding of feminist theory is relevant to this case study. First, the program director, Maria Palazzi, has a strong background in feminism from her personal efforts and her previous involvement in a feminist theory reading group. Second, the summer program title includes “A technology mentoring program for young women,” explicitly marking gender as a primary program focus. The program intent is to engage young women directly with technology through the arts. Palazzi’s background with feminist theory and experience in technology and digital animation fields precipitated her
concerns with recruiting and including female participants and staff from different sociocultural groups (MP, PC, Y1). Additionally, the program serves to counteract the social, cultural, and internalized biases against women in technology by providing them with an environment and the resources conducive to exploring technology’s many possibilities (Ortner, 1974). A program goal is to contradict, and hopefully change, current cultural impressions and limitations of women with technology. The potential for creating actual change for women fuels this program. Poststructuralism and its inter-relationships with feminism provide opportunities and support for change.

Poststructuralism complicates feminisms even more. In the next section, I briefly contextualize poststructural theory and its primary concerns. Afterwards, I more thoroughly explain the synthesis of feminist and poststructuralist theories and outline categories of feminist poststructuralist concern. Subsequently, I use these categories framework to analyze Digital Animation case study data.

**Defining Poststructuralism for Digital Animation Analysis**

Poststructuralist theory builds on postmodern and feminist theories, as well as the structuralist theories of de Saussure (1916), Lévi-Strauss (1949; 1958; 1962), Barthes (1964; 1970), Althusser (1969), and others. Structuralism, very generally, posits that systems and structures create meaning instead of individuals— that language “speaks us” and defines and delimits our sense of selves, experiences, and understanding. Structuralism relies on stable systems and single, unified subjects, the most important system being language (de Saussure, 1916). In this model, structures fix meaning within a closed system— words and sentences have specific, precise, culturally defined definitions.

Poststructuralism originated as a response to and an extension of structuralism. Five French theorists dominate the development of poststructuralism: Jacques Derrida (1967/1976), Michel Foucault (The Order of Things, 1970; The Archaeology of Knowledge, 1972; Discipline and Punish, 1978a), and Jacques Lacan (1968), all academic contemporaries, along with Julia Kristeva (1981, 1985), and, in his later career, Roland Barthes (1976, 1977, 1981). By the late 1960s, Derrida introduced one of the key processes in poststructuralist theory, deconstruction, by naming and deploying the tactic in several examples (1967). In short, Derrida (1967) uses deconstruction to demonstrate the instability of language, its cultural construction, its lack of a center. Derrida recasts language as slippery and in play, its meaning always dependent on différence - how one thing differs from, or is not, others. In effect, Derrida asserts a chair is a chair because it is not a table or a stool or a commode, not because a single, precise definition/image/concept exists that encompasses all chairs. Meaning becomes contingent; words always define other words. Meaning also involves multiple, subjective experiences, negating any singular, fixed, Real reality. We do not see or experience anything in its pure form, unmediated, outside our subjectivity, our culture, or our perspective. As Gertrude Stein famously said, “there is no there there.” We construct it all through mixing fragments of culture, language, ideas, images, and objects.

Derrida’s deconstruction involves examining binary word pairs, such as hot/cold, to determine which term is privileged and which subordinate, which we crave and which we wish to exclude.
Deconstruction involves identifying the hierarchy of the terms, then reversing it, then exploring how the privileged term reveals its necessary dependence on the subordinate one. Destabilizing a system produces what Derrida calls “ruptures,” where the system or structure that enables something becomes visible. These ruptures allow critical consideration of where and in what ways invisible structures work to create and constrain possibilities, particularly through working to suppress, exclude, and marginalize certain subject positions.

An important feminist example, for this research, is the binary of man/woman. In this binary, man is the privileged term and woman its subordinate. Man is defined by difference (différance) from woman. Man is not woman. Other important binaries exist: culture/nature, masculine/feminine, presence/absence, rational/irrational, moral/immoral, light/dark, life/death, good/evil, etc… The subordinate term is often negative, defective, wrong, or insufficient.

Other prominent poststructuralists apply Derrida’s ideas and techniques to reading socio-cultural norms, power relationships, institutions, and disciplines. Foucault, originally more of a structuralist, later uses deconstructive criticism to analyze the development and evolution of power codes within social and institutional relationships, as in Discipline and Punish (1978a). Foucault’s archaeologies (1970, 1972) demonstrate how certain oppressive structures and systems, exemplified in Bentham’s panopticon, simultaneously oppress some and benefit others. Foucault examines how specific discourses construct and manipulate power, such as medical, governmental, disciplinary, psychological, and sexuality discourses. Lacan also starts as a structuralist, in psychoanalysis, but he eventually adapts poststructural ideas to review and re-cast much of Freud’s work. Lacan (1968) applies poststructuralist concepts to develop, extend, and influence theories around identity development and maintaining subjectivity. One of Lacan’s (1953 - 1954) most notable poststructural concepts is the “mirror stage,” the process by which an individual develops a visual/phenomenological image of herself. Also, Lacan (1953 – 1954) proposes three orders: the Real - that which actually exists without mediation; the Imaginary - the visual/embodied perspective and experience that invokes linguistic mediation; and the Symbolic – a combination of language, culture, and self-regulation that produces subjectivity. Perhaps Lacan’s most forthright application of poststructuralist thought to psychoanalytic theory is his “objet petit a,” or the drive of desire, the insatiable desire to desire, the elusive lack we never fill.

Barthes (1976, 1977, 1981) and Kristeva (1981/1985) apply poststructuralist concepts of slippery meaning, instability, and multiple interpretations across disciplinary boundaries, exploring a variety of subjects and concepts. Both accept meaning as a construction, happening at an individual, subjective level, and built on fluid languages and discourses. Famously, Barthes (1977) characterized this belief in the construction of meaning subjectively by each individual as “the death of the author.” The author’s intent, once considered the penultimate determiner of meaning, becomes irrelevant for Barthes (1977), what matters instead is the meaning the “reader” creates from the text, or from an object, or an image. For Barthes, everything contains meaning and there is always an excess of meaning for and with everything.
Barthes questions assumed and naturalized truths, examining both what and how things mean. His interrogations of meaning included high and low media forms as subject matter, earning him status as an early cultural studies scholar.

Kristeva (1981/1985) investigates language and its meaning-making abilities, particularly as a tool to construct, interpret, and create history in subjective and persuasive ways. Initial feminist responses to poststructuralist theory often criticized its obliviousness to women and other marginalized populations. In response, (1981/1985) combines poststructuralist theories with feminist principles, critiquing patriarchal constructions as well as feminist theory itself for practices of exclusion and reifying traditional hierarchies. Kristeva’s poststructuralist leanings encourage consideration of gender in combination with other multiple identities. Kristeva’s interest in identity formation as a poststructural process influences her eventual professional psychoanalytic practice.

Poststructuralist theory plays an important role in understanding the complex theoretical basis for Digital Animation. The program’s purposes and practices aim to counteract current impressions of women’s interest and abilities in technology, as well as justifications for their absence. Digital Animation’s program structures and philosophies arise from poststructuralist interrogations of ways gender is privileged and punished, recognized or ignored, why this might happen, and ways to counteract it. The fluidity of language and discourse is important in (re)constructing and (re)defining young women with relationship to digital animation technology and countering the image of women as technologically deficient. To do this, Digital Animation combines young women, technology, and their attendant discourses purposely, to explore the ruptures and contradictions and to provide even greater spaces and possibilities for change (Malson, 1998). This case study employs poststructural concepts to analyze how Digital Animation produces, negates, silences, or enhances gender and other power differentials, and how these relate to current technology education and environments. Also, poststructuralist theory is important in this case study because of Barthes and the resulting cultural studies approach to considering both “high” and “low” art forms, treating traditional and new media and communication modes as art by considering their aesthetic, scientific, mathematical, and other interdisciplinary qualities, implications, and meanings. Digital Animation uses digital visual technology as an artistic communications medium, a form some might consider “low” art or “popular culture.” Poststructuralist theories promote interrogating and erasing the boundaries between “high” and “low” art, considering how all media contain, transmit, and catalyze meaning. Poststructural theory easily accepts digital animation as valid subject matter.

In the next paragraphs, I synthesize several major poststructuralist concerns then situate them in the context of Digital Animation’s pervasive feminist theoretical underpinnings. Afterwards, I use these concerns to construct and apply feminist poststructuralist pedagogy as an analytical framework.

From poststructuralism’s beginnings, several main concerns emerge. Even though poststructuralism promotes the questioning and dissolution of hierarchies and easy categories, a list of major concerns provides a useful framework for theoretical understanding and application theory. I freely
admit the imperfection of categories – their arbitrariness, their overlaps, and their interconnectedness. But, we need a little structure for these ideas to be useful and to make sense. The main poststructuralist concerns include language, subjectivity, power, and truth and knowledge production and access (Foucault, 1972, 1977). In this case study, feminist theories and convictions precipitated and continue to permeate the Digital Animation program. Maria Palazzi infuses the program with a feminist perspective with her presence and her efforts, even though the program does not always perfectly adhere to or address feminist values and principles. As a result, I deliberately approach these poststructuralist concerns from a feminist perspective. Both feminism and poststructuralism influence the intent, design, and operation of this program.

Next I explore the union of feminist poststructuralist pedagogy and use the attendant categories of concern to construct a theoretical framework. Afterwards, I deploy this framework to create, organize, and analyze these concerns in detail.

**Defining and Characterizing Feminist Poststructuralism**

*Everyday* that we know, sense, or experience is a partial, situated interpretation mediated through us, and this *knowledge* changes us as it forms. It also changes our retrospective interpretations and narratives of our prior selves. Foucault’s (1972) work enables investigation of *foundational* or *natural* “truths,” such as gender, as constructed, contingent, and fluid. Malston (1998) notes the “poststructuralist concept of discourse not only allows for a more socially grounded analysis of subjectivity and gender, [it] also enables a conception of ‘woman’ as an unstable collectivity of multiple, often contradictory subject positions in discourse.” In effect, feminist poststructuralism applies poststructuralist concerns with language, power, truth and knowledge production and access, and subjectivity with an explicit focus on gender and marginalization (Weedon, 1987), although Tisdell (1998) notes the “limitations of a focus only on social structure(s)” (p. 143). Some feminists rightly criticize Foucault for not exploring the feminist ramifications of his archaeologies (Fraser, 1989; Hartsock, 1990), even as he nurtures the tiny seedlings of queer theory.

Combining feminist and poststructural concerns re-emphasizes the multiple, simultaneous, shifting, contradictory, privileged, and oppressed aspects of individuals’ identities. *Subjectivity* is a poststructural term signifying these fluctuating collections of identities as a set of ... demographic markers in conjunction with personal, individual interpretations, beliefs, and experiences (Tisdell, 1998). Orner (1996) agrees that combining feminism and poststructuralism embraces the multiple and partial conditions of knowledge and ongoing processes of identity (re)construction.

Again, constructing categories of feminist poststructuralist concerns as a stable analytical framework may be in theoretical opposition to the tenets of feminist poststructuralism and its emphasis on fluidity, but they provide useful tools for understanding and communicating, what Lather (1991) considers the necessary reductive process of resorting to texts.

In the next section I pursue the concept of feminist poststructuralism as pedagogy.
Feminist Poststructuralist Pedagogy

Definitions of pedagogy, like everything in poststructuralism, abound, but most consider it broadly, generally encompassing teaching philosophies, strategies, and practices as well as understandings about learners and learning. Yates (1994) finds contemporary poststructural pedagogy concerned “with social control and oppression occurring in multiple forms; suspicion of truths and engagement in reflexivity; interest in context” (p. 430). Concurrently, feminism enacts pedagogy. For some scholars, feminist poststructuralist pedagogy offers a new view of teaching and learning by acknowledging classrooms, educators, and students as sites of gender, race, and class inequalities, and simultaneously sites of political struggle and potential change. Feminist poststructuralist pedagogy recognizes that teaching and learning have the power to be about liberation (Brisken & Coulter, 1992, p. 250). Brisken & Coutler (1992) also emphasize that feminist pedagogy “is about social change; it is a politic of transformation. Feminism recognizes education as both a site for struggle and as a tool for change-making” (p. 250).

Richardson (1985) characterizes an approach to feminist poststructuralist pedagogy:

First, personal experiences were defined as legitimate sources of insight in both theory-building and empirical research. Second, revisionism and innovation in theory and method were viewed as acceptable, and the demystification of the research process was sought through candid in-class discussion of which research strategies worked and which did not. Third, a collaborative search for knowledge was encouraged through joint research projects and collective discussions of the conduct of inquiry. Fourth, an egalitarian classroom atmosphere was established, promoting a model of intellectual interaction that was nurturant rather than competitive. (p. 314)

In these ways, feminist poststructuralist pedagogy advocates using socially-responsible, critical, emancipatory, inclusive action to create positive change for marginalized folks.

Feminist poststructuralist pedagogy calls for education, action, and change through the recognition, participation, support, knowledge construction, and validation of all people (Balsamo, 1995; Garber, 2003; Malson, 1998). Feminist pedagogy values diverse life experiences (Gilbert, 1999) encouraging equity, tolerance, and connectedness in classrooms (Jacobs & Becker, 1997). Ritchie (1990) asserts:

[O]ne of the most important contributions of feminism [is] the model of a discipline that constantly connects intellectual activity—the study of literature, language, and ideas—to the history and experience of people’s lives. This interrelationship provides intellectual practice that allows students to see that we make our own knowledge rather than simply acquire “the facts,” and that we do so in a reciprocal process of rethinking and reinterpreting the “word and the world,” in Paulo Freire’s phrase. (p. 35)

This presents education as a necessary tool for understanding and change that requires feminists continually monitor the evolution, application, and communication of their knowledge and learning processes. Feminist poststructuralist pedagogy emphasizes applying relevant knowledge to real-life, practical concerns (hooks, 1989; Relke, 1994; Orner, 1996). In feminist pedagogy the connection between theory, feasibility, and action is vital.
**Feminist Poststructuralist Pedagogy and the Importance of Purpose**

Many scholars, particularly female scholars of color, emphasize the necessity of continual self-monitoring, or reflexivity as a key component of feminist poststructuralist pedagogy (Dolana, 2003). According to Ritchie (1990) feminist pedagogy “encourages a critical practice that continually turns back on itself, continually monitors, challenges, and changes itself.” Dolana (2003) adds that teachers need to be socially-conscious and self-reflective in examining their attitudes and behaviors as well as their consequences in order to “advance the political project of feminism” (pp. 365-366). Other educators offer additional perspectives on feminist poststructuralist pedagogy. For hooks (1989), it involves addressing the realities of the students within the class (especially those in oppressed groups), and includes world views that oppose the dominant view; emphasize reflexive, critical, and sometimes painful analysis of self; encourage active “resistance and rebellion” against oppression; and work to challenge “the politics of domination on all fronts.” This implementation/application of theory, critical self-reflection, and change based on self-reflection is often referred to as praxis (hooks, 1989; Bryson, M. & de Castell, 2005). To Dolana (2003), feminist praxis also “concerns the transformation of oppressive patriarchal relations of power both outside and inside the classroom,” or what Ann Manicom (1992) terms "teaching for transformation" (p. 365).

Reflexivity and praxis are complicated issues in feminist poststructuralist pedagogy, though. hooks (1989), Dolana (2003), and many others also wish to “examine the contradictions between what feminists describe about their emancipatory work as teachers and what actually has taken place in a number of classrooms” (Dolana, 2003, p. 365). Some scholars are skeptical of any theory’s ability to overcome re-inscribing itself along with its hierarchies, values, and prejudices. Does feminist poststructuralist pedagogy exploit marginalized students through requiring their voices in classrooms, spaces some may not find safe (Dolana, 2003, p. 365)? Also, who has the power to implement feminist poststructuralist pedagogy and toward what ends? These questions propel the continual cycle of reflection and change.

**Why Feminist Poststructuralist Pedagogy is Important to Art Education?**

While feminist poststructuralist pedagogy has many undeniable assets, it has specific relevance to this case study because of its applicability for art education that supports critical visual literacies and traditionally marginalized learners. Art education is a field rapidly realizing what Sandell (1991) calls “the liberating relevance of feminist pedagogy” (p. 178). Many art educators recognize the need to include women and other marginalized artists, their contributions, artistic media, and pedagogies as a necessary step in incorporating feminist pedagogy (Congdon, 1999; Garber, 1990, 2003; Hicks, 1991; Keifer-Boyd, 2007; Keifer-Boyd, Amburgy, & White, 2007; Lampela, 1995, 1996; etc…). Sandell (1991) argues “It remains in the domain of art educators to redress gender imbalances within art as a subject and with regard to its status in society” (p. 178). Sandell also highlights the connections between art education and feminist pedagogies, asserting “Feminist pedagogy can be employed to address the value of the discipline of art itself because of its focus on the subjective, personal, emotional and investigative” (p. 184). Sandell lists
other commonalities, too: using the self as a primary subject; self-as-inquirer; employing a process of questioning and discovery rather than promoting singular correct answers; using collaboration, cooperation, and interaction within art educational environments and within professional aspects of the field (p. 185). Finally, Sandell (1991) recognizes that “feminist pedagogy provides art educators with a sex equity model that also serves as a paradigm of educational equity with balanced concerns because it promotes development of the individual, subject, and society” (p. 185). Sandell believes art and feminist pedagogy both require “that most difficult thing of all: listening and watching in art and literature, in the social sciences, in all the descriptions we are given of the world, for the silences, the absences, the nameless, the unspoken, the encoded – for there we will find the true knowledge of women” (p. 180), as well as the knowledge of other marginalized populations. Art education scholars, as well as those from other fields, are beginning to explore the meanings of feminist and poststructuralist pedagogy in terms of visual culture and media studies and practices (Jones, 2003; Parry, 1996; Schor, Amos, Bee, Drucker, Fernández, Jones, Kaneda, Molesworth, Pindell, Schorr, and Wilding, 1999).

In the second half of this chapter, I use feminist poststructuralist pedagogy and scholarship to craft a framework for analyzing Digital Animation data. I use principal feminist poststructuralist pedagogy concerns around language, subjectivity, power, and truth and knowledge to sort data initially. Then I use the data to develop subcategories for more specific analysis. I examine ways the ACCAD program data supports and implements feminist poststructuralist pedagogy as well as ways it contradicts, complicates, or exceeds this framework and these theories.
PART TWO:

Using Feminist Poststructuralist Pedagogy to Analyze Digital Animation Data

In the following sections, I create, adapt, and then apply a feminist poststructuralist pedagogy framework to analyze case study data from the Digital Animation summer program. I use poststructuralist concerns with language, subjectivity, power, and truth/knowledge as an organizing outline for exploring in ways Digital Animation data reflects feminist poststructuralist pedagogy and ways it does not. Within each main topic I present subtopics generated from my data coding – prominent or recurring ideas with relevance to feminist poststructuralist pedagogy. Again, I acknowledge the inherent contradictions in using categories for organizing poststructuralist principles and data examination; my subtopic categories share the same weaknesses. In short, I acknowledge creating an imperfect, arbitrary organizational structure for the sake of creating a coherent presentation and systematic analysis of the case study data. Just as the main concerns inseparably intertwine with each other, the subtopics I define and assign under reflect an inadequate and artificial separation and categorization. The design is, of course, flawed from the beginning, but necessary.

Feminist poststructuralist pedagogy is the implementation of feminist poststructuralist theories for educational goals, including what Chris Weedon (1987) calls disrupting “social systems of privilege and oppression” (p. 40). From a feminist poststructuralist pedagogical perspective, teachers and learners develop an awareness of these social systems, examine their characteristics, and explore how they impact people’s identities, beliefs, and values. This new awareness creates the possibility of agency through changing discourses and identities (Tisdell, 1998, p. 143). According to Weedon (1987), the ultimate goal of feminist poststructuralist pedagogy is to “identify areas and strategies for change” (p. 40). These changes are not solely based on gender, either Tisdell (1998) insists feminist poststructuralist pedagogy, as a “postmodernism of resistance,” aims to “keep the interests of women in mind, while attempting to change educational systems to also benefit those who have been marginalized by race, class, sexual orientation, and ableness” (p. 143).

Approximately twenty years ago, two foundational feminist poststructuralist works emerged contemporaneously: Chris Weedon’s Feminist Practice and Poststructuralist Theory (1987) and Women’s Ways of Knowing (Belenky, Clinchy, Goldberger, & Tarule, 1986). These books highlight feminisms’ intimate connection between theory and pedagogy: the first book presenting foundational feminist poststructuralist theory, the second, foundational feminist poststructuralist pedagogy. Although both books present what later become oversimplified perspectives, they both provided, and still provide, a strong base for the continuing application, development, and revision of feminist poststructuralist pedagogy.

In 1982, Carol Gilligan applied a feminist poststructuralist lens to interrogate Kohlberg’s (1971) characterization of levels of moral development. Kohlberg’s moral development scale relied on male subjects and favored masculine ways of thinking, concluding males generally score higher than females in
terms of moral development. Gilligan challenged Kohlberg’s moral development scale and scoring method that privileged males, eventually convincing Kohlberg to revise his processes. The resulting scores became gender equitable.

In *Women’s Ways of Knowing*, Belenky, Clinchy, Goldberger, & Tarule (1986) appropriated Gilligan’s (1982) tactics. This group of female academics discovered that scholarship about ontology and epistemology rested entirely on research and findings conducted with all-male subjects and then generalized. In *Women’s Ways of Knowing*, this group of feminist researchers deconstructs earlier studies conducted with exclusively white male participants (most notably Perry’s 1970 study on ways of knowing, “Forms of intellectual and ethical development in the college years”) by studying the ways women come to know. Belenky, Clinchy, Goldberger, & Tarule (1986) develop five major categories for women’s processes of knowing: 1) silent knowing; 2) received knowing; 3) subjective knowing; 4) procedural knowing; and 5) constructed knowing. In addition to these categories, the authors emphasize other findings, such as women’s preference to learn in a connected fashion rather than the separate, individualistic approach geared toward men.

In *Feminist Practice and Poststructuralist Theory*, Chris Weedon (1987) explains and explores feminist poststructuralist theory and practice primarily from a psychoanalytical perspective. Instead of ways women know, Weedon focuses on ways women are and ways they can be. Weedon uses poststructuralist concerns around language, subjectivity, and power to frame her analysis. Beginning with poststructuralist works of Lacan and Foucault, Weedon analyzes ways feminism extends and enhances poststructuralist theories, opening them to additional perspectives and understandings. Like Foucault, Weedon (1987) believes discourses produce meaning, and “meaning is always political” (p. 134). Weedon acknowledges using the different categories of poststructuralist concern, but explicitly expresses her understanding of their entanglement and overlap. Discourses are language, and language produces embodied subjects who use discourses to manipulate power, and power controls what counts as acceptable knowledge, who get to determine that, and who can access it (Weedon, 1987, pp. 13 & 105). She applies feminist poststructuralist concepts to theorize constructions and maintenance of gender, identity, and experience – key social and cultural distinguishing factors.

These two principal works provide useful constructs for analysis. Belenky, Clinchy, Goldberger, & Tarule’s (1986) work maintains their five categories as fixed and completely separate, and they continue to marginalize other beliefs about ways women prefer to learn. Also, although Weedon (1987) does include the open-ended, contextual category of subjectivity as a concern for feminist poststructuralism, she largely continues to produce a fixed, closed set of feminist poststructural pedagogy concerns.

More recently, other feminist poststructuralist educators have built on these foundational works. In 1994, Maher and Tetreault use Belenky, Clinchy, Goldberger, & Tarule’s ideas, and those of Carol Gilligan, to produce *The Feminist Classroom: An Inside Look At How Professors And Students Are Transforming Higher Education For A Diverse Society* as an investigation of feminist poststructuralist
pedagogy in action. With respect to Gilligan, Maher & Tereault (1994) assert that the “idealized feminist teacher” is “democratic rather than authoritarian, cooperative rather than competitive, and concerned with ‘connected’ and relational rather than ‘separate’ and rational approaches to learning” (p. 11). Maher & Tetreault (1994) use this earlier scholarship to develop a set of four analytical themes for studying feminist classroom practice in higher education: 1) mastery, 2) voice, 3) authority, and 4) positionality (p. 15). These theories also echo Nel Noddings’ (1984) Caring: A Feminine Approach to Ethics and Moral Education, with connectedness and relational ethics of caring being feminine alternatives to masculine models of authority, competition, individuality, and justice (p. 2).

In the next sections, I use the general poststructural concerns of language, power, subjectivity, and knowledge as my main organizational strategy, roughly correlating them with the categories and themes of Belenky et al and Maher & Tetreault. I further develop and characterize each major feminist poststructuralist category of concern and use these to analyze pertinent Digital Animation data.

**Feminist Poststructuralist Pedagogy: Language and Digital Animation**

A fundamental concern of feminist poststructuralist pedagogy is language. Language allows us to think, communicate, and connect – it liberates us - but it also limits us in many ways, too. Language positions its users as subjects. Specific kinds of subjects. Language defines. Terminology matters.

From a feminist poststructuralist viewpoint, the program’s title, *Digital Animation: A Technology Mentoring Program for Young Women*, may be its most significant use of language. What are the important considerations and material consequences of using these particular terms? Immediately, the use of the terms “digital animation,” “technology,” and “young women” repeat familiar signifiers, but the difference is in their combination. The program challenges familiar signifiers and alters them, like disrupting technology, even animation, as a solely male domain. Across the two weeks, the participants contradict many gender and technology stereotypes and discourses. They are females good at and interested in technology, both the creative and practical potential. They are capable of learning sophisticated technologies. They see technology as a field including successful women at all levels. They also see technology as an interdisciplinary medium, a venue capable of creating and transmitting knowledge. The participants experience working with technology as a social, collaborative, group process with individual support as necessary. The repetition is a technology class; the differences are dramatic. Technology becomes inclusive and supportive of women, a practical, helpful tool, social, interactive, interdisciplinary, and a cooperative versus competitive environment.

The program’s title emphasizes its focus on young women. Why young women instead of girls or young ladies? Eisenhauer’s (2004) examination of “what is a girl?” considers how feminisms position “girl” as a potential future subject, an almost-subject, caught in a teleological development into “woman” as the final, fully-formed, mature subject. According to Eisenhauer (2004), from this angle, the critical perspectives, consciousness, and achievements of feminism are “unidirectional gifts” from older feminists (women) to younger feminists (girls), minimalizing any impact or value of younger feminists. Feminisms,
even while confronting hierarchical power structures, have validated and valued subjects contingent on age and political awareness. *Young women* may be an attempt to create an inoffensive yet descriptive category. Eisenhauer (2004) problematizes the relationships between *girl* and *woman*, but often allows the term *young women* to pass untroubled, re-emphasizing poststructural difficulties around naming, creating, and considering different subjects. But is *young women* any more neutral of a term?

The lack of specific definitions for “young” and “women” covers the program’s participants even as they shift from being mostly high school students, ages 14-17, to mostly middle school females, ages 11-14. By defining “young” as a specific (fluid) range of ages, the program initially reinscribes the traditional age-based educational hierarchy, with young program participants at the low end, college-aged mentors in the middle, and adult female instructors and administrators at the top. Using *young women* instead of *girls* expands the participants’ potential subjectivity in terms of age range. This term positions them as interstitial, as in-between being *girls* and *women*, not children and not adults. *Young women* are still becoming; they can still change. The term is somehow more open and inclusive, possesses more potential energy. *Young women* also connotes an attempt to name and address female adolescent subjects in a respectful manner, often meant to imply and urge certain mature behaviors and attitudes.

Sometimes the mentors position themselves, or have others position them, as *women, young women*, and sometimes as *girls* (ONY1; ONY2). The participants almost exclusively use the term *girl* when referring to themselves. Mentors and participants see *girl* as an empowered, active subject, as an asset, in some respects, more than a liability or limitation (ONY2). They are all actively involved in the process of claiming *girl, young woman*, and *woman* as terms representing viable, desirable, diverse subjects with a wide range of assets, skills, abilities, and perspectives. They value their own voices, capabilities, and agency (hooks, 1989; Maher & Tetreault, 1994). As an example, in Year 2, a middle school participant created, circulated, and electronically distributed all participant contact information, building a network of personal connections among girls interested in technology and arts (ONY2). This networking recognizes the relational aspects of each individual’s subjectivity as well as the cumulative potential of building an alliance to counter popular assumptions and the current status of *young women* and *women* as subjects within gender and technology discourses. *Digital Animation* provides participants the opportunity to operate from the subject position of *girl, or young woman*, as a positive subject trait and position. These *young women* and *girls* challenge and change the discourses around gender and technology. As Eisenhauer (2004) offers, these “younger women” complicate the notions of *girl* and perform it in ways that create “social resistance and a process of reclamation through … challeng[ing]…accepted definitions and confining practices” (p. 101). These “young women” signify a change, a rupture, in assumptions about gender and computer technology. Language and culture must shift and flow to allow these new subjectivities.

The formal use of *young women* in program literature and publications does differ from the daily use of verbal descriptors. Almost everyone refers to the participants as “girls,” or “the girls,” or even “my
girls” (ONY1; ONY2). In terms of self-disclosure, I use “girls” almost exclusively for these participants throughout my data. I use it in conversations with staff and parents. I never question it until I need the formal title of the program for my dissertation work. I never really noticed the discrepancy before. This obliviousness to explicit terminology and its use reveals complications around language related to gender and age. Obviously the program staff, administration, and myself as a researcher have no intention of using terminology that diminishes any participant’s sense of self-worth or identity. Does using the word girl undermine our intentions to support young women in technology? Aren’t the two really just synonyms for each other? Does everyday use of girl in a technology environment help re-create the space as including females, too, or does it reinforce a position of inferiority? What terms can be substitutes, and what other connotations do those include?

In the next section, I further explore feminist poststructuralist concerns around subjectivity. I critically consider subjectivity’s roots in language and subjectivity as performance. 

Digital Animation data from Years 1 and 2 relevant to subjectivity can be roughly divided into
The major subjectivity subtopics, gleaned from Years 1 and 2 Digital Animation data, involve aspects of identities, program functions, and interpersonal interactions and access.

Feminist Poststructuralist Pedagogy: Subjectivity and Digital Animation

In terms of poststructuralism, Derrida (1959/1978, 1967/1976) argued language may be slippery, but it is indispensable. So, how does gender impact language in education? How does language and education impact gender? Language structures who we are and who we can be, as well as what and how we can think. Language creates subjects and objects. Language names, authorizes, polices, and privileges specific subject positions, or subjectivities (Derrida 1959/1978, 1967/1976; Foucault, 1965, 1972, 1977). In effect, language and experiences socially construct and maintain subjects. Power relations socially construct and mobilize subjectivity, too. Subjectivity, like language, is relational and dynamic. Instead of embodying one static identity category at a time – girl, Asian-American, Catholic - poststructural subjectivity combines identities, experiences, and cultural contexts in a shifting mix: sometimes a model minority student, sometimes an exotic fantasy. Subjectivity allows for an individual to construct herself as a coherent, unified self, often regardless of internal inconsistencies and contradictions.

Feminist poststructuralist theorists examine subjectivity with specific attention to gender-related aspects (Maher & Tetreault, 1994; Weedon, 1987/1997). In 1990, Butler deconstructs the traditional gender binary, man/woman, again provocatively proposing gender as constructed, and performed, instead of inherent and binary. Like de Beauvoir (1949), Wittig (1981), and Gertrude Stein, Butler argues “There is no gender identity behind the expressions of gender,” instead, “identity is performatively constituted by the very ‘expressions’ that are said to be its results” (p.25). Butler extrapolates de Beauvoir’s argument that women are made not born. As an example, drag is the act of performing the subject “woman” or “man,” usually by a member of the opposite gender. These explicit performances highlight how much of gender is a performance. What does it mean to be a woman? A real woman (Wittig, p. 221)? What does it take? In
Western culture, women do many things to prepare for their performances: shave their legs and armpits, wear dresses, wear make-up, put on heels, carry purses, don jewelry, perhaps get a mani/pedi, bikini wax or brow braids. Women are not naturally smooth-skinned, dress-loving, unblemished, accessorized tip-toers; it takes a lot of work. Constant work. Weedon (1987) acknowledges that poststructuralism creates “a subjectivity which is precarious, contradictory and in process, constantly being reconstituted in discourse each time we think or speak” (p. 32). As a result, women have to continually prove their womanliness through constant repetition, with an even longer performance run than *Cats*.

What do gender-based subjectivities mean? What do they do? Does being a woman mean fulfilling certain biological requirements, like having and nurturing babies? Does it require certain innate skills and task preferences, like preparing food or cleaning? Does being a man? What happens when one does not, cannot, or will not fulfill (perform) these requirements? This is where Butler (1990) centers her exploration of how poststructuralism creates a space for recognizing, interrogating, and possibly changing the definitions, limitations, requirements, and expectations of specific subject positions. Butler advocates making “gender trouble” by exposing and challenging traditional binary gender norms, performing gender with a difference.

Feminist poststructural pedagogy recognizes the potential of language and subjectivity as tools to transform students (Weiner, p.5). Eisenhauer (2004) proposes a *parodic pedagogy* which emphasizes subjects’ agency in their ability to repeat signifiers (words, images, concepts) with deviations that “[expose] places for resistance and disruptions” (p. 162). Although repeating signifiers with variation sounds abstract, Eisenhauer (2004) underscores its actual material consequences. *Parodic pedagogy* can function to question, reduce, and minimize subjectivity-induced barriers to power, authority, and recognition. In this approach, traditional academic hierarchies fade (Gillbert, 99), and *all* subjects possess voice (hooks, 89; Maher & Tetreault, 1994), agency, and capability as (active) cultural producers, not just (passive) consumers (Orner, p. 77). If “woman,” like all identities, is a poststructural performance series, the characters, and subjects, can transform. The performances become open, full of room for ad-libbing, critiquing, resisting, and evolving (Butler, 1990; Weedon, 1987/1997).

In the following section, I analyze prominent aspects of *Digital Animation* data in relation to subjectivity. I compare and contrast traditional educational subject positions, expectations, and performances with those in *Digital Animation*, exploring their feminist poststructuralist pedagogy roots and aspects. I also investigate data that complicates a feminist poststructuralist label.

In earlier pedagogical frameworks, subjects fulfill separate, fixed roles and requirements, often existing in an overt or implied hierarchy. Previous traditional educational environments produce either/or identity choices: teacher/student, adult/child, superior/subordinate, employer/employee, authority/peon, male/female, boy/girl. These roles clearly determine individuals’ identity, position, and rank as fixed markers of responsibility and recognition. Subject positions also determine rules for interpersonal interaction within a system. In traditional educational environments, students ask teachers for help, teachers
ask students for answers; teachers report student problems to administrators, while administrators have authority over students and teachers. Subjects play their parts.

In *Digital Animation*’s adoption of feminist poststructuralist pedagogy, fluid and multiple subjectivities replace the idea of static, permanent subject identities and roles. Initially, the hierarchical program structure appears in conflict with its feminist poststructuralist understandings of subjectivity, assigning clear subject titles: participant, mentors, instructors, and administration. These positions reflect a de-facto rank order, but *Digital Animation* functions quite differently than these labels imply.

Feminist poststructuralist theories value equitable access and availability, and *Digital Animation* promotes these. The program organizational chart reflects traditional barriers and limits for marginalized populations, but in practice, participant/staff access and availability barriers are minimal. Instead of a hierarchy, *Digital Animation* functions rhizomatically. Maria Palazzi emphasizes the availability of all personnel to all participants. Palazzi reminds mentors to make themselves available to a wider range of the participants than their groups (ONY1; 05). Palazzi and Vera, formal ACCAD faculty, serve as instructors, but they also monitor the entire group’s process and work with mentors, groups, and individual participants as needed. Palazzi, the *Digital Animation* and ACCAD Director, learns all participant names and socializes with them in an effort to connect with each one. She often devotes additional effort toward girls with trouble acclimating and integrating into the program (ONY1; 05). Additionally, Palazzi reminds the mentors daily they always have access to her as well as administrative assistants.

The relatively non-hierarchical program functioning creates unique educational and interpersonal interaction possibilities. Everyone is recognized and appreciated as an individual and as a member of the larger group. The treatment of the participants is an example of how *Digital Animation* displays a keen sense of subjectivity. From the start, the participants are treated as individuals – the whole program staff waits at the entries to greet people as they arrive. Maria Palazzi always introduces herself personally, chatting with each participant and their companions. She then matches the girl with her program mentor. The mentor introduces herself then escorts the girl on a brief orientation tour of the building, asking questions along the way. Later, Palazzi explains to the participants that they have fairly unfettered access within ACCAD’s spaces. There is a room stocked with freely available snacks and beverages, and participants can take breaks according to their own needs, without asking permission or being closely monitored. In fact, Palazzi encourages everyone to take breaks throughout the day, even bringing snacks and beverages to participants in the Fishbowl (ONY1, ONY2).

A prime example of program participant treatment happens both summers during the field trips. On the day before the trip, the mentors and instructors review with participants what they should wear and bring. The introductory scenario describes how participants arriving early enter the Fishbowl classroom and use their computers then drift outside to the bus. When buses arrive, participants and mentors enter and take seats. Maria counts the number of people going and then sits, too (ONY1; ONY2). As a former teacher and camp counselor, the absence of rules and directions was striking to me on both occasions. Even more
striking was the absence of any negative behaviors on either trip, mirroring the lack of any behavior issues across both years of this case study (EVY2). One parent believed this lack of behavioral issues resulted from how the program makes each participant “feel like an adult,” explaining that “when a person is treated well, as she [the daughter] was, they are able to accomplish a lot more” (Parent survey, 2005). Program staff value each individual and work to know them as multi-faceted, complex beings. Parents, as well as participants, appreciated how even though participants did group projects, these “groups drew on the strengths of each member,” validating individual contributions and identity while boosting participants’ confidence and self-esteem (Parent Post-survey, Y2). As a result, participants can explore and highlight different aspects of their subjectivity and agency, experiencing and presenting their selves differently, behaving differently, and learning new things in different ways. Another parent reported the program gave his daughter “validation of her interest in this area and her capabilities, increased her self-confidence, and reassured her that she is not alone” (Parent Post-survey, Y2).

Not everyone completely agreed that treating the participants with so much independence produced optimal results. One mentor reflected, “In some ways, I think it’s great that we gave [the participants] the freedom that we did and treated them like adults. However, I also think that we gave them a little too much leeway, and they may have been able to get more out of camp if we didn’t give them so much unstructured time” (Mentor Post-survey, Y2). Other mentors echoed this sentiment in staff reflections after the program (Mentor Post-surveys, Y1; Y2). Not infrequently, mentors perceive some girls as off-task too often. One mentor noted frustration and felt allowing the participants full autonomy allowed them to get off-task, which led to participants being lost during instruction. In further discussions, this mentor expressed feelings of inadequacy and unfamiliarity with the 3D animation software that impacted her ability to assist participants who fell behind.

The feminist poststructuralist pedagogy of the program also provides spaces for participants and staff to inhabit multiple subject positions at once, or shift easily between roles. As a result, many individuals can perform inhabit many of these official subjectivities at almost any given time. The instructors become learners as participants introduce them to a new website or software technique or unexpected shortcut. The students may become mentors to each other. Maria herself is the program administrator, an instructor, a mentor to all the mentors and participants, a role model, an advocate, a learner, and a resource. Everyone teaches, learns, contributes, and matters in a feminist poststructuralist approach, and this is evident across both years. Everyone is an agent capable of learning and applying that knowledge to create change.

In most instances, and in most spaces, identity markers convey certain stereotypes and expectations, as well as eliciting certain kinds of treatment, perception, and authority. In our general culture, being female and young usually serve to decrease the subject’s perceived value. Being female and young connotes specific interests, attitudes, abilities, fashion choices, and social behaviors. Being a girl means being silly and talkative and only interested in socializing. Being a girl means conforming to the
identity and expectations for *girl* as feminine and heterosexual and innocent (Brown, 1998; Brown & Gilligan, 1992; Kearney, 1998).

From a feminist poststructuralist perspective, *Digital Animation* emphasizes the participants’ subjectivities, including their ability to inhabit conflicting identities and to possess non-traditional skills, desires, and behaviors. Participants can be girls and still be interested in technology and math and science. They can learn technology quickly, and maybe even enjoy it. They can and do play video games. Some note that cultural stereotypes exist against women in technology, but most see themselves as exceptions to that notion while a few question the legitimacy of that impression (Girls pre-survey Y1; Girls pre-survey Y2). Many participants, parents, and mentors express appreciation for the program being only for girls (Girls post-survey, Y1; Girls post-survey Y2; ONY1; ONY2; Parent post-survey, Y2).

On the surface, the all-female program composition does seem to diminish participants’ concerns with displaying and maintaining stereotypical trappings of femininity. This could be my own misperception, though. I noticed most participants wearing semi-androgynous or slightly feminine combinations of shorts, t-shirts, and casual shoes. But smaller markers remain: painted nails, hair bands, earrings, flats. A few participants wear skirts, but only rarely. Once or twice mentors do, too. In sharp contrast to this relatively relaxed gender dress code, on two occasions in Year 2, mentors dress in overtly feminine ways. One mentor conspicuously wears a dress and proceeds to mention it throughout the day, often making reference to her boyfriend (ONY2). On another day, a mentor wears a dress to attend a welcoming ceremony for her husband’s return from his tour of active military duty (ONY2). Additionally, one or two participants each year have very distinctive styles. In Year 2, two participants prefer a dramatic goth look, one more outlandish and the other more morose. I wonder about how these alternative costumes disrupt or reinforce gender stereotypes and the performance of subjectivities. Regardless, feminist poststructuralist pedagogy does provide participants with new, more flexible, non-conforming subjectivity and performance possibilities.

Maria Palazzi embraces the feminist poststructuralist belief in the benefits of diversity. As ACCAD director, she recruits female ACCAD students to be mentors, with a particular emphasis on minority representation. The program also seeks diversity in participants, ideally serving a representative sample of the Columbus Public School population. Recruitment efforts include distributing application materials and information through the appropriate school district representative for technology programs, advertising the program and providing applications online, along with information about past programs, photographs, and past animations, and running an ad in the local paper, *The Columbus Dispatch*. Additionally, information about the program spreads through word-of-mouth and personal connections. In Year 1 and 2, one participant each year is the younger sibling of a previous participant. In Year 2 the administrative assistant transports a neighbor to and from the program. A teacher recommended a student apply after hearing another student’s experiences.
Although *Digital Animation* intends to reach most female middle school Columbus Public School students, the efforts have not completely succeeded. The program does recruit some minority mentors and participants, but the groups demographics do not mirror the local school district’s. During a presentation, graduate art education students suggested reasons for this discrepancy and offered alternative approaches. One, Toni, noted the troubles in distributing information through central school district administration: the information does not reach the right people, the materials disappear in the daily flood of information, or students may have little understanding of the program, its purpose, its requirements, its application process and deadlines, and their ability to attend. Graduate student alternative recruitment suggestions included contacting specific school staff, community after-school programs in target neighborhoods, and churches. Another suggestion is to include a parent component as another strategy to increase program awareness and impact in diverse communities.

The mentors and instructors reinforce the sense of possibility and promise for women in diversifying technology. These mentors freely enact a wide range of subjectivities, simultaneously. There is a dancer interested in using motion capture and digital animation technology to enhance dance; a glass artist employing mechanical and technical devices in her work; an undergraduate animator using 3D animation to create educational training modules; an African American mentor interested in working within the animation field on issues of representing racial and cultural diversity; and a Caucasian graphic designer working with digital anime and minoring in Japanese cultural studies. These mentors embody their multiple subjectivities, boldly, showing the younger participants a counter-cultural perspective of what females can do and be.

Even with an active commitment to diversity, participants’ subjective experiences provide some potentially troubling information, such as the less positive experiences and lower likelihood of pursuing technology for two minority participants. The diversity among program participants increased from Year 1 to Year 2, but efforts to “recruit and accept a diverse range of participants should continue” (EVY1, p. 12).

The program also includes diverse activities and trips to broaden the girls’ experiences with different locations and technologies. The participants visited a prairie site in Year 1 and the Big Darby Creek watershed in Year 2. Participants also navigated the OSU campus. In Year 1, participants worked in ACCAD’s Motion Capture (MoCap) lab, watched a selection of animated shorts, and had female guest speakers (EVY1). In Year 2, they added experiencing Virtual Reality (EVY2). Both years, the participants used a large range of digital media software and hardware.

A final way the summer program challenges traditional educational and culture expectations is through performing alternative possibilities of conventional roles, abilities, and behaviors. In a traditional educational model, performing the subjectivity of ideal students, particularly female ones, often involves assuming the role of a passive, docile, eager recipient of knowledge. The ideal student wants to find the right answer, do things the right way. In technology environments or assignments, female subjects often meet with a different set of expectations. Chapter 3 detailed how girls are not supposed to like technology,
science, numbers, abstract logic, or machinery, much less be comfortable, interested, or skilled in them. In contrast, Digital Animation encourages participants to challenge the traditional identity roles and expectations for girls and female students. The program encourages participants to incorporate their unacknowledged, undiscovered, or untapped multiple identities as artists, mathematicians, scientists, and computer geeks while exploring active, cooperative learning as curious intellectuals, and their activist desires to create meaningful, relevant products and actual change. Participants are not passive receptacles, they are active agents instead.

In the next section, I analyze the presence and functions of power operating within, and around, Digital Animation. I consider the program’s theoretical underpinnings, their presence, absence, operation, and failure to operate.

**Feminist Poststructuralist Pedagogy: Power and Digital Animation**

A feminist poststructuralist orientation also requires an analysis of Digital Animation program data from Year 1 and Year 2 in terms of power. While reading and coding the data, I developed subtopics in a process reminiscent of grounded theory (Charmaz, 1983, 1995, 2000; Glaser, 1978, 1992). In order to analyze power’s presence, absence, position, and use, I investigate Digital Animation’s philosophies, structures, environments, and operations from this feminist poststructuralist perspective. I also consider data that contradicted and complicated my assertions and understandings.

The structure of the Digital Animation program partially embodies its feminist pedagogical philosophies as a basis for further examining the program environments and operations. The all-female program with its focus on diversity and equity strives for diversity and equity, with mixed results. Digital Animation employs strategies to minimize the impact of socioeconomic education barriers, such as the absence of tuition fees or educational prerequisites. Participant applications highlight interest in visual arts instead of computer, math, or science background and skill.

Other program structures designed to support feminist poststructuralist notions of subjectivity are the inclusion of college-aged females as formal program mentors, as well as two adult female instructors. These mentors fill and perform several subject positions simultaneously, but always as women – college technology students, digital artists, instructional support staff, teachers, confidants, role models, cheerleaders, and pals. The two female instructors often fill similar subject positions as the mentors, with the mentors themselves and the participants (ONY1; ONY2). Recruitment efforts for staff and participants, while falling short of the goal, have included diversity. Mentors have been multi-ethnic, multi-racial, multi-national, stylistically diverse, and interested in far-ranging aspects of technology and arts. Participants have been, too (ONY1; ONY2).

Power’s presence in program instruction reflects an awareness of subjectivity, too, including whole class, small group, and individual work components. The instructors lead whole-class basic animation tutorials; simultaneously mentors support their group members, recognizing that different individuals need different levels of assistance, attention, and direction while still valuing each one’s ideas,
creativity, efforts, and intentions. All participants, mentors, and instructors face digital animation and other technology situations where they excel and ones where they require assistance or remediation. During this process, instructors also monitor class and individual progress, halting and proceeding as necessary, stopping to assist mentors, groups, or individuals (ONY1; 05). This web-like structure of instruction and support promotes direct, personal connection between subjects as well as access to information and assistance, reflecting a feminist poststructuralist pedagogical understanding of the fluid, multiple subjectivities of each individual.

The Digital Animation program structure remained relatively stable across the first five years of the program. In the Year 1 Program Evaluation, I conclude the “structure of [ACCAD’s] program itself created an optimum learning and production environment. During the two-week program, the girls were divided into small groups (two with four girls, two with three girls); each was led by one of the college mentors,” but the mentor/group pairings fluctuated slightly as the instructors attempted to split mentor duties with one group. In Year 2, I realize that the previous program structure was good, but not optimum. Maria Palazzi continually refined the program, like shifting the participant target age range. The shifts impacted different aspects of subjectivity throughout the program, sometimes creating a need for mentors to be more involved in creating, revising, maintaining and directing group and individual activities (ONY2).

In feminist poststructuralist pedagogy, subjects optimally act as agents, constructing learning together in collaborative groups working toward a specific end goal (Baxter, 2003). The Digital Animation group structure initially involved a loose set of mentors working with the whole group of girls. By Year 1, mentors were assigned to specific groups of 3 – 4 girls, with both instructors sharing one mentor slot. In the Year 1 evaluation, I note:

The small group structure also allowed the students to operate in a very fluid, real-world working environment. The girls were able to negotiate the tasks required by team projects, moving easily between group work, individual tasks, conferring with one another for assistance and feedback, and working with the mentors individually or in any combination within their groups. There was also collaboration and interaction across groups, with mentors working to help one another’s groups as necessary. (EVY1, p. 6)

For Year 2, the Digital Animation program assigned each of six college-aged mentors to a different group of three girls. In this small group structure, each member’s participation is vital to the group’s success, and the mentors support each member in fulfilling her duties.

Although the 3:1 program ratio of mentors to participants might seem optimum, some mentors disagreed. One felt there was “something awkward about groups of 3 – almost a pressure to be cohesive… and sometimes it feels like there can be an odd-man-out sort of exclusion that happens” (Casey, Mentor Post-survey, Y2). Mostly, the small groups provided an instant interpersonal interaction and connection between subjects, but girls arriving late worked separately on early tutorials before joining their groups. In Year 2, one alternate participant managed to arrive before lunch on the first day and was able to learn the introductory material and join the group that afternoon. The alternate who arrived the next day had a more
difficult time integrating (ONY2). Her mentor was initially concerned about her shyness, and her absence from the field trip on day three made her group status shaky. The other two girls quickly bonded and interacted constantly. By the second week, the latecomer managed to insert herself firmly into her group, partially by creating and bringing a CD with a massive amount of sounds (ONY2). Problems around late arrival and potentially exclusionary group dynamics, while they can be overcome, can slow group cohesion and progress. Future programs could include provisions for assisting girls arriving late or other girls with difficulties assimilating.

Also with respect to the small group structure, some girls revealed that while they mostly enjoy working with others, some like to work alone just as much (Participant Post-surveys Y1, Y2). Mentors also occasionally criticized an over-emphasis on the small group structure at the expense of having girls work with a wider range of others. One mentor notes, “the division of the students into groups was not successfully overcome by the unifying group activities. Non-project activities --even tutorials-- could use different groupings or fewer groups” (Ellen, Mentor Post-survey, Y2). The Year 2 Motion Capture lab experience was the only activity where groups were deliberately rearranged, at another mentor’s suggestion. While group size might not be a primary concern, it can be directly addressed through rearranging groups for more activities.

Mentors symbolize an important aspect of this program’s pedagogical approach to power and authority. Providing each group of three girls with an assigned mentor makes authority and power less centralized, more diffuse and shared. Mentors afford their small groups immediate access to assistance and resources. They rupture traditional educational power authority hierarchies by bridging the divide between instructors and participants, between information, implementation, and application. (Brisken & Coulter, 1992) Mentors recognize themselves as existing within an interstitial space, “straddling the areas of teacher and friend,” helping girls by “dedicat[ing] a significant amount of time to ensuring that [participants] are following and comfortable” (Kerry, Mentor Pre-survey, p. 48). Mentors also see their roles as progressing from “being quite involved in the beginning, [to] slowly moving into the background, letting the girls hold more and more of the reins on their own” (Kerry, Mentor Pre-survey, p. 48). This decreasing trajectory of power begins with mentors initially exerting more power and authority through directions and suggestions and progressively encouraging and allowing participants to assume more of the responsibility and processes for themselves. Mentors recognize the importance of supporting participants, in gaining the knowledge and skills to navigate the “steep learning curve[s]” of these complex technologies (Kerry, Mentor Pre-survey, p. 47).

Mentors share much program authority. Although not responsible for formal instruction, they teach participants directly, individually, and in small groups (ONY2, p. 2). Mentors have autonomy to operate in ways they believe they can best support participants. They model a network of connection and support by working collaboratively and across groups to solve problems. As a measure of success, in both Year 1 and Year 2, a previous program participant returned as a mentor to repay the support and
encouragement they received. These former participants use their experiences, knowledge, and dedication to helping other women succeed in technology as a form of power they can work to distribute more evenly. These mentors use their agency as a form of power to pitch and perform technology as options for even more women.

Starting or radically altering a system can be excruciatingly difficult and slow, while the power of perpetuation makes continuing a system potentially easier and more successful. When participants returned as mentors, they began creating a cycle of involvement and a culture where women possess power, too (ONY1; ONY2). Their return signals movement toward instilling mentoring and networking as a professional responsibility of women throughout technology. Maria Palazzi believes mentoring is a key to the program’s success for the participants and the graduate students, supporting them throughout their Digital Animation experiences and creating expectations for women having and being technology mentors (MP, INT, 15Feb05). In a clear effort to demonstrate mentoring as a professional task, Palazzi insists on finding funding enough funding each year to pay them (ONY2, p. 2). She also purposefully structures and funds a week of professional planning and processing for mentors before and after the program.

In many ways, the mentors provide the most dramatic evidence of the power of feminist poststructuralist pedagogy. They support learners and learning - individually, in small collaborative groups, and as a larger community. Mentors also gently guide the participants to find, create, and use their own voices, intellect, and experiences. In many ways, the mentors demonstrate that women can, and some already do, achieve power and authority within this traditionally male domain. The program demonstrates the feminist poststructuralist desire to mobilize power in ways that help other women, in this case, to enter and remain in technology fields. The mentors form a foundation for building a collaborative, cooperative network of technology support for women and by women.

Maria Palazzi also aligns the program learning environments each year with feminist poststructuralist principles and concerns around power. This includes respect for participants as capable, competent, and responsible individuals and group members in technology environments (EVY1, p. 79). Palazzi tries to (re)create a professional animation environment with a feminist poststructuralist twist (Butler, 1990). She tries to (re)create the digital animation field, and technology more generally, as environments where women are present, autonomous, capable, and successful. During the program, participants’ research often uncovers additional successful women artists working with technology. These aspects of the environment contribute to facilitating and reinforcing the girls’ success. In my Year 1 observation notes, I state:

There have been no negative interactions. All the groups have positive relationships and interactions with their mentors, and even with mentors of other groups. Also, food and drinks are allowed in the lab and even on the desks next to the computers. There have been no problems with this, and it more accurately mimics a more “normal” working environment.”

In Years 1 and 2, participant autonomy reflected the respect, responsibility, and professionalism modeled by the staff (EVY1).
The program environment also exemplifies another dimension of feminist poststructuralist power concerns. Palazzi challenges the perception that the technology field is inapplicable to women’s lives and work, anti-social, very hierarchical, and competitive. She wants girls to see technology as relevant and useful. She wants them to see technology as social, collaborative, and meaningful, and as an environment where they can succeed.

Power and Cooperation, Collaboration, and Communication in Digital Animation

A feminist poststructuralist environment promotes cooperation, collaboration, and communication as vital processes for power recognition and redistribution. These emphases counter the typical competitive and hierarchical nature of many educational and professional environments. Cooperation occurs when people or groups like firefighters, police officers, and medical personnel share resources, divide duties, and make compromises in order to reach a specific goal when working together to address an emergency situation. In Digital Animation, cooperation abounds. In one example, mentors decided to re-organize participants into temporary cross-cutting groups to experience how ACCAD’s Motion Capture lab technology creates digitized motion maps that animators, and others, can use to capture, study, replicate, and alter movements across time. These new arrangements allowed some members of each group to continue working on their animations while increasing the participants’ contact with technologies.

In collaboration, parties share the intellectual, creative, mundane workload and the credit for achieving goals, like a community group organizing and brainstorming to preserve a historically significant building. Collaboration is key in ACCAD’s summer program. Mentors and small groups collaborate to choose animation topics, develop an animation storyboard, and divide and accomplish tasks. The final animation combines member segments; each girl plays a vital role in creating their group animation within the short, two-week period. Instead of seeing technology as solitary, anti-social, competitive, and “geeky,” the Digital Animation program presents technology as active, involved, and applicable (Carlson, 2006).

In an interview during the winter of 2005, Maria Palazzi asserts her desire for the program to embody cooperation and collaboration:

Along with mentoring goes this idea that we’re doing this collaborative learning, so we’re saying this isn’t about competition when you’re in this classroom, it’s about everybody sharing and supporting each other. … trying to dispel the idea that they have to [compete]. You know, I think in some ways technology can be all about power, and I’m sure that’s a lot of what they experience where you go into a lab and there’s all kinds of people in there and whoever’s most powerful gets the best computer, gets the most software, that sort of thing. What we’re saying is that’s not what this is about, it’s about how everyone can have their own area of expertise, sharing what you know and helping each other. You learn better that way. We’re saying that we reward that and that we don’t reward the other stuff. So there’s this idea that you sort of think about technology different, in a sharing way. It’s less about ‘I’m just going to stay here and hog all the resources.’ [Collaboration and sharing] is what they should experience when they go to work in this field, and they have to feel that they can work like that. So I think that is a good thing, and probably not the way most classrooms they work in are (MP, INT, 15Feb05).

Palazzi emphasizes her vision for using feminist poststructuralist pedagogy to encourage and support young women in technology. Including women in the development and use of technology becomes increasingly
important as our societies and world face increasing challenges and new desires (Margolis & Fisher, 2003). We will likely, in global ways, want as many people and ideas and perspectives involved in envisioning, inventing, and applying technology in order to provide maximum, equitable benefits as well as minimizing negative repercussions and costs.

Another clear demonstration of the emphasis on cooperation and coordination is the involvement of mentors in program decision-making. During staff meetings, Palazzi presents the tasks or objectives and the mentors create a plan and make decisions. Mentors work toward consensus. For example:

The discussion of scheduling was interesting because it was so collaborative. Maria’s general idea was to have the girls get in their groups and do research and then do short presentations about what they learned. Casey was concerned that these presentations would get repetitive. [Palazzi] asked the group for other ideas of how to do this. The mentors brainstorm. The group agrees [on] a good idea. (This is characteristic of the way the mentor group operates in general – continually interacting and refining the plans as they learn more and think more about the specific activities of the program.) (ONY2).

Discussions and decisions like this occur constantly. In storyboarding, each group has to develop their idea for an animation addressing a particular topic about the focal environment (the Ohio Prairie or the Big Darby Creek watershed). The groups echo the mentors’ process and brainstorm ideas, discuss them, and work collaboratively toward a plan for their group animation. After storyboarding, groups divide animation tasks. Palazzi insists, “Figuring out how to divide tasks is the key. When the girls feel like they own part of the storyboard, they are more likely to work and be more engaged” (ONY2, p. 4).

Collaboration and cooperation also occur continuously within and across groups. Group members often help one other. Mentors offer ideas and suggestions as they model collaboration, often referring participants “to another individual or helpful source” (Farah, Mentor Pre-survey, Y2). Overall, the program pedagogy supports feminist poststructuralist pedagogical principles, using power as a process of constant negotiation, cooperation, and collaboration, as well as establishing an equitable system of resource provision and distribution.

Power and Digital Animation: Providing Material Resources

Another significant aspect of Digital Animation’s attempts to practice feminist poststructuralist pedagogy with respect to power involves providing and distributing necessary, sometimes desirable, material resources in equitable ways and amounts. While the program does not have the power to erase socio-economic differences among participants, providing material program supplies ideally functions to diminish them. The free two-week program includes lunch, snacks, and transportation during program hours. Also, Digital Animation provides all material program provisions in individual start-up packets. Start-up packets contained “a prairie resource book, a small sketch book, 2 blank CD-Rs, 1 zip disk, a package of tissues, a personalized name badge, a pencil, and a felt-tipped pen” (ONY1, p. 7 and p. 59). Lunches each day involved options allowing individuals to choose or modify their meals based on preferences or dietary restrictions. Snacks included fruit, yogurt, juices, and granola bars, as well as
plentiful chocolate, candy, chips, pretzels, and sodas (ONY1; 05). All program staff/participants expressed explicit appreciation for the excellent snack and meal options (Participant Post-survey Y1; Participant Post-survey Y2; Mentor Post-survey Y2). Parents even reported how much their daughters’ appreciated the food (Parent Post-survey Y2). Providing these material supplies functions to equalize the material standing of participants, at least in terms of needs for this program.

In conclusion, power is an important factor in a feminist poststructuralist examination of Digital Animation. The overall program structure and function, educational environment, and material provisions provide powerful example of feminist poststructuralist pedagogy in practice.

In the next section, I proceed to analyze Digital Animation’s alignment with feminist poststructuralist concerns around truth and knowledge.

**Digital Animation: Truth and Knowledge and Feminist Poststructuralist Pedagogy**

Under a modernist framework, “the truth” is a real, objective, immutable, singular answer, and it’s our job to find it (Habermas, 1993). The “truth” becomes the objective of scientific, medical, and social investigations and discourses, built on incremental bits of fixed knowledge. With respect to Digital Animation, I consider questions and evidence around how Digital Animation positions truth and knowledge as a final important concern in analyzing the feminist poststructuralist pedagogy of Digital Animation: What counts? As truth? As knowledge? Who decides? Who knows? Who can access this knowledge and truth? How? Who gets credit for this knowledge? Who has the skills to produce and disseminate it? For what reasons? How does gender impact these issues? How do other marginalities affect them?

In the first half of this chapter, I presented poststructuralism’s constructivist assumptions of truth and knowledge as continually evolving beliefs and opinions - the negotiated, authorized, and accepted beliefs and assumptions of cultural groups (Balsamo, 1995; Garber, 2003; Lather, 1991; Maher & Tetreault, 1994; Malson, 1998; Ritchie, 1990). In many ways, poststructuralist theory frames truth, like subjectivity, as a fluid result of multiple, shifting discourses, based on partial, embodied, culturally mediated knowledge (Brisken & Coulter, 1992; Dewey, 1934, 1938; Freire, 1995; Gallagher, 2000; Orner, 1996; Rich, 1985). Feminist poststructuralist educators assert that women and other marginalized groups fare better using this constructivist view of truth and knowledge (Lather, 1991; Maher & Tetreault, 1994).

In the following paragraphs, I situate feminist poststructuralist terminology, theory, and characteristics pertaining to truth and knowledge production and access. I use this foundation to investigate how Digital Animation characteristics and evidence dovetail with and diverge from feminist poststructuralist pedagogy in terms of knowledge as a situational, collective, connected construction (Relke, 1994). I also investigate ways Digital Animation addresses knowledge as interdisciplinary, applicable, and transferable.

To develop more diverse, complex, fuller truth and knowledge with respect to technology and its impacts, diverse populations need increased access to current, sophisticated technology with instruction and support, as well as to current means of production and distribution. In Digital Animation, the students learn
to use Maya software as the primary medium for synthesizing, producing, representing, and communicating knowledge, and they do so rapidly. Both years, the participants’ rate of learning how to access knowledge and use it in creating and distributing new knowledge astounds the mentors (ONY1; ONY2).

Collaboration and cooperation are also important feminist poststructuralist concerns with respect to knowledge. Knowledge results from specific discourses, which are both inclusive and exclusive. Feminist poststructuralist pedagogy advocates teamwork and inclusion, in contrast to education’s current focus on individual achievement, inclusion, and exclusion through institutional hierarchies. Cooperative and collaborative approaches can facilitate the support of marginalized populations and improve their access to knowledge and power. In Digital Animation, individuals and groups synthesize research, experience, and skills to produce knowledge in the form of animations. The girls divide tasks and combine resources in a group effort to create meaningful visual representations of their topical concerns. The small group size and the short program timeframe make all member contributions vital to overall success, minimizing any participant exclusion or disengagement.

In feminist poststructuralist pedagogy, knowledge construction is interactive and inclusive. The goal is creating positive change. In “Reconnecting Feminist Theory and Pedagogy” (1990), Ritchie asserts:

Teaching from a feminist perspective involves: wanting students to see beyond and outside of mainstream traditions; sensitively presenting different experiences of people (from other races, social classes, age groups, ethnic backgrounds, sexual orientations, and ablebodiedness), re-examining definitions of art, developing modes of analyzing from personal experience to consider multiple perspectives and response methods, “encourag[ing] students to take themselves seriously as intellectuals,” recognizing people’s capacity for problem solving, and actively creating change. Feminist pedagogical practices include: response journals that document growth across time, small group work to share ideas and develop questions for the class, participating in related activities, learning each other’s names, listening to each other… (Para. 15)

According to Ritchie (1990), feminist pedagogical practices promote a communal learning atmosphere, reinforced through collegiality, patience, respect, and tolerance.

The Big Darby Creek Visit as a Site for Accessing and Producing Truth and Knowledge

Digital Animation values a community approach to learning and stresses cooperation and collaboration in constructing and disseminating new knowledge. Let’s return to the introductory scenario of the Big Darby Creek visit. Students did initial research at ACCAD on watersheds in general and the Big Darby Creek watershed specifically. At the park, the Ranger presented local, preserved, mounted wildlife specimens and delivered an introductory orientation to the site’s ecology, history, and geography. Participants experienced the environment firsthand. They collected data and compared it with previous accounts. They compared and synthesized their objective information with their personal subjective experiences. They collectively constructed knowledge. Through follow-up storyboarding, groups used their research and experiences to outline their animation ideas and develop them further through drafting possible scenes, or rough representations, into a sequence of key visual images (ONY2). During the rest of the program, the mentors and instructors assist groups in producing animations meant to address their Big Darby Creek watershed subtopic based on participants’ research, knowledge, experiences, and ideas.
From a feminist poststructuralist orientation, connections create knowledge (Belenky, et al, 1986; Jacobs & Becker, p.6; Lather, 1991; Relke, 1994; Ritchie, 1996). I use Jacobs’ (n.d.) elaborations of Belenky et al’s (1986) categories to analyze Digital Animation examples using feminist poststructuralist processes and forms of knowing: 1) silent knowing; 2) received knowing, 3) subjective knowing, 4) procedural knowing, and 5) constructed knowing.

Digital Animation and Passive Forms of Knowing

For Jacobs (n.d.), the first two forms of knowing, silent and received, involve primarily passive learners and learning. In silent knowing, learners internalize the beliefs of authorities as their own. In received knowing, learning happens through listening, although learners do consciously adopt knowledge from authorities. During Digital Animation, participants sometimes reveal their silent knowing, often through the process of recognizing and challenging cultural assumptions, even their own. Initially, participants often express concern about their technology background, believing they may not have ample technology experience, sophistication, skills, or resources. Occasionally participants voice their awareness of cultural biases against women in technology, usually using themselves as evidence to the contrary. (Girl pre-surveys 04; Girl pre-surveys 05). Participants reveal their previous silent knowing of technology’s culturally assigned gender associations, as well as their resistance to them. Throughout the two-week program, most silent knowing takes the form of counter-cultural ideas, with participants internalizing new positive messages about themselves, about gender, about technology, and about art.

Digital Animation produces and authorizes young women as conceptually and technologically capable. Maria Palazzi, silently and vocally, uses her authority as program director to insist girls can be interested and successful with technology, a belief that conflicts with mainstream gender and technology stereotypes covered in Chapter 3. She believes it; she says it; she enacts it through this program (MP personal communication; ON 04; ONY2). The young women believe and enact it, too. (Girls post-survey 04; Girls post-survey 05). And the mentors. (Mentor post-surveys 04 and 05). Even participants who report no or minimal home computer resources and access feel successful with technology and digital animation by the end of the program (Participant Pre-surveys Y1, Y2; Participant post-surveys Y1, Y2).

In other examples, the participants internalized Palazzi’s assumptions about the Ohio prairie (Year 1) and the Big Darby Creek watershed (Year 2) as important, vulnerable local environments and the value of digital animation as an artistic communications vehicle. Participants also tended to move from received knowing into silent knowing as animators. During the initial days of the program each summer, participants scramble to learn Maya basics while staff continually position them as beginning animators (ONY1 ONY2). After the first week, participants silently accept their basic animation knowledge and amateur animator identity. They continue to work as animators daily throughout the rest of the program (ONY1; ONY2).
According to Jacobs (n.d.), women’s other ways of knowing (Belenky et al, 1986) – subjective, separate procedural, and connected procedural - involve more active learners and learning. In subjective knowing, learners assume they somehow feel or just know the pre-existing right answers. This kind of knowing does not play an immediately visible role throughout most the basis for their ideas and decisions. In an interesting twist, during Year 1 and Year 2, groups use subjective knowledge that contradicts their experiences and data. Both summers, groups making animations about modern dangers to vulnerable ecosystems include representations of litter as a prominent environmental threat (ONY1; ONY2; www.accad.osu.edu). As Palazzi noted, participants saw no real evidence of litter at these places (MP, PC, Y2; ONY1; ONY2). Participants do use different kinds of subjective knowing constantly as they experiment with digital animation commands and tools, trying what they feel to be the right approach or choice for producing the effect or action the participant envisions. This approach to knowing can be haphazard and frustrating, as people do not always feel very well. At times, feelings function as (informed) guessing, delivering very similar results.

In contrast, connected and separate procedural knowledge involve deliberate courses of action for pursuing and creating knowledge, although these courses are often quite different. Separate procedural knowledge stresses rigor, abstraction, rationality, certainty, completeness, and absolute truth, as well as being deductive, algorithmic, and structural (Jacobs, n.d.). In traditional education, knowledge in the hard sciences possesses these characteristics. When the participants at the Big Darby Creek site gather and record quantitative data, they engage in separate procedural knowledge (ONY2). When they enter precise numerical values into 3D animation software for precise effects, they also engage in separate procedural knowledge (ONY1; ONY2).

Digital Animation also emphasizes a final form of knowing: connected procedural knowing (Belenky et al, 1986; Jacobs, n.d.). In connected procedural knowing, learners prefer processes that stress creativity, hypothesizing, relativism, incompleteness, and are experiential, inductive, and personal, but tied to the cultural environment. Digital Animation pedagogy centers on creatively addressing locally relevant issues, delivering information and perspectives through the culturally relevant artistic medium of digital animation. Participants base their creative efforts on informational and experiential research, building and expressing personal connections and understandings.

From a constructivist perspective, knowledge is a result of trying to create meaning through integrating the ideas and experiences of others into a framework of what a learner knows intuitively, experiences, or discovers. In this respect knowledge is complex and diverse, formed in these connections. In the next sections, I analyze Digital Animation data as reflecting feminist poststructuralist pedagogy aspects of interdisciplinary and interpersonal connection, as well as the connection between knowledge and its real-life applicability.
Creating Knowledge through Interdisciplinary Connections

Feminist theories and pedagogies stress interdisciplinarity as a form of connected knowing. Feminist theory itself has its roots in interdisciplinarity, beginning with its inclusion in sociology and English studies, and spreading through the application of feminist theoretical lenses to other traditional academic disciplines/subjects (Relke, 1994). As a feminist poststructuralist concept, an interdisciplinary, also called “crossdisciplinary,” approach “reorganiz[es] knowledge along the lines of its application rather than its origin” (Relke, 1994). Interdisciplinary research represents cooperative models of knowledge construction where instructors work with students to build explicit connections with their interests and multiple subject areas to create knowledge. Interdisciplinary education creates opportunities “to provide students with opportunities to think beyond anything we are capable of thinking ourselves” (Relke, 1994). Interdisciplinarity creates a web of connections, a safety net through which whole traditions of knowledge do not easily fall into obscurity. Students enter classrooms as interdisciplinarians by inclination because they are born into a world that is not, for the most part, ordered and structured around separate disciplinary models (Relke, 1994). Interdisciplinary approaches encourage learners to build connections and apply knowledge more broadly.

In “Feminist Pedagogy and the Integration of Knowledge: Toward a More Interdisciplinary University,” Relke (1994) asserts that interdisciplinarity involves connecting knowledge in one academic field to another, or to an outside situation. It involves connecting students with disciplinary theories and current debates as well as building explicit links to student interests, “to provide students with opportunities to think beyond” the confines of separate academic disciplinary limitations (Relke, 1994). We are all “interdisciplinarians by inclination,” as subjects living in a world without many formal, visible disciplinary boundaries. In feminist poststructuralist pedagogy, knowledge is contextual, subjective, fluctuating, and dependent on other knowledge to exist (Relke, 1994).

Maria Palazzi insists on the importance of interdisciplinary, connected learning. She views Digital Animation as an interdisciplinary project. She views this interdisciplinarity as an asset, hopefully making science, technology, and math, as well as other academic subjects, more appealing and accessible to girls (MP, PC, Y1, Y2). Aligned with feminist poststructuralist values, Palazzi stresses learning current technology and its underlying structures. Using digital animation as an artistic medium, the program specifically increases participants’ knowledge of, and skills with, software and hardware, but secondarily, the instruction focuses on the underlying interdisciplinary components of technology, most notably math and science. Literacy knowledge and skills, as well as pop culture fluency, provide other options for creating knowledge through interdisciplinary connections. Palazzi wants the participants to see themselves not only as users of technology, but as artists, scientists, and researchers with the potential to design, create, and apply technologies, for interdisciplinary practical and artistic purposes (MP, PC, Y1).
**Digital Animation: Creating Knowledge through (Inter)personal Connections**

Feminist poststructuralist pedagogy reflects the deep conviction that knowing happens at the individual level through direct personal associations. Constructing knowledge through connections can involve individual working collaboratively, building ideas as a community of learners (Jacobs, n.d.). For example, collaborative construction of knowledge can result from sharing similar experiences and ideas with others, recognizing their value, and then appropriating or adapting this knowledge in other situations. This can be greatly impacted by aspects of subjectivity. Belenky et al (1986) relate that “Several intellectual perspectives suggest that women would feel more comfortable with a relational, interactive, and connected approach to” learning, while men prefer “a more distanced stance, planning, commanding, and imposing principles” (p. 5).

*Digital Animation* capitalizes on creating knowledge through interpersonal connections. The small groups with assigned mentors reflect a collaborative approach to accessing, processing, and then producing knowledge. Participants overwhelmingly appreciate the collaborative, connected aspects of the program. In participant surveys following the program (ONY1; ONY2), they value collaboration - being in a group, working toward a goal together, supporting each other, and contributing as individuals. Participants note their access to the trifecta of cutting edge technologies, college-level instructors, and individual support as well as the importance of the social connections they made (Girls post-survey 04; Girls post-survey 05). Each person also feels like she contributed positively to group activities and overall performance. Everyone reported feeling positive about being fully involved in group processes: gathering and selecting information; brainstorming ideas; creating certain animation images, effects, or sounds. Everyone felt useful (Girls Post-survey Y1; Girls Post-survey Y2). Parents and participants all praised the collaborative production of each group’s end animation. They were impressed with the process and the final products. (Girls post-survey 04; Girls post-survey 05). Palazzi says this connected knowing operates in stark contrast with traditional technology educational environments where individualism and competitiveness reign (MP, PC, Y1, Y2). She believes girls can benefit from the social aspects and interpersonal connections involved in applying feminist poststructuralist pedagogy to digital animation education (MP, PC, Y1).

**Creating Applicable Knowledge through Real-life Connections**

Maria Palazzi, in line with feminist poststructuralist pedagogy, also believes in the importance of making real-life, practical, meaningful connections in learning (hooks, 1989; Relke, 1994; Orner, 1996). In principle, she agrees with Ritchie’s (1990) assertion that feminism provides a model for constantly connecting intellectual activity to our lives, which echoes the concept of connected procedural knowing Belenky et al (1986), and then Jacobs (n.d.), developed. Feminist poststructural pedagogy stresses the benefit to marginalized groups from connecting active and critical investigation of relevant situations in redressing issues of inequity, of creating actual, not just theoretical, change.

Knowledge application exists in many guises within the *Digital Animation* program. On one level Palazzi uses *Digital Animation* as an experimental effort to improve technology education and
environments for women. She uses feminist pedagogy as an overall design framework. Palazzi also uses *Digital Animation* to model how feminist poststructuralist pedagogy can be used to frame projects that apply knowledge to create awareness and change. ACCAD publishes the final animations on their website, making them widely available online. The goal is for the animations to reach a wider audience to have greater potential impact. The results can be greater environmental awareness and changing consumption patterns of people who view the animations, or it can be greater awareness of young women’s potential with technology. Hopefully *Digital Animation* achieves a mixture of both.

Modeling transmits learning through observation, participation, and imitation. Learning occurs from seeing and doing. *Digital Animation* relies on modeling as a key mechanism for transmitting knowledge and skills. Initial program days involve whole group tutorials on Maya’s 3D software and its basic tools and functions. The instructor provides the rationale, discusses the steps, and models the skills on overhead screens while the participants follow along. Mentors support them when needed, often by modeling or talking through problem-solving approaches. Participants also use one another as models and resources. In one instance, “[Maria] is modeling how to critique and edit – very high order thinking skills. [She] talks about how something doesn’t look just right and how she wants it to look better. Then she shows the steps she would take to improve the animation” (ONY2). Participants follow the instructor’s logic and thought processes while performing the task. The positive, welcoming, respectful program environment also results from modeling and reinforcing respectful behaviors.

Mentors also model a willingness to see and use each other as resources. This influences how the participants interact and learn together, starting early each year. Observation notes remark, “the girls seem very comfortable asking each other questions and getting help from their peers,” and are encouraged to do this (ONY1, p. 16). According to the Year 2 ACCAD Evaluation, participants benefited from being able to network and learn from peers “who have similar interests and ambitions” and “make friends while they learned” (EVY2). Dale, a Year 2 participant, confessed she “likes talking with peers and having them help instead of the mentors” (Dale, INT, Y2). This participant also expressed discomfort and unfamiliarity with computers in the beginning survey. Her reluctance to ask mentors or instructors for constant help and support forced her to interact more with her peers. She was more comfortable learning from people she saw as closer to her ability and experience level.

Modeling also introduces and reinforces undesired behaviors. During the program, mentors continually express frustration in staff meetings about the off-task behaviors of their group members. Common negative behaviors include emailing, playing computer games, IM-ing, finding and playing music, and browsing on the internet. Interestingly, these same behaviors are common among the mentors, too. During formal and informal breaks the mentors talk with one another, check and send email, read news on the internet, and browse briefly online (ONY2). During a staff meeting, one of the mentors indicates this double standard, but the others ignore her observations. The mentors fail to consider the reasons or purposes behind these behaviors (ONY2).
A Captivating Sense of Adventure, Challenge, and Stimulation

Many times pursuing knowledge or expertise in a field results from continued interest in and interactions with it. From a poststructuralist pedagogy perspective, building knowledge can be a challenging, invigorating, active, and engaging process. As one mentor notes, “I’m usually willing to try anything or learn anything as long as I find it mentally stimulating” (Me’chelle, Mentor Pre-survey, Y1). Scholars and researchers criticize traditional technology programs and the resulting gender disparity (Margolis & Fisher, 2003). The traditional technology program begins with theory and abstraction, an approach that tends to favor males. Feminist poststructuralist technology scholarship contends females, and other marginalized populations, fare better learning through meaningful problem-solving and application (Margolis & Fisher, 2003). In this approach, learning results from a process of engagement, play, and experimentation with information, ideas, or tools. Feminist poststructuralist pedagogy encourages challenging participants and risk-taking, without failure representing inability or negative stereotypes.

Mentors see challenging participants as an important component of the program:

Kate thinks the frustration is good and necessary. She thinks they need to struggle and learn to overcome challenges alone (with a little help). MC agrees that it is a disadvantage if it’s way too easy – it gives them a false sense of what animation is like. Kate says they’ve got to be comfortable getting it wrong. (ONY2)

Challenges also provide opportunities for individualizing instruction and support:

When MP notices that some of the girls have moved quickly through these tasks, she offers them more individual and advanced challenges. She asks one girl to figure out how to approach an even more advanced step. In some ways, these advanced tasks offer the girls a chance to problem solve on their own. This challenge seems to motivate those girls to keep working in MAYA rather than jumping onto the internet. MP poses it as a challenge and a question. When the rest of the class catches up, she poses the next step/challenge to all of them and asks if anyone has any ideas how to do it. The girls who were ahead can sometimes offer better guesses since they’ve been experimenting.

Maybe in some ways this is what MP and this program are facilitating. Maybe these girls need to understand technology as an activity that takes an experimental and playful approach – you try things out and see what works. If something doesn’t work one way, you try another way. It’s all about being willing to try things and experiment. Maybe girls need more explicitly safe environments to try these kinds of risk-taking behaviors. (ONY2)

Challenge is vital to constructing knowledge. Feminist poststructuralist pedagogy opposes unequal power relations and promotes social change, which is neither comfortable nor easy. hooks (1994) suggests an overt feminist poststructuralist political agenda, with Freire’s (1985) “radical educators” teaching for the purposes of freedom, and, as Tisdell (1998) notes, challenging “the status quo to construct and authorize new forms of knowledge and ways of knowing. In this way, feminist poststructuralist educators push to turn challenge into change. With ACCAD’s program, Maria Palazzi challenges stereotypes around technology and gender. She wants girls to realize their many important contributions to technology. She wants them to know, “You don’t have to be the user, you could be the maker, too,” that they can create and apply new technologies, modify existing technologies, and combine artistic interests with technologies.
Maria Palazzi wants to ensure young women feel capable in meeting technological challenges. She wants positive change for *all* learners, but particularly for women and other minorities.
CHAPTER 4 BIBLIOGRAPHY


Yates (1994)

CHAPTER 5

VISUAL CULTURE ART EDUCATION AND DIGITAL ANIMATION

Opening Scenario

In the Fishbowl, ACCAD’s main computer lab, every monitor glows, every chair holds a transfixed young woman. Mentors stand or sit with their groups. Maria Palazzi stands at the instructor computer station on the last row, her desktop projected onto large screens in the front of the room.

Maria announces to the group that they are going to learn how to make a plant grow and then have a ladybug climb it. She has the participants move their time slider to 1 in the Maya scene tools. She asks everyone to select a leaf on the plant as she demonstrates on the screens. She reviews how the hypergraph illustrates and can be used to manipulate groupings of objects, stressing the importance of grouping as an animation concept. She “pickwalks up” the hierarchy of groupings in the hypergraph; as the selected hypergraph component changes, the portions of the model selected change, too.

The girls need to understand several related concepts in order to animate change in a scene over time. Maria explains how scaling over time creates the effect of growing as she selects the plant and correlates its beginning size with the 0 on the timeline. Everyone sets and saves this as the beginning key frame. Participants then follow as Maria moves the time slider to 30 and then increases the scale of the plant. This is saved as a second key frame. Maria then demonstrates how they can “scrub” between 0 and 30 on the time slider and watch the plant increase across the time span. They review the Maya key frame functions and their controls on the screen. Maria then shows how to jump from key frame to key frame.

After the girls have successfully made their plant model grow, Maria introduces the physics involved in actual movements that have to be considered in animation. She moves to the front of the room and uses a graph on the white erase board to chart action and describe how changes in the graph represent and mirror some of our experiences and perceptions, describing how something pushed might swing back and forth in high arcs at first, but the arcs diminish in successive swings. She also demonstrates the results of changing the graph to a flat line.
Once Maria has modeled the skills, she explains the next task: take the growing plant animations and animate a ladybug model walking up its stalk. The girls import ladybugs into their Maya files and work, sometimes with their mentors, to rescale them. This is an important animation skill because it is common for animators working separately to use different scales. Once the models are rescaled and animated to grow across time, Maria has the girls manipulate their ladybug’s speed.

Maria returns to the graph in the front of the room and illustrates the graph for slope, explicitly connecting this important mathematical concept to an animation task. Maria solicits ideas about how the curve would look if the ladybug started moving slowly, then moved faster, then slowed again to a stop. She also asks again about what the slope graph for these movements will look like. Maria turns to the board and draws a graph that mimics live movements, particularly starting and stopping, as she explains the correlations. Maria emphasizes the reality of how we transition into and out of action, the anatomy and physics of our movements. A student asks Maria to review how to manipulate the graph for a different specific effect. Maria answers her question as the others return to their current animation task. (ONY2, p. 15 – 16)

Introduction to Visual Culture Art Education

The overarching rationale for conducting this case study is, as Eisner advocates, to produce a fine-grained, field focused study with relevance to art education (1991). This Digital Animation case study provides, analyzes, and interprets data about what Maria Palazzi terms an arts-based approach to increasing the likelihood of young women pursuing additional technology education and employment (MP, PC, Y1; http://accad.osu.edu/womenandtech). How can art education support and increase technology’s gender equity? How can art education work in conjunction with critical theories and bodies of scholarship?

Considering and answering these questions implies digital animation and computer technology count as “arts,” a foundational assumption of ACCAD. This is not, however, an unproblematic assumption in the art education community. In fact, approaching the Digital Animation program as arts-based requires a visual culture art education orientation. A VCAE perspective subsumes digital technology into its amorphous, open-ended acceptance of all media. Visual culture is a widely inclusive term; almost anything counts. I provide the obligatory list of bewilderingly diverse possibilities later in this chapter. In this chapter, I agree with a VCAE orientation both because the subject of this study requires it, but also because I share many of its core principles. Digital Animation relies on the important creative, instructive, inspirational, and communication capabilities, capabilities important to art education. Digital Animation also relies on new digital media technologies as the primary means for activating these capabilities.

Digital Animation: A Technology Mentoring Program for Young Women is a tactical, seemingly small-scale intervention to encourage and support young women’s future technology interest and pursuit. This program’s twist is recruiting young women who are primarily interested in art; their interest in and
experience with computers and technology is a secondary consideration. Linking art with technology through digital animation provides young women with a different point of entry into computer technology. From this perspective, using technology requires creativity, imagination, resourcefulness, and collaboration, with real-world, valuable results for the community and the individual.

Some of the processes and outcomes of participants’ arts-based technology experience are visible. *Digital Animation* uses a currently relevant pop culture medium for films, videogames, virtual reality, mapping and modeling, and a multitude of other scientific and artistic artifacts. Animation is a cool tool to use right now. During the final presentations, participants report their own contributions to the group’s project, they provide visual and verbal documentation of their learning and artistic process. The *Digital Animation* website contains documentation of how integrating the arts, and other disciplines, into a project can be a sophisticated, intellectually challenging process. Photos of participants engaged in activities from internet research, to storyboarding on paper with markers, to following tutorials provide multiple forms of visual culture evidence of the program’s interdisciplinary approach.

VCAE provides *Digital Animation* participants with a framework for critically consuming and producing media and texts. The participants use digital visual culture as a medium for researching, investigating, analyzing, and addressing issues from multiple perspectives, across multiple media, as consumers and producers. As a result, VCAE and technology are inextricably intertwined throughout this case study, in much the same way visual culture and technology are inseparably enmeshed. Visual culture can function to contain, reveal, and conceal technologies. Radio Frequency Identification (RFID) chips attached to any item are miniscule, nearly invisible, yet they allow continual electronic tracking. This tracking can be used in commerce for inventory purposes and for instantaneous and automatic check-out in any store. Conversely, technologies like ultrasound machines and heart monitors provide visual representations of previously invisible objects and processes. How does the synergism between visual culture and technology impact art education? How does art education impact the synergy between visual culture and technology? How can VCAE promote equitable technology and visual culture education, consumption, and production? How can art educators use VCAE and technology as an “artistic” tool to address current social justice issues?

In the sections that follow, I briefly summarize the development of visual culture art education (VCAE) within the broader context of art education, justify its appropriateness as a theoretical lens for this study, and examine its relationship with feminist poststructuralist pedagogy. Subsequently, I present and examine the stated aims and pedagogical goals of visual culture art education, shaping them into my final analytical framework and applying this framework to the *Digital Animation* data. I also explore data from the program that exceeds, extends, contrasts, or contradicts these analytical categories.

**Summary of the Development of Visual Culture Art Education: From DBAE to VCAE**

Within the past six decades, the field of art education experienced major theoretical and practical shifts. In 1947, Viktor Lowenfeld wrote *Creative and Mental Growth* and “emphasized the physical,
mental, social, and emotional growth that children experience by drawing, painting, and sculpting” (p. 9). Lowenfeld argued art is a “fundamental human process” and has “great potential for the education of our children” (p. 2). Instead of focusing on art as a technical skill, Lowenfeld (1947) stressed creativity’s important roles in developing empathy and sensitivity to others, fluency across multiple media, mental flexibility, originality, abstract conceptualization and analysis, and the ability to integrate, synthesize and apply information and skills. Later in his career, Lowenfeld (1960) explicitly distinguished between creativity and intelligence, arguing they have no direct correlation.

Lowenfeld appropriated the psychoanalytic stages of development model and applied it to art education, creating stages of development for art education. These stages greatly influenced what and how art teachers taught at each grade level. Some art educators misinterpreted Lowenfeld’s stages, interpreting them to mean artistic ability is age-dependent, sequential, innate, and unteachable (Wolbien, n.d.). Lowenfeld’s philosophies and methods form the backdrop for a paradigm shift in art educational pedagogy from a focus on art’s creative and intellectual possibilities to a focus on its objective, teachable, and measurable outcomes.

Art educators Harry Broudy and Manuel Barkan poured the foundation for what became discipline-based art education’s (DBAE) structure. In the 1960s and 1970s, Broudy recognized that “serious study of the serious arts both in their classical and contemporary manifestations” would provide support for their integral place in education (1966, p. 21). Broudy (1978) argued that for art to qualify as a fourth academic basic, the arts … need … to demonstrate that there are [artistic] skills that function as instruments for impression and expression” and that these skills have “somewhat the same generality as do the symbolic skills in the cognitive domains,” such as the signs and symbols specific to any disciplinary discourses, like letters and words in English or numbers in Math (Broudy, 1978, p. 24). In apparent contrast, Broudy also claimed using skills as the justification for including the arts as an educational basic “fails to convey the fundamental and distinctive role of images and of imagination in life and learning” (Broudy, 1978, pp. 26 – 27).

In Barkan’s article, “Is there A Discipline of Art Education?” (1963), he equivocates on art education’s qualifications as a separate official discipline, stressing the lack of “an appropriate and pervasive set of rules – a characteristic strategy and a consistent approach to [art education’s] ultimate goals and purposes, positions, or points of view” (p. 4). Barkan (1966) also challenged art’s tentative status as a fundamental academic discipline by questioning whether art’s “absence of a formal structure of interrelated theorems, couched in a universal symbol system, as in science, mean that the branch of the humanities called the arts are not disciplined?” (pp. 244 – 245). Eventually, Barkan (1966) concluded that art did qualify, but “that the disciplines of art are of a different order” (pp. 244 – 245). Barkan’s (1963) work also emphasizes the importance of the subsections of art, or what later become the disciplines of DBAE: art, art history, art criticism, and aesthetics (p. 5)
Into the 1980s, the National Education Association (NEA); the Getty Center for Education in the Arts; and art educators including Elliot Eisner, Laura Chapman, Ralph Smith, and many others, continued to advocate for increasing the intellectual rigor of the arts in order to demonstrate art’s value within school. Eventually, in a 1986 NEA publication, *Excellence in Art Education: Ideas and Initiatives*, Ralph Smith delineates the philosophy of discipline-based art education (DBAE) as an arts curriculum based on “disciplines” of art, divided into art history, art criticism, aesthetics, and art production. This curriculum was “legitimized by the National Standards for Arts Education published in 1994” and remains the standard in many states (Wolbier, n.d., p. 13).

DBAE reasserts the need for and value of arts education in schools, as a legitimate subject taught by qualified personnel. For many, DBAE pedagogy establishes separate subsets of art education to promote a broader, more inclusive approach to art, by incorporating “the study of technical skills, art concepts, organizational skills, and appreciation of fine works of art” (Wolbier, p. 13). Each separate discipline emphasizes using traditional evaluation criteria paired with the canon of authorized Western arts masterpieces to teach students objective knowledge, refined tastes, and the appropriate sensibility to art. Many contemporary art educators continue to advocate for such an approach (Kamhi, 2000; Kamhi, 2003; Smith, 2003; Stinespring, 2001; Stinespring & Kennedy, 1995). According to Greer (1984) DBAE’s distinguishing features include a focus on the intrinsic value of art study, the larger context of aesthetic education, a systematic and sequential structure, a sense of interrelated components across the disciplines, and specific learner outcomes.

But DBAE has its detractors, and has for some time. While the DBAE disciplines expand the realm of art education, they still reify traditional sociocultural hierarchies and their exclusionary results. Tavin (2007) notes even while traditional views of art and pedagogy still flourish, some art educators began advocating for the inclusion of popular culture images within art education as early as the 1960s. Over the past four decades, art education scholars including Vincent Lanier, June King McFee, Laura Chapman, and Brent and Marjory Wilson have worked to establish much of the basis for what has become the current debate over visual culture in art education (Tavin, 2007). Concurrently, many teachers, particularly those influenced by the cultural revolution in the United States during the 1960s and 1970s, began including, studying, and producing popular culture in their classrooms. As an example, Stout’s (2002) *Flower Teachers* documents the drive of a generation of art educators to critically consider contemporary culture within an arts environment and through artistic media and processes. These teachers couldn’t imagine education as separate from life.

Still, some art education scholars support and maintain a divide between high art and low art, or popular culture, including visual popular culture. They only value traditional, (Western) culturally defined and sanctioned masterpieces as subject matter for good, enlightening art education, eschewing mass media (Kamhi, 2003; Smith, 2003; Stinespring 2001; Stinespring & Kennedy, 1995). This divide separates Art from Not Art, good from bad, worthwhile from worthless. But what counts as Art, and who gets to decide?
These questions are central to art and art education. These scholars believe the boundaries are clear and necessary. From a traditional vantage, art has beauty, skill, evocative power, intention, ability to elevate viewers, and critical value. Art is fair game for intellectual analysis. Artists like the Guerrilla Girls question, though, who decides what counts as any of these? In many ways, art remains an elite, exclusive club; you have to be invited to join, and you certainly have to be recognized to be invited.

DBAE provided seemingly objective, well-defined, measurable subject matter and skills as a means to justify art’s inclusion as a core educational discipline. Many art teachers and art educators mastered these disciplines, producing technically proficient artists and students with a wide knowledge of traditional masterpieces and artists. Some teachers used this framework to develop creative, inspirational lesson plans and impressive final products. Others began to challenge the DBAE model’s monopoly on art education. Scholars like Lanier, McFee, Chapman, Wilson, and Wilson pushed to expand the boundaries of what counts as art and who gets to define it. Their work gained traction and support, and their ideas eventually precipitated a paradigmatic rift in art education, a rift echoing the one in the art world itself. Removing the boundaries of what counts as art and is, therefore, worthy of critical artistic consideration, invites the critical consideration of and experiential reflection on almost any subject matter – any cultural or material or purposeful representations or efforts at communication.

In the next section, I explain connections between this art education paradigmatic shift within a larger cultural and theoretical context.

**Visual Culture and Art Education (VCAE)**

During the period of DBAE’s ascendance to the forefront of art education, scholars in a range of academic disciplines became increasingly interested in critically examining the roles of the visual in culture and the roles of culture in the visual. Cultural studies developed in the 1950s and 1960s in Britain, leading to the 1964 establishment of the Birmingham Centre for Contemporary Cultural Studies. Cultural studies implied a critical and political orientation for inquiry into cultural objects and phenomenon, freely appropriating and applying theories and tools from multiple fields, such as literary criticism, psychoanalysis, sociology, and anthropology. Cultural studies branched in many directions, including into media studies, material culture studies, and visual culture studies.

Visual culture studies concerns critically studying visuals, the visual, and visuality (Elkins, 2003; Evans & Hall, 1999; Mirzoeff, 1999; Rose, 2001; Sturken & Cartwright, 2001). Visual culture displays a similar penchant for theoretical appropriation, invoking Lacanian psychoanalysis (Judith Butler; Jan Jagodzinski; Deborah Smith-Shank); literacy studies (Donna Alvermann; Margaret Hagwood; Flood, Heath, & Lapp; Hobbs; Carmen Luke) and its critical literary and art theories (Norman Bryson; W. J. T. Mitchell; Karen Jacobs; Paul Jay). Scholars explore visual culture with feminist (Anne Balsamo, Amelia Jones), poststructuralist (Mieke Bal; Nicholas Mirzoeff; Keith Moxey); post-colonialist (Kobena Mercer; Malek Alloula; Adrian Piper), and critical race theories (Anne McClintock; Frantz Fanon). Visual culture scholars also applies concepts and methods from anthropology (Peter Biella; Jean Rouch, Dan Georgaka,
Udayan Gupta, Judy Janda); sociology (Chris Jenks); queer studies (Judith Butler, Judith Halberstam; Donna Haraway), art history and cultural studies (James Elkins; Griselda Pollock; John Walker) and many others. These range of theories provide multiple perspectives and possibilities for critically analyzing visual culture.

Tellingly, media and cultural studies scholars (David Buckingham; Gunther Kress; Colin Lankshear; W. J. T. Mitchell; Noam Chomsky; Stuart Hall); film studies scholars (Lisa Cartwright; Laura Mulvey), and many artists themselves (Jeff Koons, Barbara Kruger, Jenny Holzer, Sadie Benning, Glenn Ligon, Andy Warhol, Michael Ray Charles, Ann Hamilton, Toni Morrison, Pepó Osorio, Coco Fusco and Guillermo Gomez-Peña; and plenty more) have embraced visual culture’s influence and possibilities, expanding the realm of art, art practices, artists, art subjects, and art objects. A visual culture orientation considers other new and popular visual media such as print advertisements, web pages, reality television, and computer-based artistic endeavors. Some visual culture scholars believe people encounter increasing amounts of visual culture trying to communicate information, advertise, entertain, distract, interact, discipline, and monitor (Benjamin, 1936; Foucault, 1977; Freedman, 1997b, 2003b; Mitchell, 1994).

While many groups have considered or accepted visual culture’s importance to art and art education, art education itself has warily tarried. Much of the resistance in disciplines like art history and art education, stems from visual culture’s rejection of traditional evaluation criteria and acceptance of all visual media as valid content for critical exploration (Drucker, 1999). In the field of art education, Duncum (2001) proclaims the shift from art to visual culture is different, more substantial, than the shift to DBAE. He reasons “the previous shift involved a different approach to at least recognizably the same artifacts,” while the shift to visual culture involves a shift in approach and subject matter (p. 101). Adjusting to both changes simultaneously can involve a tremendous amount of struggle and internal conflict. Resistance is not surprising. A shift of this magnitude requires a critical mass of educators who understand, attempt, embrace, and succeed using a visual culture art education approach.

A growing list of art educators increasingly advocate for including newer media within art education (Anderson, 2003; Ballengee-Morris & Stuhr, 2001; Bolin & Blandy, 2003; Duncum 1999, 2000, 2001, 2002, 2003; Elkins, 2003; Freedman, 2000; Freedman & Stuhr, 2004; Tavin, 2000, 2003, 2005, 2006). These art educators value technology’s intersections with visual culture, without concern it will diminish the value of traditional works. Digital technology and media increase the ability to create, manipulate, regulate, and distribute information, much of it delivered in visual form. New digital media extend far from some traditional artistic media and disciplines, including drawing, painting, sculpting, and even photography.

In “The Age of the Electronic Image: The Effect on Art Education,” Stanley Majeda (1993) argues that art education can no longer separate and exclude digital media. Majeda (1993) insists students without general visual literacies and “competency in computer imaging at the entry level” will be at a disadvantage (pp. 11 - 12). Throughout the next decade, as the debate over art and visual culture raged, visual culture
continued to make inroads into the mainstream of art education discourse, as well as making large strides to become a more autonomous hybrid interdisciplinary field of study. In short, visual culture infiltrated common academic and popular discourses, growing in importance and interest. As art education continued to question what comprises art, what comprises visual culture, what separates the two, and what these things mean, the arts have shifted. Artists have seized and employed new, contemporary, digital media and technologies. Visual culture embraces multimedia, and visual culture art education advocates insist the field of art education must incorporate a visual culture orientation to maintain its relevance and re-emphasize its practical value (Duncum, 2002; Freedman, 2003a; Freedman & Stuhr, 2004; Mirzoeff, 1999). Visual culture, like it or not, is becoming art, as art becomes visual culture. The shift has not been easy or unanimous, nor is it complete.

In addition to the roots in cultural and visual culture studies, Duncum (2002) stresses visual culture art education’s (VCAE) critical foundations. Current critical pedagogy begins with Paolo Freire’s work in the early 1970s, primarily in Pedagogy of the Oppressed. Freire (1995, 1998b) understands people as subjects with agency, able to critically examine their personal world, and able eventually to recognize and analyze multiple, and different, realities. For Freire (1995), education is an exercise in and of democracy; people need to be literate in order to fully participate in cultural, political, economic, and educational discourses and decisions.

Henry Giroux (2004) imports Freire’s (1995) concepts into an American educational context. Giroux advocates interdisciplinary learning; an interrogation of power in education, rejecting the false dichotomy of high and popular culture in order to make curriculum relevant to students’ lives; and examining ways teachers’ language use defines cultural expectations. For Giroux (2004), pedagogy functions as “a form of political intervention” and learning is about actively constructing and using knowledge rather than passively receiving and accepting it (p. 34). Also, critical pedagogy includes examining “how knowledge, values, desire, and social relations are always implicated in relations of power” and how “to fight deeply rooted injustices in a society and world founded on systemic economic, racial, and gendered inequalities” (Giroux, 2004, p. 34 - 35). Directly relevant to this study, Giroux believes that contemporary literacy must include the ability to analyze new media and technologies critically.

Peter McLaren also applies Freire’s concepts, stressing empowerment of teachers and students as a key component of critical pedagogy. Much of McLaren’s scholarship focuses on critically examining race, particularly whiteness, as a primary factor in educational inequities. For McLaren (1995), critical pedagogy involves non-violent dissent within the capitalist system, promoting a revolution toward a more socialist-democratic society.

Michael Apple (1995, 1996) focuses on democratic education in relationship to culture and power, particularly as they manifest in and affect school curriculum. He insists education is a political endeavor,
even when it appears neutral. Apple posits that education functions structurally to produce and reward “cultural capital” (1995) while maintaining and reproducing sociocultural inequities (1996).

**VCAE and Digital Animation: A Technology Mentoring Program for Young Women**

These crucial issues in critical analysis and pedagogy found much resonance in contemporary art education from within a visual culture art education orientation. In a formative article, *Clarifying Visual Culture Art Education*, Duncum (2002) explicitly links critical pedagogy to VCAE, stressing VCAE’s primary goals of “critical understanding and empowerment” (p. 6). Duncum believes the best way to achieve understanding and empowerment is through image-making as a form of critical construction (2002, p. 6). VCAE is a new paradigm that “requires a substantial shift in what is to be known about images,” in how we create, manipulate, mis/interpret, and experience images and visual culture (Duncum, 2002, p. 7). In these ways, VCAE is “profoundly historical,” “cross-cultural,” and interested in “both aesthetic value and social issues” (Duncum, 2000, pp. 6 – 10). VCAE is less about policing the boundaries of *Art* and more about considering the structure, use, and impact of all kinds of visual stimuli and events, including traditional art masterpieces such as Michelangelo’s *David* (1500-1504), and visual culture, such as a comic strip, clothing ad, commercial, a theme park - really, almost anything. This shift is not to demean or devalue traditional art “masterpieces,” it is to erase the hierarchy separating them from other works ad media, to nullify the term. The shift to VCAE is to encourage and value critical examination of any and all visual/s. *Objets d’arte* may exude formal value, but low riders in L.A. may communicate more about a particular cultural group and their means of artistic expression.

**Visual Culture and Computer Media**

The larger field of visual culture happily considers computer technology and digital imagery as ripe, meaningful subject matter. Several pro-visual culture art educators specifically include computer and digital media as components for critical study (Carpenter & Taylor, 2003; Ettinger, 1988; Freedman, 1997a; Mercedes, 1998; Taylor, 2003). These scholars and educators note the current boom of digital media forms and interactions, and their likely continuing proliferation. Freedman (2003a) asserts most new digital technologies are experienced as primarily visual. Is this true? If so, why? What results from this arrangement? What are the implications for relying increasingly on visual interfaces with digital technology? How does the increasing ability to use vocal interfaces with technologies compare with visual ones? Digital computer technology gives visual culture nearly unlimited capabilities for (image) access, re/production, transmission, and manipulation. Visual culture allows space for examining these complicated intersections of technology, visual culture, and critical theories.

*Digital Animation*, the summer technology mentoring program, is an undeniably rich visual culture environment. As discussed fully in Chapter 2, *Digital Animation* occurs at ACCAD, The Advanced Computing Center for the Arts and Design, a division of Ohio State University’s College of the Arts. This center originated in 1963 when Charles Csuri, an Art Education professor at OSU, began experimenting with computers as artistic tools. His work and interests led to the development of a separate computing and
arts program that eventually evolved into today’s ACCAD. The young women in the summer program use ACCAD’s cutting-edge technologies, including computer-generated image production software, to create an animation about locally important environmental issues.

ACCAD’s full title, along with its clear inclusion in the College of the Arts, reinforces the visual culture theoretical position that technologies are compatible with, even important to, the arts (Duncum, 2001; Freedman, 1997a; Gregory, 1996; Jackson 1999). ACCAD’s culture reveals no reluctance or theoretical struggles with assuming computing is a medium for conceptualizing, creating, recording, and transforming arts and design. Visual culture art education (VCAE) merges well theoretically with ACCAD’s assumptions about the validity and potential of technology and art.

VCAE’s emphasis on using critical theory to examine visuals, including computer media, is important within the context of this case study. Maria Palazzi, the center and program director, presents the summer 3D animation program as an attempt to use art to get girls interested in technology through its creative, practical, economical, and theoretical possibilities and interdisciplinary connections. VCAE encourages consideration of visual culture influences on meaning construction and interpretation, as well as sociocultural factors (Desai, 2000; Freedman, 1997a, 2000a; Freedman & Wood, 1999; Tavin, 2005, jagodzinski, 2001). While this recalls feminist poststructuralist issues, how closely do the two match, and where do they diverge?

**Visual Culture Art Education and Feminist Poststructuralist Pedagogy**


Like feminist poststructuralism, VCAE recognizes fluid aggregations of identity markers, like gender, and their roles in creating sociocultural and economic hierarchies. Both perspectives utilize the concept of *subjectivity* to signify the multiple, shifting intersections and divergences of gender and other identity markers in context with an individual’s experiences and perceptions (Atkinson, 1999; Burton, 2006; Eisenhauer, 2003, 2006; Walker, et al, 2006). Both perspectives consider subjectivity’s impact on and within educational and cultural contexts.

As a result, both VCAE and feminist poststructuralist pedagogy question traditional instructional models and propose alternatives. Instead of the more traditional competitive, individualistic, hierarchical instructional models that reward and reinforce masculine learning styles, both consider the impact of collaboration and community, the value of heterogeneous groups working toward common goals (Barr, 1999; Belenky, Clinchy, Goldberger, & Tarule, 1986; Markwick, 2005; Shakleford, 1992). Like feminist poststructuralist pedagogy, VCAE promotes inclusion, diversity, multiplicity, and critical analysis (Daniel
As noted in Chapter 3, this collaborative, real-world, project-based approach benefits not only female learners but all learners, particularly marginalized ones, at no one’s expense.

Specifically, VCAE uses a similar critical perspective to examine and confront the visual aspects of these sociocultural forces. How are gender, race class, subjectivity, language, power, and truth reflected by and constituted within images? What do images teach us – about our culture, our positionality, our potential, and ourselves? How do images contribute to creating and maintaining inequities through misrepresentation, stereotyping, degradation, manipulation, oppression, absences, and censorship? What can we do? How can we apply VCAE to analyze sociocultural issues around interactive cognition, subjectivities, interdisciplinarity, constructive reflection and critique, and new media possibilities (Freedman, 2003a; Giroux, 2004)?

_Digital Animation_ challenges, and ruptures, the image (and reality) of gender inequity in technology by inserting females into it. Nevertheless, additional sociocultural images and inequities emerge. The all-female program population may temporarily nullify technology’s gender bias, but other biases surface. While there is some diversity, the majority of _Digital Animation_ participants are white, middle-class, and suburban. Program demographics do not reflect the racial or economic diversity of the local public school system, a program ideal (Demographic Data, 2004, 2005; MMP, PC, Y1, Y2).

Technology environments discourage women; not only women, but definitely women.

_Digital Animation_ struggles to recruit minority female applicants, a struggle reflected in recruiting diverse female mentors, too. Palazzi grapples continually with ways to increase the program population’s diversity, from advertising in local papers, distributing information and applications through a local school district technology administrator, and posting information on the ACCAD website (MP, PC, Y1, Y2). But it hasn’t been enough. Who gets and reads the newspaper? What district-level administrator effectively distributes information to individual schools, teachers, and students? Who is aware of the program and knows enough to look for the information online? Who can get online?

As an example, during Year 2 of this study, an African American staff member is responsible for picking up one of the program participants and taking her home each day. While this is a specific instance, it encapsulates the struggle to address multiple barriers for minorities. Although the participant was fully qualified, accepted, and engaged throughout the program, without the transportation assistance, would she have been able to attend? The lack of transportation could be an economic issue, or one of logistics, but it hints at the multiple additional barriers young women face in technology in addition to their gender.

In Chapter 3, I used feminist poststructuralist pedagogical concerns to construct a theoretical framework. Because of their commonalities, and for the sake of consistency, I now use the same categories of concern to craft the VCAE analytical framework: language, subjectivity, power, truth, and reflexivity, as they apply to visual culture concerns. As a critical undertaking, VCAE, like feminist poststructuralist
pedagogy, aims to produce intellectual as well as material changes to increase justice and equity. Both frameworks position subjects as active, autonomous, participatory, fluid, multiple, and contradictory.

In this chapter, I apply feminist poststructuralist framework categories, beginning with subjectivity, to *Digital Animation* data to demonstrate intersections with VCAE concerns and to contextualize and roughly guide preliminary data investigation. Afterwards, I use the National Art Education Association’s 2002 position paper on Visual Culture Art Education for more focused consideration of how this case study data both reflects and conflicts with the explicit VCAE aims and goals.

Below, after an introductory discussion of subjectivity in relationship to VCAE and technology, I present three vignettes from *Digital Animation* case study data. Each vignette illustrates elements of the program’s visual culture and analyzes their effects on participants’ subjectivities. I chose these vignettes to provide representative examples of visual culture’s impact/s on subjectivities across a wide range of aspects common to many programs: environments, representations, and experiences.

**Analyzing Subjectivity and Technology in VCAE: Spaces, Mentors, and MoCap**

While some VCAE literature uses the term “identity,” its conceptual meaning aligns more closely with poststructuralism’s concept of “subjectivity,” which many VCAE scholars are recognizing and incorporating. VCAE understands learners and citizens do not have one single fixed identity, but rather exist as loose, dynamic, complex aggregations of multiple, fluid sociocultural identity markers, context, and personal experiences (Daiello, Hathaway, Rhoades, & Walker, 2006; Dias & Sinkinson, 2005; Eisenhauer, 2006; Garoian & Gaudelius, 2004; Springgay, 2007). In effect, VCAE emphasizes that learners reflect on the relationship of visual culture to the construction and maintenance of subjectivities, the richness of global cultures, and the integrity of natural and human-made environments. VCAE questions ways visual culture marks and influences individual and group identities (NAEA, 2002 Advisory).

Sholle & Denski (1994) assert VCAE derives its pedagogical power from exploring “what is important to know, how [it is] to be known and how this production of knowledge constructs social identities” (p. 23). VCAE scholars acknowledge and examine subjectivity’s importance in recognizing and appreciating individual differences and group affiliations, examining its relationships with visual culture (Duncum, 2002; jagodzinski, 2003). Identity and subjectivity depend heavily on visual culture signifiers and other cultural markers.

In the next three sections, I present and then analyze space, mentors, and the Motion Capture lab as key visual culture components of *Digital Animation* that construct, influence, and maintain subjectivity.

The bulk of summer program time and work happens in “The Fishbowl,” ACCAD’s main classroom. One side and the back wall of the room are windows, allowing outsiders full view into the space. Three long rows of tables stretch across the width of the room, holding student computer workstations and an instructor station. All computers face the classroom’s front. The instructor’s computer desktop projects on two screens descending from the ceiling. The room is dark, cool, and quiet.
This environmental arrangement showcases students, technology, cooperation, and education. It also raises issues. What does this display mean when students are all young women? This environment visibly repeats the Fishbowl as a classroom, but disrupts the image through the presence of only women. This repetition with difference (Butler, 1990) creates positive possibility and actuality of change. The image makes it so.

From a more negative perspective, this unusual image invites voyeuristic consumption, the all-female classroom an exotic spectacle. Girl as contained commodity. Girls with technology. Girls and technology as in/violating masculine domains.

The mentors formal self-introductions to participants on the first day demonstrate early the value, and power, of visual culture in marking personal subjectivity:

The mentors do a Powerpoint presentation. [Maria Palazzi] introduces it. Each mentor had put together some slides about what they thought the girls might want to know about them, particularly about their interests and experiences in using technology and also in their areas of expertise in the arts. [Maria] talks about how [Alyse], a former program participant returning as a college mentor, exemplifies what the program is striving for - for having women sharing what they are doing and their skill and interest in technology to support and serve as role models for young women interested in technology. She encourages the girls to interact with all the mentors, not just the one for their group.

Cathy came to OSU from the University of Florida with a BS in Digital Arts and Sciences (Computer Engineering). She studied programming and art and video production. Her career goals include working in feature film animation as a technical director (she likes the problem-solving aspects of the job). She made a short film based on Van Gogh’s “Starry Night” as an undergraduate project. She talks about how ... special effects and rigging are her main interests. She talks about the complexity of character rigging.

Me’chelle is also from the University of Florida with a BA in Visual Arts studies. Her thesis was “A Model for Designing Culturally Sensitive Characters for Feature Animation.” She addressed the problem in animation of creating and using negative stereotypes. She reviews some positive and negative aspects in animated movies and provides examples (Pocahontas, Aladdin). She also reviews the concepts of blackface and minstrel show history. She shows the 1910 image of Saartjie (see drawing of female figure in Observation Notes)...

Carly is interested in art + fire ... and robotics/kinetic sculptures. ...large-scale sculptures that fill rooms...

Ellen is interested in dance, cinema, and performance video. She likes the artists maya deren and ozu yasujiro ... She has a lot of Japanese influences...

MP says that she hopes this presentation gives the girls a sense of the mentors and their interests and she hopes the girls will talk to the mentors about their interests and what to do to pursue them. (ONY2, pp. 2-3)

The data demonstrate ways Digital Animation stresses visual culture as an effective means to investigate and communicate. Maria Palazzi capitalizes on this by having the mentors present introductions and information about themselves as visually enhanced presentations. Mentor presentations contain some traditional text, but the primary communication of the content - their personal information, technology experiences, and interests – occurs visually. The mentors also function in a visual culture capacity to provide possibilities and the proof of women succeeding in technology. One participant exclaimed the mentors “were extremely helpful and they were living examples of what we can grow up to be and what we can work for” (Participant Post-survey, Y2, question 6). The students associate the mentors with these
images and words, creating a sense of increased intimacy and connection. This intimacy and connection with the women in the Digital Animation technology setting enables a participant to see these careers as possible, to imagine herself working with technology.

The Motion Capture lab (MoCap) is a sub-center of ACCAD, down a back hall, away from the program entrance, offices, and classrooms. In a large display window immediately before the MoCap entry, an orange imac displays captured and manipulated digital images of passers-by, blurry and abstract. The first MoCap room resembles a recording studio. Circuit boards, controls, and computers hug a mostly glass wall. Shelves of equipment and manuals line the far wall. Scattered rolling chairs rest around the room. The large window and adjacent door open into a large, square black room, clearly a performance space. The matte black walls and floor melt away from participants’ figures, creating a visual void, negating the visual. A square, metal halo of lights and cameras floats above this implied phantom stage.

Brandon, an ACCAD employee, manages the MoCap lab. During the MoCap experience, he describes the lab its uses to the participants. Brandon notes that while ACCAD uses motion capture technology for the arts – dance, animation – it originates in the Military-Industrial complex. Motion capture technology has also had a tremendous impact in the medical, video, and gaming industries.

Brandon displays a MoCap suit – a black unitard outfitted with white reflective balls in key anatomical locations relevant to movement – mainly center torso points and major appendages and joints. There is a separate ping-pong ball crown, creating a vaguely updated Frankenstein experiment scenario. These balls reflect light to sensor cameras located around the room that capture and plot their movement from different points around the space, creating a 3D representation of this data across time.

Brandon shows several examples of raw and cleaner data. The raw data consist of white dots on in a 3D environment grid that move separately. The cleaner data link the dots into simple but meaningful figures and forms, capturing a sense of more realistic and recognizable motion. The examples Brandon shows include motion capture segments of his own son, Bebe Miller choreography and performance archives, a dog walking, Marcel Marceau miming, and a participant from last year’s Digital Animation riding an imaginary horse and swinging a non-existent sword.

The variety of scenarios and the invisibility of the bodies in the data appeal to the girls; the black unitards do not. In fact, their skin-tight fit discourages several girls from later donning the suits to create and capture their own movement data. In this instance, gender and body issues influence subjectivity, conspiring to discourage some young women from participating. These young women have visual mental images of the “ideal” female body, and many young women experience extreme discomfort with their real, or even imagined, differences from that ideal. Visual culture can reinforce, promote, glorify, and normalize cultural ideals, perpetuating oppressive and denigrating gender stereotypes and inaccurate or mis-contextualized representations. Gender, visual culture, and technology are interdependent, and this has material impacts on how young women engage with and respond to technology. The different visual culture of the Digital Animation program provided a forum and impetus for these young women to engage and
respond more actively, confidently, and innovatively with technology. Digital Animation impacted their subjectivity.

During the final morning of the Year 2 program, my research observation notes report one of the Digital Animation female instructors leading the whole group in an exercise using the MoCap data several girls created:

_Vera [an instructor] starts the MoCap lesson with the girls. She introduces the session from the front of the room and then moves to the instructor station in back. Vera shows the girls how and where to find the data to use. She talks about the generic data files and talks about the MoCap walking files done by a theater professor in miming. The girls begin finding the files. Alyse is working with Tonya again. Vera asks for volunteers from the MoCap activity to use their file. Alba volunteers first, but many volunteer hands shoot up. Vera shows how it works. The girls start playing with and examining the files. Vera talks about the effects of different kinds of walks (how leading with the chest projects confidence and energy; leading with the chin seems regal and like a celebrity; and how leading with the pelvis is seductive). Vera then returns to the Alba file. She checks to see if the girls have picked the file they want to use. She then gives the girls a couple of minutes to choose and the girls begin scrolling through and looking at some of the choices. Vera tells the girls to ask permission before they use someone else’s walking file from the class. Then she opens Photoshop and shows them where their headshots are from when Kathi took their photos in the hallway. Vera talks about how the faces will be distorted as they map them onto the spheres/heads of the figures. She compares this to looking in a funhouse mirror._ (ONY2, Day 9, pp. 49 - 50)

Both Brandon and Vera use some aspects of a VCAE approach to the MoCap lab and data. Brandon highlights some of the social and historical context and uses of motion capture technology. He also emphasizes MoCap’s interdisciplinary artistic application possibilities and shows examples with different visual representations of captured data. Vera uses visual demonstration along with verbal instruction to teach digital animation and technology tasks.

These episodes demonstrate the range of possibilities for using visual culture as a critical tool for recognizing, understanding, valuing, creating, and communicating multiple, fluid, contradictory subjectivities. The Fishbowl emphasizes subjectivity as performance (Butler, 1990) and spectacle (DeBord, 1967; Phelan & Lane, 1998) – a familiar scene with unfamiliar subjects. The mentors use visual culture as a means to communicate and manipulate multiple aspects of their own subjectivities. They use images of their own artwork and list artistic connections and influences. They connect digital media with more traditional art forms like dance and painting. They share biographical information and personal interests as a way to connect with the participants through visual culture. The MoCap lab highlights the variety of multiple, fluid, unstable, and unequal subjectivities and their visual cultural re-presentation.

Brian’s presence and information about MoCap’s military origins clearly impacted some participants’ subjectivity, discouraging their full engagement. The act of refusing to wear the unitard creates a conundrum around participants’ subjectivity and agency. On one side, participants mobilize their agency by not wearing the suit and performing. On another, is this refusal really an act of agency, or is it an act of complicity with cultural norms? Does non-participation accept the perpetual unfavorable comparison of women with an unattainable ideal? With technology an overwhelmingly masculine field, most women in
technology invariably work with men. In technology environments, like Digital Animation, the presence of men causes subtle and overt shifts, enhancing, concealing, and recombining shifting elements of subjectivity.

In the next section, I use a VCAE framework to examine the visual cultural aspects of Digital Animation’s language and the language aspects of its visual culture.

**Visual Culture Art Education and Language**

Feminist poststructuralist concerns with language provide another useful lens for examining the visual cultural aspects of Digital Animation data. In this study I consider language, text, and image as synonymous, incorporating media of all types.

At ACCAD, the MoCap lab houses Virtual Reality equipment, software, and program resources. During the second week of the Year 2 program, Maria Palazzi accompanied a remixed group of girls and mentors to the lab and introduced them to Brent. Brent talked to the girls about Virtual Reality (VR) – telling them what it is and how it works. He holds large, clunky glasses attached to a partial helmet, like a welding mask, that work in concert with motion sensors to translate viewer movements into a 3-D Virtual Reality environment. In short, if the viewer actually turns her head to the left, the view in the virtual environment shifts correspondingly. Is that a dinosaur behind you? Spin around and check! Viewers can choose from several environments, including the Sistine chapel, a fantasy fairytale landscape, and a prehistoric landscape with dinosaurs. The girls eagerly scramble for turns. They all enter the black box to watch. A large screen overhead allows those not wearing the glasses to see their contents. Usually the participant wearing the glasses narrates, points, and reacts aloud while examining the scene. The girls ask Brent many questions about what VR can and can’t do; they love it. They love even getting to try the glasses for a couple of minutes (ONY2, Day 9, pp. 49 - 50).

As the participants take turns with the VR glasses, Maria notices and calls my attention to the masculine, sometimes violent dimension of the computer technology language the two male VR facilitators use (Personal communication, ONY2). Bernstein (1999) collected examples of violent computer terminology, definitions, and possible alternatives:

<table>
<thead>
<tr>
<th>Expression</th>
<th>Alternative</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abort/Kill</td>
<td>End the program</td>
<td>To manually terminate the program</td>
</tr>
<tr>
<td>Bomb</td>
<td>Stop unexpectedly</td>
<td>When a program terminates unexpectedly</td>
</tr>
<tr>
<td>Boot</td>
<td>Initialize</td>
<td>Initialize the operating system on a computer</td>
</tr>
<tr>
<td>Code warrior</td>
<td>Software developer</td>
<td>Great software developer</td>
</tr>
<tr>
<td>Crash</td>
<td>Failure</td>
<td>Unexpected software failure</td>
</tr>
<tr>
<td>Execute</td>
<td>Run</td>
<td>Run a program</td>
</tr>
<tr>
<td>Kill file</td>
<td>Filter file</td>
<td>File that filters unwanted patterns</td>
</tr>
<tr>
<td>Kill a program</td>
<td>Terminate</td>
<td>To terminate a program abnormally</td>
</tr>
<tr>
<td>Killer apps</td>
<td>Popular application</td>
<td>Application that is so popular that it will induce people to buy a computer</td>
</tr>
</tbody>
</table>

*Figure 19: Examples of Violent Computer Terminology*
While language itself does not literally exclude women from technology, the prominence of power, violence, hostility, and domination in technology discourse becomes another subtle disincentive for women.

Visual images of masculinity also dominate computer gaming visual culture, creating hyper-masculinized males and hyper-feminized females, reinforcing, even extending, ridiculous gender stereotypes (Brosnan, 1998). The visual culture of masculinity and violence associated with computer games balances uncomfortably with the popular image of the computer geek. In contemporary culture, computer geeks, like computer users, are still presumably masculine, but their image of masculinity has some key differences. Instead of hyper-masculine physicality, computer geeks represent hyper-masculine intellect. Popular culture often depicts computer geeks as guys who are good with math and science, bad with fashion and appearances, and perhaps socially and physically awkward (Kendall, 2000). In many ways, the image of computer technology geeks offers a stark contrast to the chiseled, rugged soldier hulks of action games like Black Hawk Down. Lori Kendall (1999) argues that “hegemonic masculinity” both denigrates and is beginning to embrace nerds, primarily associating them with computers and technology. When popular culture conflates “computer user” with “computer geek,” and “computer geek” conjures particular kinds of masculine images, or texts, what happens to feminine roles, images, and subjectivities within and because of this discourse? What effects, if any, does this have on the relationships between women and technology?

In some ways, technology has the capability to diminish the importance and presence of gender in many interactions and relationships – business, pleasure, incidental – occurring virtually instead of visually, auditorily, phenomenologically. Instead, in many ways technology reinforces gender roles virtually. Christensen (2006) reports that even given technology’s ability to transcend gender roles and rules, online gamers reproduced them, frequently using misogynistic and homophobic threats and slurs to police behavior and enforce masculine gender norms. The visual culture discourses around computer technology encompass extreme, sometimes opposite, masculine subject positions while the discourses simultaneously limit, negatively stereotype, and objectify feminine ones (Carr, 2006; Kendall 1999, 2000). For Carr (2006), Kendall (1999, 2000), and others, women, when present at all in technology, often function as physical caricatures of femininity: big breasts, tiny waists, wide hips, long hair, large lips.

In Gender Inclusive Game Design: Expanding the Market, Sheri Graner Ray (2006) notes the exaggerated aspects of both male and female characters in video games, but male characters “display the common heroic traits of being young, strong, virile and fertile” while the female characters “display physical traits humans get when they’re ready for sex: partially open mouths with large red lips, heavy eyelids (or ‘bedroom eyes’),” and they are “overly endowed, highly sexualized,” dressed in sexually explicit clothing, or “all but naked,” and “placed in sexual poses, whereas the male characters aren’t” (Girard, 2006, Paras. 4 - 7). The women are rarely soldiers, race drivers, or sports heroes. Such stereotypical and exaggerated gender representations conspire to limit the presence of women and their
scope of involvement (Carr, 2006), but the dearth, or absence, of gender inclusive verbal and visual culture texts carries considerable power in constructing and maintaining gender inequities in computer technology.

As noted in the Chapter 4 on feminist poststructuralist pedagogy, language and subjectivity are inextricably intertwined. Poststructuralist theories expose language’s instability, cultural construction, arbitrariness, and limited subject positions (Althusser, 1977; Derrida, 1973, 1981, 1982; Foucault, 1972) and feminist poststructuralist theories explore language’s gendered aspects in even more depth (Braidotti, 1994; Butler, 1990; Jackson, 2004). But the term language is too limiting and exclusionary, much like the relationship between art and visual culture. Words and symbols remain valid, but text includes actions, expressions, events, all media – anything with multiple interpretation possibilities. For Derrida (1978) text is any chain of signifiers with an apparent singular meaning that deconstructs, or contradicts itself, under critical examination.

While images are not equivalent to spoken and written language, many methods for critically investigating more traditional forms of language provide useful starting points for critically analyzing images as texts. Visual culture, like language, is loose, suggestive, and in play. Images communicate both more and less than words, and definitely differently from them. Texts are open, multiple, and self-contradictory. Digital Animation capitalizes on visual culture as a means for re-writing, or re-imagining, gender-biased visual, verbal, and cultural texts and discourses surrounding women and technology. Symbolically, having entirely female program staff strongly visually contradicts the prevailing image of technology as a masculine domain. Maria Palazzi’s position as a female technology program director provides another prominent example of re-imagining technology leaders’ and administrators’ genders, too.

The Digital Animation staff encourages participants to incorporate their own experiences, both figuratively and literally, in developing animations. In this way, these female participants insert themselves into the visual and verbal texts they produce, inserting themselves into technology discourses. For example, when the participants work with MoCap data to animate figures walking, they digitally insert images of their own faces onto the generic data “heads” (ONY2).

Participants also engage in critical negotiations of identity and representation as they make creative and editorial decisions about what to include and exclude throughout the group animation project. For example, groups representing historical images of local environments had to grapple with representing Native Americans and their culture, such as representing teepees. Another group debated finding and including portions of the 1971 public service announcement by the Keep America Beautiful organization featuring Iron Eyes Cody, a Native American actor, crying about pollution.

The participants negotiate the purpose, intent, and content of the animation, or text, they produce. This process and product rely heavily on how aspects of text and language create, reflect, influence, and interact in identity and subjectivity work around gender issues with regards to visual culture. In Year 2, one group decided their animation would eschew a traditional narrative format, instead following a more
stream-of-consciousness flow of animated scenery and figures, allowing viewers leeway to create personal connections and interpretations (ONY2).

The next sections examine program data emphasizing Digital Animation’s visual culture power aspects. After an introductory scenario, I compare feminist poststructuralist pedagogy’s conception of power to VCAE’s and then analyze how the visual culture of Digital Animation serves to disrupt and reinforce cultural power discourses.

**Visual Culture Art Education at ACCAD and the Power of Images**

**Program Day 1, Year 1**

*Early morning*

Maria Palazzi starts the introduction activity with totem poles. Maria asks girls what they know about totem poles and the girls begin to give a few answers. Then she explains the activity with totem poles they are going to complete in their small groups with their mentors... Maria hands out a list of totems – animals affiliated with certain characteristics or traits. Each girl is supposed to decide on which totem to use to represent her self in creating a group totem pole, based on the strengths she brings to the group. There is some discussion about being in the groups for the next two weeks and explanation of the need for grouping. Maria has the girls begin moving into their groups. The movement into groups is a little awkward because of the long seating rows in the room, but once the mentors move in and start directing a little, things start happening...

Maria gets markers and paper and distributes them to the groups so they can draw their totems and create their poles. As the girls finish reading the totem lists, some chatting begins. There is a little confusion about what group 2 girls are in. Franny says she can take both girls in her group. Franny then proceeds to work toward incorporating the 4 girls into one group. She makes sure to pass out art supplies to each of the four individually and works to include them in conversation as a group. The mentors are being chatty with each other and with the girls, which is creating a very nice, welcoming environment. All girls are engaged in the totem pole activity, even those being quieter. They are all drawing and discussing animals. Maria checks in with groups and finds they all need a few more minutes to work.

Franny is very positive in her interactions with the girls. She is really positively interacting with and reinforcing the activities of the girls in her group, particularly the ones she added. She praises their artistic abilities and style and compliments their pictures. Franny confirms with Maria her current group and being able to have the 4 girls instead of just 2. As girls finish they begin to create the totem poles by hanging their pictures on the walls with help from their mentors, negotiating the order of the pictures within their groups.

After hanging their totems, groups begin introductions. Franny’s group starts, followed by Francine then Hu and Shana. Maria asks the Hu/Shana group to elaborate on their totem and
they give a better, fuller explanation. Then everyone returns to the Fishbowl. Maria tells
participants to rearrange themselves into their current groups. (ONY1, pp. 7 - 9)

The scenario above sketches the first morning of the Year 1 summer program. The participants
arrive, sit, and complete surveys. Maria explains the introductory activity: making simple paper hand-
drawn totem poles. The girls gather in assigned groups and begin. An immediate visible contrast exists
between traditional educational environments and the Digital Animation summer program.

Visual culture art education (VCAE) and feminist poststructuralist pedagogy share similar
concerns with power. Both support challenging gendered expectations and stereotypes as manipulations of
power that create and maintain “deeply rooted injustices” and the resulting “systemic economic, racial, and
gendered inequalities” (Giroux, 2004, pp. 34 – 35). At Digital Animation, participants and mentors are
active and engaged, displaying their own personal power and agency. Groups shift easily from individual to
group work and back. Mentors work with individuals and groups continually. The instructors mingle and
help at times. Everyone is connected. Hierarchies of power undeniably exist in this institutional setting
complete with professors and college students working with middle and high school students. The Digital
Animation program instead presents an image of technology education as including clear, easy, constant
access to technical, conceptual, and personal support. In effect, the Digital Animation intervention visibly
counters the in/visible networks created and maintained to support, assist, and benefit men in technology
fields. The program creates an explicit, visible model to provide women some of the same advantages, and
power, albeit on a smaller scale.

The program also visibly leverages its power in terms of affiliation and assets, combining
university, community, and individual resources to confront the gender inequalities in technology. Maria
Palazzi uses ACCAD’s physical facilities and affiliations to host and staff the program. Grants come from
the White Castle Foundation, as well as local individuals, and all receive recognition in final presentations
and on the Digital Animation website. Digital Animation provides the participants with access to beautiful,
expensive, professional-grade equipment and software, not leftovers or donations but state-of-the-art
graphics tools and technology. The participants can see and use the equipment and resources with
substantial support, training, and encouragement, opening future educational, artistic, or career possibilities.
In these ways, Digital Animation attempts to expose and address the gender and power barriers for women
in technology.

Images in/of Inequality

From a VCAE orientation, Duncum (2002) stresses the need to interrogate the investments of
power we make in images and how these images embody our sexist, racist, ageist, and class-specific
interests, stereotypes, and prejudices (p. 20). We must consider who has the power to create and distribute
these images? Who has the power to question or change them? How do these images, their contents and
implications, impact, reveal, or conceal, real lives (Klein, 1993)? If technology complicates and increases
the access, spread, and control of information and actions through mainly visual means (Freedman, 2003a),
how does it reinforce and perpetuate a male-dominated, hierarchical gender system (Freedman, 1994;
Hopkins, 1998, pp. 5 –6)? How do technology and visual culture conspire to create “the informatics of
domination,” the ability to use technology to increasingly monitor and control people, particularly women
(Haraway, 1991)?

Visual culture art education encourages students to recognize and utilize their own power through
critical investigation of visual culture as active consumers and production of critical visual culture as active
responses. VCAE encourages students to recognize and utilize their own power (Freedman, 1994). Duncum
(2002, 2001) and others repeatedly emphasize the necessity of production within VCAE, stressing
individual autonomy and response. In VCAE, critical analysis and response provide space for possibilities
and for change. Digital Animation’s summer program trains participants in several technologies and
programs, expanding their personal power by increasing their technology skills and access to visual culture
production and distribution.

In “Manipulation, Simulation, Stimulation: The Role of Art Education in the Digital Age,” Flood
& Bamford (2007) stress art education’s responsibility to recognize and foster “the passion and energy” of
students and to engage new media in the process (p. 96). Flood & Bamford (2007) believe art educators
must:

engender the desire to learn and explore issues that are essential for future experience in the real
world by asking students to analyze and deconstruct the signs and messages. It is essential that we
harness these new devices and make them work in ways that reduce apathy and
disengagement... We must make [digital technology] a vehicle for individual expression and
response and provide the means by which the world of signs is understood by learners so they can
employ these tools in ways that enable new ideas and a sense of power to flourish. (pp. 96 – 97)

Art educators can involve students directly in critically manipulating and deconstructing contemporary
imagery. Students can learn new technologies by manipulating and deconstructing contemporary imagery,
engaging with digital “simulations of the real and the imaginary,” and “creat[ing] their own simulations”
and visual culture (Flood & Bamford, 2007, p. 97). Additionally, the arts provide a medium and reason for
learning multiple digital tools. The “arts alone,” Flood & Bamford (2007) insist, use the many modes of
digital communication “interchangeably and simultaneously” (p. 98). In contemporary Western digital
societies, a “critical standpoint” for investigating media and communications is vital to learners who need
to “increase their awareness of visual symbols, iconography, and the complexity of communication” (Flood
& Bamford, 2007, p. 98). If “future eras will be dominated by multidimensional communication systems,”
learners must be adept at consuming, analyzing, and producing within these systems in increasingly

**VCAE: Digital Animation and Truth**

VCAE and feminist poststructuralist pedagogy share common roots and similar perspectives on
truth – how truth is relative, culturally-defined, plural instead of singular, and subjective (Mitchell,1992;
Barthes, 1977; Rogoff, 1998; Alldred, 1998; Sarup, 1996; Lather, 1998; Mohanty, Chandra in Kennedy &
Beins, 2005). Truth encompasses knowledge; truth is what we know and what we believe. To know includes room for subjective interpretation. Know means, concurrently, committed to memory, perceived directly, a firm belief, awareness, understanding, familiarity, connoisseurship, and recognition. In effect, what we consider truth and knowledge are culturally constructed agreements. They are subjective understandings or perceptions that gain widespread acceptance or authorization (Foucault, 1978a). Knowledge is authorized, vetted information (Foucault, 1978a). Feminist poststructuralist pedagogy and VCAE assume knowledge is constructed, subjectively, at individual and collective levels (Chalmers, 2001; Freedman, 1997a, 2000b; jagodzinski, 1997, 2003, 2004). Both promote critically examining how social, cultural, and economic factors influence what becomes validated as knowledge, by whom, and to whom. Who has access to channels and venues for knowledge (re)production and distribution? Who has the skills necessary to use technologies of knowledge? The skills and access to design, build, or control technologies? What we seek in pursuing knowledge influences what we see; what we see influences what we seek and create. Who does the seeking and seeing influences both; subjectivity influences perceptions, interpretations, communication, and connections. The truth is what we believe. The truth, like Warhol said about art, is whatever you can get away with.

Again, VCAE and feminist poststructuralist pedagogy promote critical practice, critical understanding, and empowerment. In feminist poststructuralist pedagogy, empowerment might mean providing traditionally marginalized group members with extra support. The mentors in the ACCAD summer program supply visible evidence of a pedagogical commitment to support all learners and facilitate their success. Mentors are empowered to be active, committed members of a support network for women in technology. The short-term intent is for them to learn mentoring skills, help these participants succeed, and promote them as capable, confident professionals. The long-term intent, Maria Palazzi stresses, is to create the expectation of mentoring as a component of the professional life of women in technology. Women entering the technology field, according to Palazzi, should expect to find and cultivate mentor relationships throughout their careers – first by finding mentors and then by being mentors (MP, PC, Y1, Y2). Maria Palazzi herself serves as a model of how women can subvert traditional technology hierarchies and how to support other women in the field. Almost every mentor in Year 1 and Year 2 specifically comments on the positive influence Maria exerts in their lives – as a role model, mentor, and advocate (Mentor Pre- and Post-surveys, Y1, Y2).

Critical empowerment within a VCAE framework includes the ability to investigate images and analyze their context, content, intent, and potential impact. VCAE uses empowerment as a tool to create and analyze subjective truth and knowledge. An animation from the Year 1 program, The Butterfly Effect, reflects such a VCAE investigation into the relationships between the city and the prairie.

The Butterfly Effect animation begins with a wide-screen, distant view of a section of prairie. The view zooms closer, into the prairie’s midst. Plant stalks loom like giant tree trunks. A dragonfly buzzes in, up, around, darts down, and lands on a leaf. A butterfly erupts into the air, fluttering. A car races by on a
new road, nearly splattering the butterfly. Buildings sprout from the ground, repopulating the prairie. Houses and cars replace birds and bees. As the animation shows the Ohio prairie rapidly disappearing, the narration reinforces the reality of this situation and the potential consequences. To do this, each group member contributed scientific knowledge, interpretation, and animation skills to present a critical visual representation of the impact of human activity on this particular environment. The animation counters the cultural construction of nature as separate from cities, intrusive or resistant to progress and more modern ways of life.

The Butterfly Effect presents a more complicated version of the truth about how the development of local cities and towns altered the natural environment. Their intent is to inform a wider audience about the precarious presence of the few remaining patches of Ohio prairie in an attempt to increase their survival odds. Digital Animation participants become critical consumers as they investigate assumptions about relationships between people and nature. They also demonstrate “critical understanding and empowerment” by using “critical construction,” or image-making, as a principal medium (Duncum, 2002, p. 6).

Participants consider what they have learned from previous images about the local, and what they did not learn from them. Participants consider how their prior image and awareness of the local environment differ from what they see and experience on site visits. They produce images to address and express their own truths, from their experiences and the knowledge they construct.

Interesting visual culture misrepresentations of truth and knowledge also develop. Sometimes participants construct visual representations of their interpretation of truth, with no real factual, observational, or experiential evidence. Several animations from the Year 2 program on the Big Darby Creek watershed depict litter peppering the creek and its immediate surroundings. Maria Palazzi notes these representations of the Big Darby Creek contrast starkly with the almost litter-free environment at the actual Big Darby Creek. There were small pockets of litter in roadside drainage ditches along our travel route, but the park and creek were almost pristine. Maria wonders why several groups deliberately include this misrepresentation of litter, depicting it as a visible problem (MP, PC, Y2). Do research and experience succumb to expectations and stereotypical discourses of environmental concerns? What effects do these kinds of visual misrepresentations have on viewers? How do they impact knowledge construction and truth? In real life? In the next section, I examine how truth and knowledge, as a part of feminist poststructuralist and VCAE pedagogies, impact the processes of reflexivity and praxis.

Reflexivity And Praxis

Visual culture art education co-opts feminist poststructuralism’s stress on the importance of reflexivity and praxis. Like feminist poststructuralism, VCAE uses reflexivity and praxis to construct a learning as a dynamic process of knowledge construction through “dialogic pedagogy,” where students and instructors all become learners and teachers (Duncum, 2002, p. 20). Fluid teaching/learning roles and visual culture boundaries require fluid teaching and research methods (Duncum, 2000; NAEA Advisory, 2002; Tavin, 2003). Tavin (2003) warns art educators to avoid static characterizations or disembodied theories.
that neatly form recipes for teaching methodology because our relationship to art and visual culture is always fluctuating, situational, and subjective. Education is an active process, with any environment a potential classroom. VCAE, like feminist poststructuralist pedagogy, recognizes and recommends alternative sites of teaching and learning, including alternative media and virtual classrooms (Duncum, 2000z). Reflexivity and praxis create a dialogic, symbiotic process of experiencing, learning, reflecting, and changing, resembling the fluidity of subjectivity. In VCAE, like in feminist poststructuralist pedagogy, learning is personally significant, and opportunities for exploration and expression “allow students to discover their own personal positions in relation to questions and issues specifically of cultural experience” (Duncum, 2002, p.20). Students continue to assimilate new information and experiences in an infinite cycle.

*Digital Animation* data include specific examples of reflexivity and praxis. Small groups form the primary instructional and work unit of program participants. The small groups and mentor sets of Year 2, each with 3 girls and 1 mentor, develop from prior observation, data, reflection, revision, and reimplementation. Originally, mentors and participants did not have specific connections. A loose affiliation of all mentors with all participants worked for the first few program years, but staff continued to court improvement. In Year 1, as a result of data, personal experience, and critical reflection, Palazzi assigned mentors to specific small groups (Palazzi, personal communication). Through feedback and observation, Maria Palazzi sensed participants feeling more connected and comfortable with assigned mentors (Palazzi, personal communication). By Year 2, Palazzi standardized group size and mentor distribution: each groups of three girls had one assigned mentor. These small groups within a larger group are to support individual participants and group success. In this collaborative, supportive learning environment, all participants and mentors teach, learn from, and work with each other (ONY2).

For Palazzi, reflexivity suggested the value of alternative educational sites and opportunities, and as a result, field trips and on-site educational activities became increasingly important (Palazzi, personal communication). The environmental site trips are the most prominent ones, but other sites and opportunities include the Motion Capture lab, the conference/lunch rooms, small computer workrooms, outdoor picnic tables, and even the student union on the university’s campus (ONY1; ONY2). These potentially infinite opportunities and challenges reinforce the need for fluid, malleable methodologies (Tavin, 2003). In *Digital Animation* program, reflexivity and praxis enable continual evaluation and improvement of daily visual culture activities. Mentors facilitate storyboarding on picnic tables with poster board, paper, markers, and pencils. Instructors must troubleshoot erratic animation scenes. Administrators adjusts schedules according to participant progress and mentor input. Everything is contingent and related; the long-term goal is always improvement. Reflexivity begets praxis. In Year 1, Maria Palazzi noticed storyboarding on site at the prairie was more inspired and successful than during previous years at *Digital Animation*. As a result, the Year 2 schedule formalized a site visit for storyboarding.
The strong affiliations between VCAE and feminist poststructuralist pedagogy provide a strong initial framework for considering ACCAD data. VCAE focuses ACCAD data analysis on the visual and cultural, including poststructural considerations of text, subjectivity, power, truth and knowledge, and reflexivity and praxis. While these categories are helpful, they are not comprehensive. VCAE combines critical theories, such as poststructuralism, to analyze the presence and effects of visual/s, visuality, and culture in educational contexts. While VCAE draws heavily from other critical theories, embraces fluidity and flow, and rejects final, fixed understanding, interpretation, application, and instructional methodologies, some scholars advocate a particular set of VCAE aims and pedagogy. In the second half of this chapter, I explore the National Art Education Association’s 2002 Visual Culture Art Education Advisory categories as an additional framework for analyzing ACCAD summer program data.
PART TWO  
A Visual Culture Art Education Analysis of Digital Animation

In the second half of this chapter, I shift from using feminist poststructuralist categories of analysis and focus instead on using VCAE aims and pedagogy as a framework for analyzing Digital Animation data. I provide an introductory vignette summarizing my observation notes from Day 1 Year and illustrating many VCAE components of the program. These notes provide a holistic initial impression of visual culture’s infusion throughout Digital Animation’s content as well as a reference for exploring pedagogical alignment with VCAE.

After this vignette, I enter art education at a crucial juncture with visual culture. I detail the literal outcomes of this juncture, specific aims and pedagogy for VCAE, connecting it to Digital Animation and providing an illustrative vignette. Afterwards, I pair the aims and pedagogy statements and use these as a lens to analyze Digital Animation data related to specific aspects of VCAE. I end the chapter with some lingering questions about VCAE and about Digital Animation’s divergences from it.

**Digital Animation Day 1 Summary**

[Orientation begins in the Fishbowl computer classroom]

Maria offers a broad overview of the program – they will talk about why people make art, environmental artists, and focus for 2 weeks on using animation as art and as a way to talk about things that are important to us, including the Ohio Prairie.

Maria mentions [to the girls] … a purpose of the program is to encourage preservation of the prairie... The girls will become animators using art as the medium for communicating about prairies. Maria notes that today will include …a focus on environmental artists. The afternoon will include an introduction to Maya.

The groups begin to settle in – the mentors help girls find their login information and log into their computers. Vera covers how to change their passwords and Maria offers information and circulates to offer help ... There is some discussion as asides about how people think technology will change – like the evolution of voice commands.

Vera reviews the NIMBY box\(^1\) on screen so girls won’t have their computers used for rendering someone else’s projects while they are working. They need to keep the NIMBY program on and running in their task tray – Vera shows girls how to get to their “area” on any computer at ACCAD because they are all connected to a network that stores everyone’s saved information from the program.

Vera asks who draws, paints, does photography, ceramics – why do people do/make art? She talks about environmental art and artist’s personal connections to a place – not just because something is important, but also because it is important to them. VB shows how to get to the ACCAD website section on ... Artists and Social Change ... and explains how to use it. Selects Georgia O’Keeffe as an example and asks some questions about her and her work. There will be a Georgia O’Keeffe exhibit at the Columbus Museum of Art in the Fall that will juxtapose her paintings with photos of the actual places, There is also a list of Prairie Artists.

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\(^1\) NIMBY is the acronym for “not in my backyard.” This program protects the user’s networked computer from system-wide availability for processing, or rendering, of final animations. Computers being used by others for rendering perform tasks and run programs extremely slowly, particularly graphics-heavy ones like Maya.
For the next 45 minutes, groups ... choose an environmental artist to do a brief presentation about. On the website there is a list of 5 questions groups should address about each artist... Girls ...all begin searching online for info and writing it down, bookmarking pages. Franny tells her group members about helping each other – says “there’s always overlap in research.”

The girls are talking about themselves and their interests, particularly in areas related to computers and art.

[All groups do environmental art/artist presentations involving visual examples.]

Vera tells girls how to open the Maya program. She explains that Maya is a section of Indian philosophy meaning “illusion” and that it is a high-end animation program for modeling, rendering, and animating – that it is a big program. Vera begins explaining menu items, command icons, pulldown menus. Vera explains Maya’s complex file system.

She has students input a cone from the ‘Create’ menu and then use the ‘Alt’ key and left mouse button to look at the model from different angles (by tumbling the view)... Vera asks girls how good their math is and says Maya contains a lot of math underneath – she explains how the grid is a measuring unit. She also explains how the channel editor allows you to enter coordinate numbers to move the model directly. If you are modeling something that needs precision, math can be helpful. You can also use tools to rotate the models in channel editor. You can also use degrees to be precise with this tool... Vera shows how to reset the cone by setting the channel editor to 0, 0, 0. Vera also demonstrates how you can switch from world to object views as the center point in order to move object in different ways...

[After a 15-minute break, the next tutorial is figure modeling]

Ladybug Modeling

Vera shows the whole group the finished ladybug model to use as a goal... Vera also uses scientific names for the parts of a ladybug model – elytra (wings), pronotum (shoulders) and asks girls to describe primitive shapes in the ladybug. Vera shows girls how to select individual and group segments and delete. Vera explains Maya as 2-D illusion of 3-D. She names objects after creating them...

Vera uses a different way to create another sphere (again reviewing skills – math, graphing, radius). Francine ... asks a question about using the mouse to scale an object... Vera asks questions about how many degrees to rotate and around what axis...

Vera encourages girls to start creating the dots and anything else they want to for their ladybugs, using the appropriate colors, shine, etc... She models how to duplicate and invert images. She then reviews how to add color to the model. She assures girls it’s ok if their ladybugs have different sized eyes – that it adds character...

Maria does announcements for the end of the day. (ONY1, Day 1)

The National Art Education Association and the VCAE Advisory

In 2002, the National Art Education Association (NAEA) published an advisory co-authored and supported by a cadre of well-known art educators: Doug Boughton, University of Northern Illinois; Kerry Freedman, University of Northern Illinois; Jerome Hausman, School of the Art Institute of Chicago; Laurie Hicks, University of Maine; Stanley Majeda, University of Northern Illinois; Suesi Metcalf, University of Northern Illinois; Marty Rayala, Wisconsin Department of Education; Deborah Smith-Shank, University of Northern Illinois; Mary Ann Stankiewicz, The Pennsylvania State University; Patricia Stuhr, The Ohio State University; Kevin Tavin, The School of the Art Institute of Chicago; Elizabeth Vallance, University of Northern Illinois. This advisory was their attempt to clarify visual culture art education (VCAE), promote its acceptance within art education, and provide guidance in adopting and implementing a VCAE framework within the art education field.
VCAE arises from the swirl of interdisciplinary possibilities, poststructuralist and constructivist theories, and the expansion, or dissolution, of art boundaries. These scholars assert the need to acknowledge the presence, persistence, proliferation, and pervasiveness of newer media, as well as its impacts on contemporary lives and cultures, local and global (NAEA VCAE Advisory, 2002). These art educators recognize that visual culture provides multiple media for transmitting “information, ideas, and stories,” and “reflects and contributes to the construction of knowledge, identity, beliefs, imagination, sense of time and place, feelings of agency, and the quality of life at all ages” (NAEA VCAE Advisory, 2002). These beliefs create an “imperative to educate learners to interpret and create visual culture in ways that help them to understand the range of its forms, meanings, and purposes” (NAEA VCAE Advisory, 2002). Visual culture, from this perspective, becomes a critical tool for operating within an increasingly visual global environment. In order to assist learners in becoming critical visual culture consumers and producers, these VCAE advocates provide a set of six aims and six correlated pedagogical principles for art educators.

The 2002 NAEA Advisory on Visual Culture Art Education Aims and Pedagogy

Aims
1. To respond to the needs of contemporary learners in a society dominated by visual images and designed objects.
2. To enrich students’ knowledge, imagination, and cognitive possibilities, including in the emotional and kinesthetic realms.
3. To promote the critique and creation of images, artifacts, cultural sites, and public spheres as products and processes of mediation between people.
4. To promote an understanding of the value, diversity, and complexity of all of the visual arts as expressions of social and cultural issues, past and present.
5. To illustrate the power of visual culture in the construction of individual and cultural identities and environments.
6. To educate citizens who participate in a democracy through reflective and responsible interactions with visual culture.

Pedagogy
1. Focus on curriculum content that is conceptually based, interdisciplinary, and socially relevant through creating and responding to images, artifacts, and performances.
2. Encourage students to take responsibility for their learning under the guidance of a teacher who initiates experiences with a full range of visual culture.
3. Expand awareness and use of newer visual media and alternative sites of teaching and learning.
4. Engage the perspectives of artists who create a variety of forms of visual culture to broaden students’ imaginations and inform critiques.
5. Encourage learners to reflect on the relationship of visual culture to the construction of identity, the richness of global cultures, and the integrity of natural and human-made environments.
6. Assess student work using long-term reflective methods and criteria developed and refined by ongoing debate among stakeholders (including students, teachers, and community members) to determine the nature of knowledge acquisition and application. (NAEA VCAE Advisory, 2002)

This advisory is not mean prescriptive or didactic, instead it reflects VCAE’s philosophical underpinnings, many rooted in feminist and poststructuralist theories. VCAE encourages interdisciplinary, relevant curriculum; students as active learners; alternative media and educational sites; diversity; critical thinking; critical construction; and a sense of visuals in connection with identity and culture. VCAE also promotes evaluation as a critical, reflective dialogue between students, community, and educational
stakeholders. In the next sections, I pair VCAE aims and pedagogical principles and use them to analyze
Digital Animation case study data.

1. Visual Culture Art Education: Contemporary Learning, Conception, and Visual Culture

Aim: To respond to the needs of contemporary learners in a society dominated by visual images and
designed objects.

Pedagogy: Focus on curriculum content that is conceptually based, interdisciplinary, and socially relevant
through creating and responding to images, artifacts, and performances.

The first VCAE aim and pedagogical principle pair advocates attending to current cultural
environments and the resulting learner literacy needs. Citizens in societies “dominated by visual images”
need visual literacies to participate, actively and critically, in (visual) cultural discourse, as makers and
viewers (NAEA VCAE Advisory, 2002). Digital Animation embraces VCAE philosophies and practices
toward addressing contemporary learner needs. Both present learning, ideally, as an interdisciplinary,
conceptual, relevant, and applicable process. In practice, Maria Palazzi began Digital Animation to address
the dearth of women entering computer technology programs. Digital Animation attempts to provide a small
cadre of girls with access to contemporary technology and training in current, relevant visual technological
skills in computer animation and in technology more generally.

The short-term program aim is to use animation and art to give participants positive experiences,
self-confidence, computer technology skills, and awareness of and practice with sophisticated visual culture
technology. The beginning vignette catalogues lessons in performing specific animation tasks, such as
using the ‘Alt’ key and left mouse button to “tumble” an animation model to see it from different angles.
The participants also learn and practice more general technology skills, such as logging in, changing
passwords, locating information online, and visual presentation tools, like Powerpoint. The longer-term
program aim is for more women to pursue technology education and careers and remain there, supported by
a network of women. Maria Palazzi firmly believes that changing stereotypical impressions of computing
and technology can draw more women into the field, and that women’s perspectives and approaches to
technologies will increase and improve the possibilities for using and creating future technologies.

Many other details in the observation data above demonstrate how Digital Animation’s practice
matches the first VCAE pedagogical tenet. The how Digital Animation program emphasizes conceptual
aspects of learning, both in terms of content and application. In the beginning vignette, Maria introduces
theoretical reasons people create art and ways art can function as a conduit for social awareness and
change. Palazzi sees these as core conceptual concerns. She discusses concepts like the differences in 3D
and 2D animation and their uses. She structures the two-week program around creating topic-based
conceptual projects. The topics are specific enough to provide groups with direction but broad enough for
participants to employ wide creative license in creating end animations. This larger conceptual orientation,
toward skills and content, invites the kinds of interdisciplinary pedagogy VCAE encourages.
Additionally, *Digital Animation* uses visual culture as a medium for deliberate interdisciplinary learning. Palazzi wants participants to see purposeful application for abstract scholastic skills and knowledge. She wants young women not to feel excluded, intimidated, disinterested, or uninformed technology fields. As a result, the program staff continually emphasizes interdisciplinary academic connections, applicability, and possibilities. Above, Vera asks the participants directly about their skills in Math then proceeds to discuss how Maya, an artistic animation tool, uses mathematical concepts as its organizing structure. 3D animation requires an understanding of 3D space that allows for specificity of location, shape, and movement of scenes and figures. Geometry is foundational to Maya: the grid, the channel editor, the shapes used as basic animation building blocks. At the end of the tutorial, Vera specifically reviews “math, graphing, [and] radius” concepts, including locating, scaling, and rotating objects in Maya.

Science also plays a prominent role in program curriculum. One program purpose in Year 1 is to use animation to “encourage preservation of the prairie,” so groups spend most of the first morning choosing and researching environmental artists, culminating in short group presentations. Vera emphasizes science connections through her deliberate use of scientific terminology and concepts. Vera emphasizes science connections, explicitly incorporating biology and anatomy in her Maya modeling lesson, deliberately using specific scientific terminology for the ladybug’s body components, such as elytra (wings) and pronotum (shoulders). Vera also blends Math and Science as she guides participants to use mathematical tools and formula to create scientifically sound ladybug models.

The use of art, or visual culture, as the program’s curricular medium emphasizes its value and importance as an interdisciplinary connection. Digital visual media foster visual construction, representation, demonstration, and application of knowledge from most disciplinary fields. Visual culture as art and artistic process are the curricular cornerstones of *Digital Animation*. The first day starts with Maria, and later Vera, introducing the concept, the puzzle, of “why people make art,” especially environmental art. Vera explains how environmental artists, like Georgia O’Keeffe in the Southwest and prairie artists in the Midwest, often have “personal connections to a place.” She also asks participants about their own artistic experiences, “Who draws, paints, does photography, ceramics?” In this program, art counts as visual culture, too. Modeling the ladybugs involves many artistic processes, purposes, and choices. Participants create individual variation in the size, shape, and appearance of their ladybug models. Vera encourages their individual artistic creativity, urging them to “start creating the dots and anything else they want to for their ladybugs, using the appropriate colors, shine, etc…” Vera assures participants that their individual aesthetic decisions, like “different sized eyes,” “add character” to their models. Participants begin to think artistically, becoming more deliberate and adventurous in their choices. The groups will use 3D digital to communicate information and provoke people into action. Palazzi wants participants to see their academic and creative skills as important, relevant, interconnected, and meaningful (MP, PC, Y1, Y2).
Maria Palazzi also envisions the summer program as an intervention into the culture, perception, maintenance, and results of the masculine culture of technology. She believes the dearth of women in technology limits its applications, access, dissemination, and possibilities (MP, PC, Y1). Palazzi uses a multi-pronged approach to address this lack of women: using the arts as a way to interest young women in technology; giving these young women positive experiences and the knowledge and skills to use sophisticated technologies; using technology as a tool for meaningful impact; demonstrating interdisciplinary relevance, particularly of Math and Science; being connected to a support and mentor network; and having the confidence of being able to succeed with, and even enjoy, technology. This whole first day reflects the participants’ progress toward learning and using technological skills to produce socially relevant, environmentally aware, and locally significant visual culture. The participants become more cognizant of the power of visual culture and their ability to create, manipulate, and question it. In the introductory example, the participants learn how some artists use their work as a way to educate, confront, and motivate viewers. They learn the significance of using technology and visual culture as tools of social change, modes of communicating about things important to them. In this program, the participants learn to create images, produce ‘artifacts,’ and perform. The program also aims to have participants critically respond to visual culture.

Although not present in the observation notes above, Maria Palazzi regularly notes her desire for the participants to spend a portion of time at the end of each day formally reviewing and critiquing their work. She expresses disappointment that this does not happen officially in Year 1 or Year 2 (MP, PC, Y1, Y2). Palazzi believes instituting specific time for critical review and discussion of the animations would ensure more depth, accuracy, and meaning in them.

The participants do incorporate and reference other visual culture within their animations as a form of response. All groups use music and sound in their animations. Some also include references and appropriations to pop culture: James Bond movies, a children’s book, music videos, Oprah, and the horror genre. These visual culture techniques of appropriation and reference, without prompt, demonstrate the level of participants’ knowledge and familiarity with them, as well as their facility adapting to and using visual culture. In contrast, they spend little time critically exploring the nature, reasons, and outcomes of employing these media and techniques. In the observations notes, Vera provided a quintessential portrait of how opportunities to explore visual culture critically go untaken. She explained that the word Maya, the name of the animation program, derived from “Indian philosophy” and means “illusion.” She does not discuss the significance of using cultural terms or philosophical concepts for product naming, or its obvious associations with the sophisticated native empire in Mexico and Central America. Instead she focused on Maya as a high-end, complex tool for creating the illusion of 3D objects, figures, and actions. Perhaps pursuing these opportunities for more critical investigation into visual culture would lessen the time available for learning to produce visual culture using technology. Perhaps pursuing them would increase
participant awareness and deployment of visual culture tools and techniques, further merging the pedagogical ideals of VCAE and *Digital Animation*.

In the next section, I present and analyze the second VCAE aim and pedagogy set as applicable to *Digital Animation* case study data. This first pair stresses the value of relevance in learning for people who function in visually saturated cultures. The second set proposes teachers guide students through intellectual, emotional, and experiential encounters with multiple visual culture media. Through this process, teachers support students in becoming autonomous, active learners able to critically examine and produce relevant visual culture.

**2. Visual Culture Art Education: Student Possibilities and Guidance**

*Aim:* To enrich students’ knowledge, imagination, and cognitive possibilities, including in the emotional and kinesthetic realms.

*Pedagogy:* Encourage students to take responsibility for their learning under the guidance of a teacher who initiates experiences with a full range of visual culture.

The second VCAE aim and pedagogical principle pair encourages teachers to guide students in becoming autonomous learners, increasingly responsible for their personal intellectual, emotional, and experiential enrichment. Teachers help students locate visual culture resources across multiple media, introduce students to new ideas, information, technologies, experiences, interpretations, and possibilities. Teachers in VCAE challenge students and themselves, posing problems and addressing issues with no easy or clear answers.

My observation notes from Year 1 and Year 2 highlight the Motion Capture (MoCap) lab’s relevance in terms of guiding students to and through a new technology. In an earlier section, I use MoCap observation notes from Year 2 to discuss subjectivity as important within both feminist poststructuralist pedagogy and VCAE. In the following sections, I examine how instructors, staff, and mentors guide participants through learning about and using MoCap, a new digital technology, in creative, active ways.

**MoCap in Year 1**

*Franny’s group goes with Vera to the MoCap lab. MoCap is short for motion capture, which is the process of digitally capturing, or filming, reflective balls attached to a moving figure across time. Vera explains the overall idea of MoCap and how animators use it to create realistic motion much faster than they could by manually animating it. In effect, a software program allows animators to translate the reflective dots into a stick figure shape. This figure roughly mimics actual motions, creating a moving skeleton that animators can use for pre-existing characters.*

*Vera explains how the suit and cameras work. She also explains how they will have 30 seconds for performing and names the 3 roles/tasks for people – performer, director, and operator. Caitlin and Nichole rock-paper-scissors to decide who is the operator. Vera explains their roles and the procedures.*

*In the control room, Brandon shows a previous group’s activity from yesterday to give the girls ideas of what has been done and what they can do in the lab. Lauren goes with Vera to put on a MoCap suit, a black, skin-tight body suit. Caitlin and Nichole ask Brandon some questions about what props they can and can’t use (like the rolling chair being off limits). Vera then has Nichole and Caitlin help her with removing the tape from reflective balls while Laura*
Laura needs help, so Nichole goes to assist her. Vera tells Laura she can walk around in the lab to see if her socks will be slippery on the floor. Vera works with Laura to put reflective markers on her suit. Vera updates Nichole and Caitlin and they come to help finish putting/taping reflectors onto Laura. Vera explains how the reflective markers need to stay on during movements and not fall off. (I wonder why Nichole isn’t receiving some training during this to be the operator instead of waiting until after Laura is ready.)

Nichole will be the [MoCap recording] operator. Brandon explains the software they’ll be using and how to manipulate the controls. He then has Nichole click a button and shows her how to get to the starting point for doing a T-Pose. Brandon describes how to start with a T-pose and then what to do for the actual motion capture session. Brandon tells Vera they’re ready. Vera gets Laura ready for the T-pose. Brandon shows Nichole how to zoom in and assign markers, but he does it all himself. Brandon troubleshoots a missing marker and corresponding digital image. Brandon also explains more about the software, then he has Nichole take over the system. Brandon and Nichole are ready, so Vera coordinates the start. Caitlin rides the “horse” while Nichole chases and whips, jumps on the trampoline, etc... The group stops to watch what they’ve recorded so far. Girls decide they like this, so Lauren goes to take off the suit. Brandon saves the work on the computer. Vera explains that Brandon will now “clean up” the data to speed up the animation process. (ONY1, p. 34)

Later in Year 1, on the last day:

Vera is going to let the girls work on the Motion Capture data. Vera asks girls to “Start your engines” – to open Maya - and tells them where to locate the MoCap data on the server in specific folders. Vera shows how to open the file and a few things to look at – shows how the Maya grid relates to the MoCap data, where the markers are, and shows how to view the data from different angles. Vera shows how to begin modeling using “nerve surfaces.” She also explains what Maya does with markers it can’t see (“artifacts”) – it just puts them somewhere that makes sense. Vera shows another example – where Soki runs outside of the MoCap filming area and the software makes it look like the dots representing Soki’s body explode. What happens is the software program connecting the dots into a skeleton has no movement or connection to translate until Soki returns. Her sudden exit leaves the computer with no data and results in the skeleton evaporating and the reflective dots flying off like loose sparks.

Vera opens the third MoCap data set of Annie galloping on a horse (bouncing on a big ball). Francie’s group returns and Vera quickly catches them up to where the whole group is. This takes a few minutes and Vera goes to Francie’s group and shows them how to do the nerve surfacing part.

As Vera gives additional important information, the girls help each other color the plan and get ready to “playblast” the MoCap animation and learn how to make it small enough so they’ll be able to burn CDs of the scenes in the afternoon. I can see that Emily is moving ahead already and modeling the invisible trampoline into the MoCap scene. (ONY1, pp. 34 - 35)

MoCap also enriches participants’ visual culture experiences in Year 2. The filming process closely resembles that of Year 1. On the last program day in Year 2, Vera again leads all the participants through opening and modifying MoCap data:

Vera explains to the girls how to find the data to use. She shows them the generic data files and talks about the MoCap walking files done by a theater professor in miming. The girls begin finding the files. Alyse is working with Tonya again. Vera asks for volunteers from the MoCap activity to use their file. Alba volunteers first, but many volunteer hands shoot up. Vera shows how it works. The girls start playing with and examining the files. Vera talks about the effects of different kinds of walks (how leading with
Vera then returns to the Alba file. She checks to see if the girls have picked the file they want to use. She then gives the girls a couple of minutes to choose and the girls begin scrolling through and looking at some of the choices. Vera tells the girls to ask permission before they use someone else’s walking file from the class. Then she opens Photoshop and shows [participants] where their headshots are from when Kathi took their photos in the hallway. Vera talks about how the faces will be distorted as they map them onto the spheres/heads of the figures. She compares this to looking in a funhouse mirror. (ONY2, p. 49)

The National Art Education Association’s “Visual Culture Art Education Advisory” (2002) positions teachers as guides helping increasingly autonomous students learn about, imagine, find, experience, and work with a wide variety of visual culture. Digital Animation obviously embraces this holistic approach to learning. In the two examples that follow, I use observational data to consider further ways Digital Animation pedagogy and practices match VCAE pedagogy and aims. I also consider complications and tensions around pedagogy and practices between Digital Animation and the 2002 VCAE Advisory.

The MoCap observation notes clearly depict adults guiding program participants in navigating another component of the program’s wide range of visual culture technology. Each year, mentors and an instructor accompany self-selected groups of girls to the MoCap lab. Vera gives participants foundational information as she introduces them to new visual culture and technology. She explains the MoCap lab and its uses, assisting directly as necessary, like helping Laura don a MoCap suit and working with Nichole and Caitlin to attach reflective markers to it. Participants assume different roles in the MoCap lab – performer, director, and operator. Assuming these new roles increases participants’ autonomy and range of experiences. Brandon, a graphic research specialist and the MoCap manager, explains the software, demonstrates how to use it, provides examples, offers guidelines, and troubleshoots a problem. In the early observation notes, he tells the participants what he is doing as he does it, positioning them as passive observers instead of active learners and participants. Later in the lesson, Brandon does have the participants increasingly assume the motion capture roles and duties (ONY1, p. 31). How do participants experience these new visual culture technologies?

The instructors, mentors, and other Digital Animation staff invite, encourage, instruct, and support participants in discovering, exploring, and experiencing a very wide range of visual culture. Participants initially use more traditional and familiar visual culture media like paper, markers, crayons, pencils and pens, music, and photography. Later they add Photoshop for digital image creation and manipulation, Final Cut Pro for polishing sound, the internet for research, digital duplication for sharing information, Powerpoint presentation software, and minor word processing skills for writing and organizing ideas for presentations and animations. The Maya 3D animation software is the program’s focal visual culture technology. In Year 2, participants also get to experience ACCAD’s newer virtual reality (VR) technology, wearing VR glasses and navigating imaginary surroundings. Both summers, as detailed above, participants see and use the cutting-edge MoCap lab and technology. Formal instructional sessions include background
information, demonstrations, and hands-on practice with many available ACCAD technologies. Mentors and participants drive the use of multiple technologies to achieve different visual effects and streamline animation and modeling tasks, like using MoCap data to create a skeleton, or the “rigging,” for a walking figure and then adding digital photographs to the fabricated head to create an approximation of a 3D person. Participants work in groups to address different components relevant to and impacting local environmental sites. Groups have wide autonomy over their animations, but individual group members also retain a high level of autonomy. They collaboratively create storyboard animation outlines and decide common needs. Groups divide tasks and participants enjoy a wide degree of personal freedom to create individual objects, environments, and animation segments.

VCAE positions teachers as guides who initiate experiences with a full range of visual culture. In these MoCap examples both instructors do this, with varying degrees of participants’ direct technology involvement, contact, and use. Vera works collaboratively with participants in their MoCap experience. Brandon demonstrates and narrates as he performs the operator role in the Year 1 data, explaining the tasks and informing participants “how to start with a T-pose and then what to do for the actual motion capture session,” but he fails to allow Nichole, as the operator, to do the tasks. Instead, “he does it all himself” (ONY1, pp. 31 – 32). After completing these tasks, “he has Nichole take over the system.” Although the observation notes do not specifically state this, Nichole performs no tasks as operator during the MoCap session (ONY1, pp. 31 – 32). After Brandon completes the initial operator tasks, the MoCap cameras film automatically until the session ends, when he “saves the work on the computer” to clean up for later participant use (ONY1, p. 32). In these examples, the participants get guided exposure to these technologies, but there remain specific situations, such as with Brandon, where instructors show and tell more than they guide. These experiences are still important and meaningful within a VCAE framework, but their use should be tempered with active, firsthand use, encouraging autonomy and skill.

Digital Animation aims to increase participants’ knowledge of visual culture technology, their technological skills, critical thinking, and creativity. In the MoCap notes, participants learn what motion capture technology is, how it works, and some of its uses. New technologies at ACCAD expand participants’ sense of possibilities and encourage their imagination. The Year 1 observation notes reference Brandon’s use of previous MoCap examples but omit his mention of working with renowned dancer and choreographer, Bebe Miller, to create 3D digital data files of her work. In the Year 2 data, Vera uses MoCap walking files by a theater professor in miming, and discusses “the effects of different walks.” Participants note how bodily motion communicates purpose and feelings and how to apply this information to animation.

Digital Animation also emphasizes the kinesthetic and emotional aspects of learning. Maria Palazzi wants young women to be self-confident as well as technologically competent; she wants them to see themselves as capable and smart and see technology as intellectually accessible, teachable, and meaningful in their lives. As noted previously, Maria emphasizes direct participant access to and use of
expensive, high-tech, professional technologies to counter the typical gendered distribution of technology resources that often marginalizes, or excludes, women (MP, PC, Y1). In the MoCap experiences, participants use previous examples as creative stimulation for performing kinesthetic movement to be captured. Body and technology unite, expanding possibilities. Although participants cannot directly experience every aspect of using ACCAD’s visual culture technology, and problems still exist around who performs what roles and tasks, Digital Animation provides exposure and guidance with top-notch technology. The program also guides participants in learning new skills and information, using them creatively, and critically considering alternative possibilities, all while attending to and supporting participants as unique, holistic individuals.

In the next section, I analyze the relationship between the third VCAE aim and pedagogy combination and Digital Animation data. I build on learner autonomy as a springboard into concepts of learner empowerment, critical analysis, response, and action. I also argue for the value of alternative media and educational venues using case study data for evidence of the benefits from expanding the boundaries of art and art education to include all forms of visual culture as forms of mediation. I consider the Digital Animation data in terms of how exposure and experiences with a wide range of visual culture media expands learners’ educational opportunities and future possibilities.

3. VCAE: Media Communication, Skills, and Locations as Factors in Education

Aim: To promote the critique and creation of images, artifacts, cultural sites, and public spheres as products and processes of mediation between people.

Pedagogy: Expand awareness and use of newer visual media and alternative sites of teaching and learning.

The third visual culture aim and pedagogical principle coupling promotes dissolving traditional hierarchies and exclusionary categories with regards to Art. VCAE encourages the critical study and construction of any and all things visual or visually connected – objects, places, interactions, ideas, and media (Anderson, 2003; Ballengee-Morris & Stuhr, 2001; Bolin & Blandy, 2003; Duncum 1999, 2000, 2001, 2002, 2003; Elkins, 2003; Freedman, 2000a; Freedman & Stuhr, 2004; Tavin, 2000, 2003, 2005, 2006). Subsequently, VCAE expands educational sites to include alternatives to traditional classrooms and programs. Visual culture exists as an expansive and open-ended category. In traditional western Art, artistic forms include drawing, painting, and sculpture; traditional art venues accommodate and elicit these forms. These traditional forms count as visual culture, but visual culture also includes all visuals as viable content, including newer media. VCAE encourages the field of art education to adopt a more expansive, non-hierarchical approach to media and possible educational sites. VCAE asserts the need for art education to include more popular, more diverse, and more contemporary visuals, voices, and cultures instead of relying on the western canon (Anderson, 2003; Ballengee-Morris & Stuhr, 2001; Bolin & Blandy, 2003; Duncum 1999, 2000, 2001, 2002, 2003; Freedman, 2000b; Freedman & Stuhr, 2004; Tavin, 2000, 2003, 2005, 2006). Western canonical works are not excluded; instead, they serve as one of many genres, or set of
resources, for critical investigation. Likewise, museums, galleries, classrooms, textbooks, and slides are not invalid educational venues; all sites and interactions hold educational potential.

In terms of considering alternative educational sites, this aim and pedagogical principle set recalls the earlier discussion of VCAE and feminist poststructuralism intersections. Both theoretical orientations advocate expansive views of possible sites and media for teaching and learning. The earlier list of alternative sites includes ACCAD itself, the Fishbowl classroom, other computer workrooms, conference rooms, and the MoCap lab. Outside ACCAD and its university setting, the Ohio prairie and the Big Darby Creek watershed serve as non-traditional educational environments. At the Big Darby Creek, educational sites include the naturalist’s office, the outdoor creek classroom, the creek, and the picnic area, even the bus. Digital Animation capitalizes on the interest, rich meaning, and significance of alternative educational sites and newer media. In the observation notes below, I sketchily capture the Year 1 trip to a prairie site:

**Program Day Three**  
**Wednesday, June 23rd, 2004**

**9:00 a.m.**  
There are a few girls [at ACCAD] already with a couple of mentors (Franny, Kathi). Franny chats with the girls and then leaves the girls alone to chat among themselves. They begin entering the bus on their own and filing into the rows from back to front.  

**9:20 On Bus Leaving**  
This is the first time I’ve seen any group of that age left virtually unsupervised. No real rules were ever explained. This is the first group I’ve ever been with that hasn’t had any rules or expectations explained before a trip. They even stood in the hall and waited when unsure, then came outside and stood until I said we could get on the bus. On the bus they voted to watch The Pirates of the Caribbean versus the animated videos pitched by Franny as “cool” and “never before seen.” The girls watch the movie quietly; the mentors and staff do, too.  

**10:30 Arrival at Prairie**  
Everyone gets off the bus to take a bathroom break and apply sunscreen and insect repellent. We all then walk to the shelter, sit at the tables, and do introductions with the prairie staff. The staff members prepare the groups for a tour of the prairie – they break the whole group into two parts by separating according to mentors. Hu and Franny go with Emily.  
The groups walk around the prairie for about 1 hour. Then they return to the shelter for lunch. The girls mostly sit in their groups and the mentors spread around, pleasantly chatting. Bree [a participant] is at a table with me, Maria, Kelly (a teacher). Maria and I work to engage her in conversation. I’m concerned about her integration.  

**12:45ish AFTER LUNCH STORYBOARDING**  
The girls get into their groups to start discussing and starting to sketch out loosely their storyboard ideas. All girls seem engaged in this process – even Bree is working with her group and offering ideas. Mentors facilitate the discussion within their groups and help keep ideas flowing and keep moving through the storyboarding process. The mentors discuss specifics of their storyboarding process and then what steps will come next. They have very positive interactions with their group members (“That sounds good.”).  

**1:15**  
Hu & Sabrina’s groups get digital cameras and go take photos. There is a seamless process of brainstorming, then selecting, then fleshing out and developing ideas for their stories and animations. The mentors seem to be working to keep the flow of ideas constant while facilitating group discussion, input, and choice. The mentors are quick to incorporate, modify, and even recognize and appreciate ideas that are impractical (Franny says, “Well, that would be pretty difficult, but if you really wanted to animate that, we could try.”). There is some division of future tasks while groups are working.
Mentors probe for kinds of details the girls might want to include (What would this part of the prairie look like? “Is this a low-angle shot?”

2:00

Groups come back to the shelter. Maria gives instructions to clean up trash, thank Emily and the other leader, thank Aline (to applause for the meals), and how to leave. (ONY1, pp. 23 - 24)

These observation notes exemplify Digital Animation’s use of alternative educational sites, informal and experiential educational approaches, and the use of newer alternative (visual culture) media. Maria Palazzi leverages institutional, educational, and community resources to support young women working with new digital technology across multiple alternative educational sites.

The observation notes contain several specific, non-traditional educational sites. On the field trip, the first alternative educational space is the bus. The audiovisual system enables participants to watch a current example of visual culture as they prepare to create their own visual culture representations of what they learn, what they want to communicate to others, and how to communicate it. The prairie is on an Ohio State satellite campus. We drive through this campus, very different from the Columbus one, around to the prairie area. The prairie itself is another alternative educational site, as well as the shelter house and the surrounding campus environment. Participants tour and investigate the prairie; the shelter house serves as a starting point and as a reference point for exploring and returning to work with the information they gather. The shelter also serves as a base for program supplies, lunch, and group work.

The informal and collaborative interactions also serve as alternative sites for teaching and learning. This informal education includes networking and building social connections, brainstorming, collaboration and discussion, and working in less hierarchical and more egalitarian ways. In these episodes, staff members interact casually with the young women. Several adults work to engage a somewhat distant participant, building on her comments and interests as much as possible. Franny, a mentor, chats with a group of the participants then leaves them to chat with each other. She makes herself available to the participants, shows interest in them, and instigates connections and interaction, and also values their independence. Other mentors also interact easily with the participants, spreading among them and “pleasantly chatting.” Introductions with the two prairie staff reinforce a sense of community, community comprised of valuable individuals. Introductions and easy conversational interactions contribute to an educational site and environment where collaboration is the norm in discussions, planning, decisions, creation, and revision. The sense of community also teaches respect and responsibility. The participants receive no specific instructions or rules for the trip, but they enter the bus and fill it orderly, “filing into the rows from back to front” on their own. They assist in cleaning up at the end of their trip and thank the prairie guides and ACCAD administrative assistant. These actions may seem insignificant, but they operate as informal educational sites and channels for reinforcing respect, gratitude, and duty.

Digital Animation and VCAE pedagogy both value newer digital (visual) media and technologies. Participants experience and use a large variety of newer media throughout the two-week program. The range of newer media in the Ohio prairie field trip began with watching and discussing a contemporary
movie, *Pirates of the Caribbean*. Although not specifically detailed in these notes, the main topics of the critical viewing discussion included the prevalent use of computer-generated (CGI) special effects and the actors in the movie. The movie itself served as a common text for discussing the pervasiveness of technologically manipulated imagery, the skill and training involved in doing this kind of work, and the visual culture aspects of how people in movies look, both in character and everyday. We investigate issues like who in the movie is hot? Who is a good actor? Who looks really different in their role from how they look in real life? Who has been in previous movies? What looks appealing to us, culturally? Again, maybe the discussion appears shallow, but the issues involved are critical to investigating visual culture. The participants chose to watch the *Pirates* movie many of them had seen instead of a more edgy, less familiar set of animated videos. This choice may reveal a desire to begin explorations within a familiar context and with familiar visual culture media, even if something new might be “cool and never before seen.”

Digital cameras are another form of specific newer media participants use during the prairie visit. There are still and video cameras for groups to use. Most participants feel comfortable with digital cameras and almost everyone takes a turn using them. The use of newer digital photography media facilitates participants’ engagement in documentation as a form and record of learning. The sheer number of digital photos a memory card can hold, and the ease of transferring and deleting them, renders traditional modes of photography cumbersome by comparison. Participant digital and paper images create a trail of artifacts, they represent ideas, possibilities, critical thinking, and technology literacies involved in the process of developing animations. Groups also use digital photos in their later animations, forming a bridge connecting familiar kinds of media and skills with newer kinds of media and skills.

This pedagogical push for expanding awareness and use of new media and alternative sites for teaching and learning correlates with the aim “to promote the critique and creation of images, artifacts, cultural sites, and public spheres as products and processes of mediation between people” (NAEA Advisory, 2002). *Digital Animation* uses computer animation as the central medium, product, and process for communicating information and catalyzing change. The program promotes the creation of images in order to learn digital media skills and as a critical component of cultural discourse. This skill and access acknowledges participants’ “authority” and “voice” (Maher & Tetreault, 1994) to become active, critical knowledge producers. The animation skill and technology confidence provide these young women with access to new cultural sites and public spheres for communicating, including the internet and digital duplication and distribution. Their animations document of what they learned, what they chose to communicating, and how. The end goal in using this medium is to communicate between people, to allow creators and viewers access to information and multiple possibilities of meaning-making.

In Chapter 3, I analyze the importance of newer media forms and venues in increasing accessibility to knowledge creation and distribution for marginalized populations, particularly women. In *Digital Animation*, the young women use industry standard graphic arts technology to create animations about local environments. These animations are available to a virtually unlimited audience online. How
else could adolescent girls communicate powerful, direct messages to a wide audience? Digital media and technology make these venues more affordable, accessible, and usable for a much wider population. VCAE should consider ways to incorporate these newer media and analyze the processes, products, and multiple perspectives involved in creating any “images, artifacts, cultural sites, and public spheres.” In the following section, I further explore VCAE’s commitment to diversity and complexity, in terms of media, creation, intention, and interaction.

4. VCAE: Diversity, Complexity, Multiple Perspectives

Aim: To promote an understanding of the value, diversity, and complexity of all of the visual arts as expressions of social and cultural issues, past and present.

Pedagogy: Engage the perspectives of artists who create a variety of forms of visual culture to broaden students’ imaginations and inform critiques.

The fourth 2002 VCAE pedagogy/aim pairing emphasizes diversity and multiple perspectives as well as complexity, criticality, and creativity. This pair reiterates the VCAE commitment to the inclusion, appreciation, and critical examination of all visual (art) forms. Digital Animation’s pedagogy and practice reflect similar commitments. Each program includes a wide range of visual artists, their work, influences, and experiences as well as some of the works’ social and cultural meanings and relevance. Mentors share their artistic interests and experiences with participants, from dance to glass to animation. Posters from popular animated films line the main walls around the Fishbowl, signed by former ACCAD students. During arrival the first day, animated shorts play on the front screens in the Fishbowl, several with strong environmental themes, like Henry’s Garden (2002).

The groups’ introductory computer task involved electronically researching environmental artists and art, followed by short group presentations. Most initial Digital Animation activities encourage the participants to expand their ideas about possible art forms and potential topics. They also provide grist for participants’ creativity and expand their basis for critical comparisons, evaluations, and responses. The program explores award-winning international animation shorts, contemporary animated and Computer-generated Image (CGI) enhanced feature films, internet and digital artwork, site-specific environmental installations and performances, photography, paintings, wildlife artistry (the current term for taxidermy, as the goal is to re-create aesthetically pleasing, life-like ‘sculptures’ of dead animals, usually killed through hunting or trapping), and others. The artists are male and female, American and international, socially and aesthetically concerned, and they create visual culture that is beautiful and ugly, literal and abstract, critical, celebratory, culturally bound, and complex (ONY1, Day 1).

This pedagogical thrust supports the VCAE aim of encountering, understanding, considering, and valuing the social, cultural, and historical aspects of visual culture. Digital Animation provides for participants to experience and explore a range of current visual culture in the course of learning technology skills. Digital Animation rests on the premise technology and digital visual culture skills are valuable for artistic, social justice, and commercial uses. Parents clearly indicate their value of exposure to a variety of
forms of visual culture and technology as meaningful to the participants and influential in their future choices. Parents appreciated their daughters’ fuller “awareness of careers in the area of digital animation” and the exposure to “new technology and techniques” and “classes of programs in the field.” One parent praised Digital Animation for “broadening [participants’] horizons in the computer and technology fields” and concluded, “Thanks for opening her eyes wide!” (Parent post-survey 05). Other parents support and value the premise that Digital Animation encourages future technology engagement, with one commenting, “I know this will be a base that she will continue to build on” (Parent post-survey 05).

Participants also eagerly share their own self-cultivated appreciation for diverse visual culture forms and artists. During Year 2, several participants express interest in anime and install anime backgrounds as their desktop wallpaper. In an interview, Jascie confesses she likes to draw anime and wants to work at a Media Play store “because the employees get a 30% discount, except on game systems, and they have an anime section, which is the main reason why I go” (Jascie, INT, Y2, 3:00). She later tells me, “My sister gave me a book about how to draw Manga – they sell them at Media Play, too. You can buy books of how to draw characters. It really does help. You can get tips online, too. I like it that you can get a career out of doing anime. That’s really cool” (Jascie, INT, Y2, 3:00).

Another participant, Tasha, tells me she likes drawing anime, too. Her influences are more specific, though. She declares, “I wanted to be an animator since I saw the movie Spirited Away by Miyazake. He’s a famous Japanese animator. Have you heard of him?” She notes differences between his work and the work of other animators and traditional artists, expressing a sophisticated, critical knowledge of the genre: “His movies are detailed and the backgrounds are just paintings. [The animators] don’t do any digital work. Well, the paintings might be scanned in” (Tasha, INT, 03Jun05, 2:10). Tasha believes Digital Animation will help her develop her own anime, by expanding her knowledge, experiences, skills, and possibilities. Other participants also mention Miyazake’s work as inspirational, beautiful, and fascinating; one calls him “my idol.” They explain how his movies deal with serious issues and are very culturally located in Japanese history and mythologies while being exquisite works of art.

Alyse, a mentor studying computer design and minoring in Japanese, connects with interested participants. She shows them her online portfolio of anime computer and freehand drawings. In conversations, Alyse commonly makes connections to her knowledge of Japanese culture and animation, as well as discussing her upcoming extended trip to Japan (ONY2). These discussions encourage her group members, and other participants, to share cultural and personal connections and consider alternative methods and expectations for expression and communication.

Other participants list additional diverse artists, visual culture media, and other influences. Anna acknowledges:

I wasn’t a huge Maya Lin fan at first. I wasn’t into designing until a Language Arts project to find a job and write a report on it. I was looking up fine artists when I realized they don’t really make much money. So then I thought, well, I still considered it, but took another quiz on a site designed to give ideal jobs. I got Fashion Design – not my thing – and Interior Design and Industrial Design. I opened Industrial Design and liked it. (Anna, INT, 30jun05, 12:15)
Her comments reveal not just artistic, visual, and cultural influences, but also economic concerns. This new media/field leads her to Maya Lin, an Asian American artist and designer best known for her Vietnam Veterans Memorial (1982) and Civil Rights Memorial (1989). Ajda’s research about Maya Lin included finding images and looking at information on her other works, too. She tells me about “Eclipsed Time” (1994), a work “where when the sun is in a place, the image is full, but when it moves, it creates a kind of eclipse. It’s really neat – the precision and simplicity.” Works like these lead Anna to admire Maya Lin and consider her “really cool” (Anna, INT, 30Jun05, 12:15). Other participants often express their new interest in digital animation and movie making. As Dale notes, “After this, I kind of want to do the movie thing, too. That’d be cool. You make it and then you watch the movie and then everybody sees it, and it’s like, ‘I did that!’” (Dale, INT, 30Jun05, 2:05).

The participants also recognize the diversity and complexity of the range of contemporary digital visual culture media and their sociocultural communications roles. In a section of our interview about gender and computers, Anna asks if I know anything about online journals, like Xanga and Livejournal, and tells me she “knows tons of girls who have these online journals – can’t think of 3 who don’t.” She notices and acknowledges gender discrepancies in technology use. She “doesn’t know a single boy” using any of the online journals (Anna, INT, 30Jun05, 7:15). During the wrap-up week after the program, Digital Animation staff discuss their desire to continue increasing the kinds of visual culture included in the program. Maria wonders:

Would it be good to show [the participants] different computer programs? What if we said for two weeks we were gonna build a game? Or create a performance using technology? This is another area where you could go. Is it possible to offer more than one of these options at a time and let the girls choose? Maybe there could be three groups of girls that choose. (Mentor Meeting Recording, Post-program, 6Jul05, 10:37, 38:38)

The mentors discuss Maria’s ideas and think about ways to expand the scope of the program, to “expand their sense of technology beyond movies, to see its diversity – not as this tiny thing, but broad” (Mentor Meeting Recording, 6Jul05, 10:37, 38:38). Everyone acknowledges animation technology “can do so much more” than narrate a story, and they discuss how Digital Animation might work with a core group of participants across four years. How would this extended experience expand their awareness of visual culture and technology uses and possibilities (Mentor Meeting Recording, 6Jul05, 10:37, 40:05)?

VCAE promotes all visual arts and their value as social and cultural expressions, but Digital Animation expands farther. Digital Animation encourages investigating spaces and media in more than visual ways. By the end of Year 2, Palazzi explicitly recognizes the importance of music and sound in the animation process and final products. All their animations include audio selected and edited for specific effects. Maria also expresses surprise at how many of the girls are also in band. She hints at eventually trying “to explore the connections between visuals and music,” and the mentors respond excitedly to this possibility (Mentor Meeting Recording, 6Jul05, 10:37, 1:08:15). In this way, Digital Animation expands its media to include non-visual components and staff wants to investigate the blending of media forms and the complexities of these interactions.
The VCAE 2002 Advisory presents a framework for melding visual culture with art education to acknowledge, include, value, understand, and consider diverse art forms in social, cultural, and temporal terms. Including diverse art and artists’ perspectives also increases creative and critical possibilities. In the next section, I build on this framework to examine ways Digital Animation reflects and contrasts VCAE tenets around visual culture and its influences on identities, cultures, and environments.

5. VCAE: Power, Identity Construction, and Subjectivity

**Aim:** To illustrate the power of visual culture in the construction of individual and cultural identities and environments.

**Pedagogy:** Encourage learners to reflect on the relationship of visual culture to the construction of identity, the richness of global cultures, and the integrity of natural and human-made environments.

This pedagogical principle and aim set stresses active learner awareness and consideration of ways visual culture sculpts individual and cultural identity, as well as ways it constructs environments—individually, locally, and globally. VCAE positions learners as active agents capable of becoming more enlightened and critically aware and, consequently, behaving in alignment with their new perspectives, although this is not always the case. Women may believe their absence in technology fields is problematic, but not all women who believe this will enter or remain in technology, regardless of the financial, social, or creative benefits.

Eisenhauer (2004) cautions art education about the seduction of replacing one hierarchy with another, using the *girl/woman* binary as her primary example. For Eisenhauer (2004) this “from *girl* to *woman*” teleological model of progression re-inscribes itself into the fundamental *female/male* binary model. *Girls*, like unenlightened learners, are less advanced, mature, aware, capable, and wise. *Girls* are not yet *women*; they are *becoming* women. To heed Eisenhauer’s (2001) warnings, VCAE will need to further grapple with how the 2002 Advisory pedagogical principles and aims may only replace previous hierarchies instead of abolishing, or expanding them. The re-inscription of a new hierarchy under the guise of deconstructing, denouncing, and discrediting oppressive hierarchies can be a covert, nearly invisible process.

In VCAE, active learners become aware of visual culture and become critical consumers, recognizing how visual culture sculpts and denotes individual, local, cultural, and global identities. Although the 2002 VCAE Advisory uses “identity,” subjectivity provides a better fit at the individual and cultural level. As I explore in Chapter 3 on feminist poststructuralist pedagogy, in poststructuralist theory, identity is too static and fixed; subjectivity is more open-ended and fluid. Cultural identity reflects this fluidity, too, existing more as cultural subjectivity. Culture is always plural and sub-dividable. No person is just one identity characteristic, just as no culture contains just one kind of person. VCAE recommends learners attend mindfully to these complex and subtle distinctions, recognizing and appreciating global cultural variations and subcultures. VCAE recognizes the influence culture(s) have on identities and the influence individuals can have on local and more global culture(s).
This VCAE pedagogical principle pair also underlines the relationship of visual culture to environments, both natural and human-made. Visual culture plays a major role in how we create, delimit, maintain, and perceive environments. Visual culture influences environmental integrity - the sense of an environment as a complete unit. Visual culture impacts our sense of place (Carpenter, 2003; Lai & Ball, 2002). For example, consider how visual culture creates the environment of a football game. White lines create a rectangular field lined with players, coaches, and assistants, all in different uniforms. The two teams face each other on opposite sides; colors and logos distinguish them. Men in black and white suits with whistles patrol this field. Rows of bleachers allow fans to watch from behind their chosen sides, often wearing colors or clothing to signify their allegiance to a specific team or even a specific player. Visual culture communicates what subject positions are possible in this environment: player, coach, fan, cheerleader, concession worker, photographer. These details demonstrate the multiple ways visual culture creates, designates, and maintains the integrity of the environment as a football game. If the players had no helmets and shoulder pads, the ball was round and black and white, and the field size and markings altered, the environment would not be an American football game but might instead be a soccer match. Visual culture can violate the integrity of an environment through absences, through mismatches, and through excess. As an example, a woman in a football uniform with a team on the field would violate the traditional constructs of this environment. This power to rupture, to create, re-create, and re-construct environments, and individual and cultural identities, echoes Butler’s (1990) concept of repeating signifiers but performing them with differences. Active, aware learners with agency can create opportunities, conditions, and catalysts for change at individual, local, cultural, and global levels. These learners can direct their analytical, creative efforts through visual culture channels, as consumers, critics, and producers.

In the sections below I describe an animation from Year 1 and analyze it using this VCAE pedagogy and aim set as a framework. I investigate the ways visual culture influences the construction and integrity of environments, representations, and influences on individual and cultural identities.

ACCAD Summer Program Year 1: Loss of the Prairie
The Butterfly Effect

The title screen is black with barely discernible viny swirls of slate grey. A pseudo-scientific white butterfly outline, sharp, startling, and a bit haunting, protrudes from the left side of the screen, left wings disappearing. The title resembles a recent spooky, independent film, The Mothman Prophhecies (2002), in font, color, and phrasing. Jaunty classical and cartoony music begins in the background as the title cuts to the first scene.

The butterfly sits on one of several pink flower stamens. Flower parts look geometrical and computer-generated, but the setting is shady and the shot brief, camouflaging the digital representations' clunky detail. The shot widens to show the butterfly launch into the air and flutter erratically through the green field flecked with color. The butterfly flies into a clearing and briefly disappears as the shot pans to twin tepees flanking a small, crackling fire in a rock ring. The tepees are conical, 3-dimensional, and identical. The music continues to build in volume.

The scene cuts to a pulsating powdery brown topped by a thin line of green and a ribbon of blue. The abstracted stripes of trees and sky hover as a thundering beat builds into a recognizable stampede, with horses and wagons erupting from the thick dust. After they pass, the dust begins to settle.
Cut to border between a grassy field and dirt passageway. People and animals peer from the brush. They appear Native American, based on the visible hair and clothing. Perhaps they are from the tepees. After the wagons thunder past, they flee.

Green grass covers a field stretching infinitely into the distance. The surface is strangely even in texture and symmetrical for a natural environment. An ominous grey sky waits above the land. The music grows louder and more insistent. A plow rips into view from the bottom of the screen, placing the viewer uncomfortably in the position of plower. The plow rips into the earth and scatters chunks of it, devastating the field in moments and turning the landscape brown, rutted, and scarred. In an instant, orderly rows of corn stalks sprout and stretch.

These fertile fields quickly fade into another storm of dust. The music fades slightly. This time, instead of horses, houses spring from the dust, bouncing into place. The first is a split-level ranch, white with a green roof. Then a pink split-level with a green roof pops into place, followed by a blue split-level with a brown roof, and so on, each one identical in shape. Their arrangement mimics the earlier orderly cornrows. The eerily identical houses recall Edward Scissorhands (1990), a movie about being very different in a homogenous environment, like this sudden suburban neighborhood. The repetitious musical score echoes this pattern.

The scene cuts to an overhead view of the butterfly surrounded by plants and flowers in grid-like rows. The butterfly flutters from this field toward a sharp boundary between the green and a field of grey. The grey area becomes sidewalks, forming a square concrete barrier. The butterfly floats over this barrier and into a black asphalt parking lot surrounded by buildings. A red car charges around a parking lot corner, obliviously destroying the butterfly in the process of parking.

The camera pans from the parking lot to a sign in the small square identifying it as “The Last of the Prairies.” The camera pulls away and the field becomes an abstract green square at the bottom of a tunnel of city skyscrapers. Music fades.

The scene then fades to a short list of prairie statistics over an old portrait in a black background. The music fades to background, too.

This animation provides rich data for considering visual culture influences on individual and cultural identities and visual culture’s relationship to natural and fabricated environments.

As a 3D animation software program, Maya hinges on the imagination and creation of virtual environments and their contents. In effect, Maya creates the illusion of three dimensions within two-dimensional spaces, primarily the flat surfaces of computer and theater screens. Maya environments require attention to detail in order to create semi-realistic representations of objects, environments, characters, and movement with the kinds of integrity viewers expect. It is important to remember Maya is a human-made technological tool to simulate natural environments. For this illusion to work, there needs to be a level of representative integrity and correlation with viewers perceptions of 3D space, objects, and movements.

In The Butterfly Effect, the butterfly guides viewers through several environments representing the historical past of Midwest prairies. The integrity of these environments relays a convincing sense of their dynamic evolution. The title screen provides the initial environment for the animation. This title screen with its rectangular shape, text, and strong, simple, focused graphic outline of the butterfly construct connections to film, including a (visual) pop cultural movie reference to cement this connection. The blackness insinuates the dark of a theater. But eerily, the skeletal butterfly slips past the bounds of the frame, penetrating the environment outside of the screen, linking animation and life, blurring the boundaries.
The first scene begins in a replication of a natural environment, a close-up of a butterfly resting on a flower in a field. Although the human-made 3D flower stamens are overly precise and rigid, the use of shading and timing allow the animators to manipulate the visual culture of the scene into a passable flower simulation. In this instance, the ability to adjust lighting, timing, and movement establish the integrity of the scene as representational enough of reality. All scenes in the animation include these same kinds of visual culture issues—overly mechanical forms, arrangement, and movement. The tepees are exact matches, the fire jerks in a repetitive cycle, the field is a uniform green with orderly weeds, the corn stalks sprout and grow in synch, and the houses are color-variant clones. These components resemble their real-life counterparts closely enough to preserve the environmental integrity. Other elements and details establish contexts that reinforce this integrity. In the animation, a green field appears flecked with colors, impressionistic flowers dotting its expanse. Scene backgrounds include green foliage extending into the distance, sections of clouds and sky, brown chunks of dirt clinging to plowed ground, dust that signals great, sudden change. In the final scenes, sidewalks, signs, parking lots, buildings, and cars signify a contemporary urban environment surrounding what is left of the natural prairie environment. The combination of simple shapes, colors, and images add depth and complexity.

The animation also employs visual culture in ways that reflect and influence cultural and individual identities. *The Butterfly Effect* contains cultural symbols, images, and references. The title, again, is a movie pop culture reference. The animation includes parking lots, cars, skyscrapers, and suburban subdivisions as contemporary cultural identity markers. The parking lot, buildings, and cars reflect a cultural environment where human and mechanical activities are privileged above maintaining the natural environment. These human-made environments trap, contain, and replace nature. This Maya animation symbolically illustrates a progression from earlier cultural identities and environments to contemporary environmental prairie contexts and influences. Other visual culture identity elements include the representation of Native Americans as barely visible, fleeing, and then absent—fairly close to the dominant cultural discourse in the United States. In contrast, the clouds of dust signify rapid cultural change, humans pursuing expectations of opportunity and progress. The prairie begins as a peaceful field with a few Native American inhabitants creating relatively minor environmental impact, symbolized by the two tepees in a small clearing. Wagons, horses, and settlers invade, forcing Native Americans to leave. Settlers manipulate the natural environment to convert prairie into farmland; farmland becomes subdivisions; small neighborhoods evolve into cities; cities slowly consume all but the most minor souvenirs of earlier natural environments. These environmental shifts accompany cultural shifts; cultural and individual identity shifts can occur symbiotically, and visual culture features prominently in those shifts.

This animation itself does not strongly demonstrate the relationships between visual culture and individual identity. The most prominent example of individual identity and visual culture in this data set involves the shifting points-of-view. The viewer must assume the point of view the animators select. In *The Butterfly Effect*, the viewer begins by following the butterfly as an observer of its innocent, oblivious
travels. The jarring scene cuts visually punctuate abrupt environmental shifts. Interestingly, the music is the same piece throughout. This combination of continuity and disruption forces viewers to entertain multiple possibilities simultaneously and situationally. The most striking example of visual culture interacting with individual identity construction is the brief portion where the viewer assumes the position of operating the plow, violently invading the earth. Although this scene is not an accurate historical depiction of events, and the viewer is likely in a human-made environment, the visual metaphor is powerful. An invasion of humans destroys, or at least dramatically alters, this vast natural environment, shaping it for easier use. In this way, the visual culture of this scene constructs the viewer as an individual and member of a culture responsible for these kinds of changes and their impacts. Even as the plow rips through the prairie with no hands steering it, the point-of-view allows the viewer no escape from cultural and individual culpability.

What the content of this animation does not demonstrate is how learning and using digital animation technology impacts the identity construction of the program participants. Each group member significantly contributes to the final animation. Each becomes more knowledgeable about using visual culture to construct certain identities. The program also uses visual culture to re-imagine the technology field as open to, containing, and supportive of women. The participants picture themselves as successful contributors and participants in technology-rich environments. They see women in technology administrative roles. They see mentors – college students not much older than they are – as visual culture representatives of women like them in technology (ONY1, ONY2). Maria Palazzi intends the program to provide a vision of technology as a supportive, fulfilling environment for women (MP, PC, Y2, Y2). The program is a progressive effort toward those goals – having visual culture positively influence the individual identities of the participants, and having these individuals in turn influence larger cultural identities. Hopefully subsequent visual culture reflects these improvements and pushes for even more progress.

6. VCAE for Activist Ends: Producing Active Citizens and Engaging Communities

**Aim:** To educate citizens who participate in a democracy through reflective and responsible interactions with visual culture.

**Pedagogy:** Assess student work using long-term reflective methods and criteria developed and refined by ongoing debate among stakeholders (including students, teachers, and community members) to determine the nature of knowledge acquisition and application.

The pedagogical component of this duo encourages local creation, negotiation, and implementation of curriculum and evaluation criteria. It advocates local articulation of educational expectations for process, progress, documentation, and product. This VCAE pedagogical tenet constructs local relevance as a fluid, debatable discourse with engaged, active participants. In tandem, VCAE aims to use visual culture as a medium for cultivating democratic, active, reflective, responsible citizens. VCAE proposes to educate these citizens through critical awareness, interaction, investigation, and production of visual culture (Duncum, 2003a, 2003b, 2003c). Citizens need to be able to access, comprehend, decode,
create, and disseminate information in culturally relevant manners. In industrialized countries, visual culture predominates as a preferred and privileged communication channel. In democracies, all citizens should have access to and skills in visual culture media. Below I provide program observation data and then examine its relationships with this VCAE pedagogy and aim set. I include excerpts of other case study data for triangulation.

Program Day Ten, Final Animation Presentations

Friday, July 2nd, 2004, Almost 10:00 am

During the first hour today groups have been working on a variety of tasks. As groups, they have been going into the video room to work with Caren & Raquel to add and edit sounds. The "sound techs" are actually using the software available to input sounds the girls have chosen, along with importing any music from the girls' files and other sources. Caren & Raquel ask the girls for editorial input – when to fade, setting the timing, raising and lowering the volume. Girls give specific feedback and comfortably make suggestions for changes and improvements.

In the Fishbowl, Franny shows me her group’s animation with Rachel while the other girls in the group are doing sound. Franny makes a point of telling me that Rachel did the dust and telling me, and Rachel, how good it looks in the final version....

The girls have been encouraged throughout the entire program to invite friends and family for later today – the final presentations. The girls and mentors are noticeably “dressier” today, for the most part.

10:30 in the Fishbowl: The girls in the Fishbowl are chatting, surfing, playing music, playing in Maya, still working on a few last minute details.

11:30 in Fishbowl: Francine’s group goes to practice in BALE Auditorium, Hu’s group returns. The girls in the Fishbowl work and play on computers while interacting – they discuss what’s happening to them in the games (“Oh, I died again.”) They talk about computer games, tell each other where to find these games on the internet, and give each other pointers...

Franny banter with her group about online cartoons, Comedy Central, and other animations and videogames. Franny is now dancing to some music and beat from one of the girls’ computers. Rachel from Francine’s group goes to see what is happening with Franny’s group.

Vera tells the girls when they are finished with the tasks they can go eat, but they continue to work and plan on the computers. Finally some girls decide to go after girls from other groups go. Franny’s group goes together for lunch with Rachel added in (Caitlin rushes to catch up with the group as they leave.)...

1:30 in Fishbowl: Maria shows the girls how to burn CDs of their projects. Maria explains and then walks the girls through the process. The mentors assist the girls when necessary. Vera interrupts to tell how to set properties to make the movie compatible with Macintosh computers. The mentors continue to help the girls. Maria gives directions for the other blank CDs the girls have – CW and RS will burn the entire research and websites produced from the girls’ work while the girls do presentations. The girls leave their CDs labeled and head to BALE for their last rehearsals of their presentations.

2:00 BALE AUDITORIUM FINAL PRESENTATION & CELEBRATION

The room is full and there are people standing around the sides to watch.

There are now family members, friends, and ACCAD staff present as the audience. MP starts the program by giving some background for the Women in Technology program. She talks about how young women relate to technology and the arts/ She also thanks all the funders and mentions all the girls involved by name. Maria explains the process of the program then turns over the floor to the first group - Hu’s.

Hu’s group – Annie, Emily, and Soki. Annie introduces the group and their segment. She gives some background about the programs they have used – Maya, Dreamweaver, Photoshop – and mentions their ladybugs, animation work, and MoCap lab experience (and defines MoCap – Motion Capture). Annie says she thought people have to take years to learn what animation is
about, but after 2 weeks she thinks it is “simple” (when you have good teachers) and possible to learn to do.

Marie begins by introducing their topic – Loss of the Prairie – and the other girls in the group introduce themselves. Marie explains the group’s process while FB scrolls through their webpage information and images. Marie reads from her written notes. Rachel discusses agricultural development and the changes between how the Native Americans farmed and how the white settlers farmed. Mary explains how fires help the prairie and the tension of bison vs cattle. Brittney explains agricultural development and how those led to the dustbowl of the 1930s. With some prodding, Brittney explains her role in the animation. RS did the settlers in the animation; Marie did the farming and plowing, the dust, and the development; Mary did the part where there are no prairies left, only cities instead.

The girls then show their animation and the crowd applauds. ...

Maria addresses the crowd again and discusses the teacher component of the program. The teachers then share their video shorts. (Kelly & Roger) Kelly – shows movie from the prairie trip and the center there. Roger shows a movie he calls “Little Man on the Prairie” – a reference to himself – and praises ACCAD – the staff and mentors. After the presentations, participants and audience members have refreshments in the lobby and can tour the facilities. (ONY1, Day 10, pp. 34 – 37)

In the sections that follow, I will discuss how Digital Animation enacts VCAE’s drive to educate critical citizens and have local stakeholders determine curriculum and assessment. I organize my analysis around discrete components of these goals, but I reverse their order into a more sequential progression. First I explore the pedagogical principle of determining the nature of knowledge acquisition and application. Next, I explore how defining the nature of knowledge requires continual stakeholder negotiation and revision. Then I will analyze how the “ongoing debate” from stakeholders provides criteria for assessing student work with long-term and reflective methods. I then discuss how Digital Animation emphasizes reflective and responsible interactions with visual culture. Finally, I consider how Digital Animation serves to educate active citizens to participate in democracy.

Digital Animation displays its philosophies through characteristics of its practice. Digital Animation positions knowledge as a dynamic combination of skills, information, experience, interaction, critical thinking, and communication. Digital Animation participants learn digital animation skills, scientific and historical information about local environments, visit environmental sites, collaborate, plan, and construct animations to represent their new knowledge and communicate it to others. Within the program, knowledge is acquired through demonstration, instruction, and hands-on interaction, evident throughout all whole group tutorial sessions (ONY1; ONY2). Learning is social, collaborative, reinforced, and supported; learners multi-task. Excerpts from the last day in the Fishbowl portray participants interacting, collaborating, and supporting each other. As they “work and play on computers while interacting - they discuss what’s happening to them in the games … They talk about computer games, tell each other where to find these games on the internet, and give each other pointers” (ONY2). This interaction also demonstrates the ubiquity of multi-tasking throughout the program. Here, while the participants are simultaneously “chatting, surfing, playing music, playing in Maya,” they are “still working on a few last minute details” (ONY2). Participants and program staff are in a continual cycle of determining, gaining, and applying knowledge.
These are traditional models of knowledge transfer, with instruction the more prominent of the two. Often during Digital Animation, instructors deliver verbal information to the participants while demonstrating on the overhead screens (ONY1; ONY2). While formal instruction happens more in the beginning of the program, during Maya tutorials, it persists throughout the two weeks as a valid teaching model. In the notes above, instructors “explain,” “give additional information,” and “give directions.” Simultaneously they “show” participants how to apply this knowledge (ONY1). Accordingly, participants adopt demonstration and instruction as a model during their final group presentations. The group members all provide verbal information to the audience as a precursor to showing their animations. They define terms and deliver research results. They explain their groups’ processes, their individual roles, and even “the meaning of the topic” (ONY1). The animations visually demonstrate the participants’ knowledge and understanding of their topics, as well as their progress with technology; their accompanying instruction reinforces their knowledge and provides another method to demonstrate and communicate their understandings.

Hands-on interaction is a key component of Digital Animation’s educational philosophies and practices of acquiring and applying knowledge. Staff encourage and allow participants to use many software programs, including “Maya, Dreamweaver, and Photoshop,” as well as experiencing the MoCap lab. Within this program day, participants “work,” “play more on the computer,” and practice their group presentations (ONY1, Day 10). Throughout the program, the participants use this hands-on approach to construct their own 3D models, add music and sound, create backgrounds, and prescribe animation action. They learn to do these things by implementing information and instruction. In the Ohio State University newspaper, The Lantern, McClintock (2006) praises the value of Digital Animation’s hands-on approach:

The seminar isn’t just about sitting at computers. The participants did research for the first few days, which culminated in a field trip to Big Darby Creek. There they spent at least part of the day in the creek, hunting for crayfish and collecting water samples. A naturalist talked to them about the wildlife that lives in and near the creek and about the environmental and political issues related to nearby housing developments. (media.www.thelantern.com/)

This program requires active participant involvement and contribution in the process of knowledge acquisition and application. The program’s hands-on approach re-emphasizes the value of learning through doing, trying, and playing.

Digital Animation also positions knowledge as the result of social interaction, collaboration, and assistance. Examples above of the social interaction aspect of knowledge production in Digital Animation include the program episodes of participants “chatting, surfing, playing music, playing in Maya…” while interacting … They talk about computer games, tell each other where to find these games on the internet, and give each other pointers” (ONY1, Day 10, pp. 34 – 37). The Digital Animation mentors often personify the social construction of knowledge in the program. They work individually with participants as necessary. As importantly, the mentors interact with the participants in a casual, friendly way, using social
interaction as a medium of instruction. In this scenario, Franny clearly applies this principle; throughout both program years, Franny proved exemplary in recognizing and capitalizing on the social component of knowledge construction. Franny invites me to watch her group’s animation with her and Rachel. She then uses this opportunity to praise Rachel and her work in front of me. Later, she “banters with her group about” many forms of digital visual culture and dances around to someone’s music (ONY1, Day 10, pp. 34 – 37). Participants clearly respond positively to this – they obviously love her – and her enthusiasm and playfulness are contagious as well as demonstrative.

Knowledge as the result of social interaction encompasses the more specific process of collaboration. This scenario provides prime examples of the importance and presence of collaboration throughout the program. In the video room, participants collaborate with two mentor “sound techs” who input and manipulate the sounds and music “the girls have chosen” and asking “the girls for editorial input” in a comfortable process (ONY1, Day 10, pp. 34 – 37). The final presentations give participants a chance to showcase their collaboration to an audience. All groups introduce their topic, discuss their processes, show their webpage research, and provide some context for their animations. Like Marie, Mary, Rachel, and Britteney, all group members discuss their roles in creating the animation (ONY1, Day 10, pp. 34 – 37).

Many Digital Animation practices also reflect the supportive component of knowledge construction. Annie’s closing comment that learning animation “is ‘simple’ when you have good teachers” reveals participants’ recognition of support as important (ONY1, Day 10, pp. 34 – 37). Although the mentors may be the most prominent example of a commitment to support, the final presentation day each year provides recognition that supportive learning extends beyond traditional classrooms. Final presentation audiences include invited parents, family members, friends, ACCAD staff, teachers, funders, and others (ONY1, Day 10, pp. 34 – 37). One of the best examples of this outside support comes in the form of this audience, and their responses, more importantly. The laughter and applause communicate clear appreciation and approval.

Digital Animation also values knowledge as the application of skills to express meaning through original creations. Final presentations showcase participants’ technical and artistic skills through their digital animations. McClintock (2006) reports that participants receive “a specific topic to learn about that they then must communicate to others…using animation is an important part of the experience” (media.www.thelantern.com). Palazzi insists, “I want to get the message across that making images that move can be thoughtful and useful,” that digital visual culture is valuable in defining, acquiring, and applying knowledge (media.www.thelantern.com/). The group presentations and animations document and demonstrate participants acquiring and applying new knowledge. In one presentation, participants speak about “agricultural practices of Native Americans” and then of the “white settlers” who supplant them. Group members emphasize the impact of altering natural processes on an environment across time (ONY1, Day 10, pp. 34 – 37). Each presentation follows much the same pattern, demonstrating the range of knowledge these participants find, choose, edit, visualize, create, and convey through animation. In the next
section, I analyze Digital Animation’s insertion of stakeholders into the continual debate of what counts as knowledge, who acquires it and how, and how do we really know.

VCAE embraces the continual negotiation of knowledge construction, acquisition, and application as an “ongoing debate.” The stakeholders in this program include the participants, mentors, instructors, administrators, Digital Animation staff, and ACCAD college students. Another layer of stakeholders includes families and friends. Funders and University officials comprise another key stakeholder group (ONY1, Day 10; ONY2, Day 10). Without the trappings of a formal debate, Digital Animation includes many options for stakeholder involvement in ongoing program evaluation and evolution through responses to the curriculum, content, methods, products, participants’ experiences, and program. One group of stakeholders, local teachers, abdicated much of their Digital Animation involvement. Low participant registration rate resulted in two teacher participants. This pair half-heartedly performed their tasks, attended irregularly, and significantly decreased the level of sophistication of their project components. In the end, the teachers produced rough unfinished video cuts. The presentations audience applauded their efforts without context for their meager achievements (ONY1, Day 10), but program administration, instructors, and mentors, questioned the program’s worth. In Year 2, Maria redistributed program resources to add three participants instead of a teacher component. She continues to see teachers as a very valuable component in increasing girls’ technology exposure, experience, and skills, brainstorming better ways to reach and integrate them (MP, PC, Y2).

I am also a stakeholder in this negotiation. In Year 1 and Year 2, I am officially the “outside evaluator” hired to observe, collect data, and evaluate the program. My observations, interpretations, and assertions provide evidence of what I notice, value, and record. This influences what the program continues, modifies, or discontinues. The evaluation report influences the kind and amount of data available for current and potential funders and future planning. Funders are also important stakeholders. These organizations, businesses, and people influence program structure and implementation through providing funding and support for what they deem appropriate. In addition to financial support, their indirect influence can be very substantial.

Stakeholders include family members, friends, and teachers, too. Each year, Digital Animation staff encourages participants and their family members to invite other family members, friends, teachers, or other interested parties (ONY1, Day 10, p. 35). These stakeholders give feedback during the presentations, with their laughter and generous applause, strong indicators they appreciate the process and the products. Palazzi encourages the further engagement of these stakeholders through offering “refreshments, a tour, and hands-on demos in the Fishbowl and MoCap lab (Virtual Reality tours)” (ONY1, Day 10, pp. 35 - 36). Stakeholders peruse the ACCAD facilities, attentively watching participants show them the equipment they used and how they used it (ONY1, Day 10, pp. 35 - 36). They demonstrate Palazzi’s assertion to the audience that “all your girls could be future image-makers in this world” (media.www.thelantern.com).
terms of VCAE, all the participants already are image-makers. The combination of their own satisfaction and response to this program, with the strong positive responses from stakeholders, demonstrates

Stakeholders clearly communicate their value for the knowledge and skills participants develop. To them, the program is an immediate success. They are impressed with the quality and sophistication of the animations and experiences (ONY2; Parent Post-surveys, Y2). This initial response and feedback are helpful for planning the next program year and for developing longer-term evaluation, feedback methods, and criteria for assessing student work (NAEA VCAE Advisory, 2002). In the next paragraphs, I consider how Digital Animation embraces, and repels similar beliefs and approaches.

Ontology determines the long-term methods and criteria for assessing student work. For Digital Animation, long-term reflective assessment includes continuous accumulation of data primarily through annual outside program evaluations. My Year 1 and Year 2 evaluations have included pre- and post-surveys of mentors and participants, observation notes, personal communications. In Year 2, I added the formal parent post-surveys. From personal experience, Palazzi admits she loved learning and doing computer animation and “couldn’t figure out why it wasn’t appealing to other women” (www.thelantern.com). She uses evaluations, individually and cumulatively, to continually craft a program to make technology “more attractive and accessible to women” (www.thelantern.com). Palazzi uses evaluations to accumulate long-term data to chart program successes, strengths, weaknesses, failures, gaps, or excesses. She seeks stakeholder responses to and impressions of the program and products. A reporter parses scenes from individual animations, connecting them like poetry:

On screen, glaciers retreated, replaced by dirt and trees. Arrows zipped through woods. Fish in scuba gear explored land. People washed cars. Three fish sang the pop song “Survivor” while shimmying in unison. Crayfish traveled on a leaf on the water’s surface. People cut down trees with chainsaws and new trees were planted as replacements. (lantern.com)

This reporter favorably describes particularly impressive examples of visual culture in the final animations. These kinds of data augment the evaluation and Palazzi’s personal experiences for longer-term reflection and assessment.

Parents’ informal comments across Years 1 and 2, as well as formal post-program parent surveys in Year 2, reveal parental assessment criteria and methods they value in achieving them. Their evaluations occur at the end of the two-week program, but they have a sense of the immediate impact on participants in terms of the specific knowledge and skills as well as longer-term potential for improving general interpersonal and technology skills, encountering newer technologies, and gaining self-confidence and reassurance in their desire to learn, use, or even design technologies. Additionally, parents value connections, interest, and engagement as measures of program success (Parent post-surveys, Y2). Several parents comment on the participants’ significantly increased “knowledge of the mechanics of computer animation” (Parent post-surveys, Y2). Some parents view the knowledge and skills participants gain as “a base that [their daughters] will continue to build on” (Parent Post-survey, Y2). They are particularly
pleased about the participants “learning the Maya software,” praising how the program enables their children to “learn about the more advanced software and actually get to use it” (Parent Post-survey, Y2).

Parents also assess the program based on the general skills the participants learn. Parents appreciate general “research skills,” value “working in a team,” and believe “collaborative efforts and opportunities for interaction are very beneficial for encouraging a team approach to creativity” (Parent Post-survey, Y2). Parents appreciate Digital Animation’s holistic approach where participants gain a “thorough grasp of the importance of research and understanding to a project,” and recognize that an arts (or VCAE) approach is “not only about drawing but understanding the subject, too” (Parent Post-survey, Y2). Parents’ extremely favorable assessments and comments signify their belief that the program structure and experiences benefit their daughters in the long term.

Parents also value the program exposing participants to technology and of digital arts as college, career, and creative options. Parents exclaim, “Thanks for opening her eyes wide!,” “broadening of her horizons in the computer and technology fields,” and increasing “her awareness of careers in the area of digital animation” (Parent Post-survey, Y2). One parent expresses gratitude for “Introducing [my daughter] to all the available technology out there — allowing her many opportunities she might never have had,” and another for giving participants “a new outlook to new possibilities in the animation field” (Parent Post-survey, Y2). One lauds the program because “getting young girls a head start in the fields of computers and science is extraordinary!” (Parent Post-survey, Y2)

Self-confidence and reassurance are another common parent assessment topic. Again, parents, and other stakeholders, provide immediate positive short-term responses to the work, but from a long-term perspective, participants’ parents desire increased self-confidence as a learning outcome. In terms of their own daughters, many parents note how the program helps “strengthen her mind, her independence,” and helps “her feel at ease, comfortable,” builds “her self-esteem/confidence,” “gives her more confidence in her abilities,” encourages “self-motivation,” and “validates her interest in this area and her capabilities” (Parent Post-survey, Y2).

Parents evaluate the program based on other longer-term criteria, too, such as the level of learner interest and engagement. Many are impressed with the level of involvement. Parents noted, “She was interested in the program,” “She had a blast,” “She enjoyed this immensely,” “I have never seen her so happy,” “She really loved the program,” and, perhaps most telling, “She loved coming here and never once complained” (Parent Post-survey, Y2). Parents value the long-term impact of this engagement and enthusiasm, encapsulated by a parent comment to a reporter about her daughter being “just so excited every day” (www.thelantern.com). Another parent remarked in amazement that “Almost every night [her daughter] was getting something ready for the next day,” (Parent Post-survey, Y2), and a couple confessed their daughter came home each night and worked for several more hours on her own Maya models and animations. Several parents wished that their daughters were “half as excited about school,” and were willing to continue to “strive to understand and want nothing more than to keep working and learning
more,” even when things are sometimes hard to learn or do (Parent Post-survey, Y2). Parents see the long-
term benefits of creating excited, engaged, persistent learners.

Connection is another parental assessment factor. I use connection here for interdisciplinary work,
work relating to the real world, and a network of people. In Year 2 parent post-surveys, several commend
the program for its “Greater connection from the outside, real world to the computer animation world,” and
for covering “real, current issues.” One couple states: “We also liked how they used the animation to share
a real world concern re: pollution, etc. @ Darby Creek. GREAT JOB, VERY IMPRESSIVE!” The
interpersonal connections really matter to these parents, too. Several agree with Bev C’s comment that “It
was really great for her to be with people who share the same interests” (www.thelantern.com). They also
believe the new friends, role models, and mentors are “a big plus.” One mother explains her daughter
“loved everyone there” (Parent Post-survey, Y2). Parents view this network as a long-term support
mechanism for their daughter’s interest in art and technology.

There are many stakeholders and methods involved in long-term reflective assessment of
participant’s experiences, a VCAE (2002) core belief, but there are also gaps. There are daily reflective
mentor and staff meetings that shape and alter the program across time, but there are no formal long-term
follow-ups with mentors, funders, and staff as of the end of Year 2. This case study reflects the absence of
any official data revealing an increase in women in technology, or any other longitudinal effects, yet.
During Year 2, Maria Palazzi and I developed a longitudinal survey to gauge past participants’ longer-term
reflections on Digital Animation’s impact. Digital Animation mailed surveys to previous participants as
well as posting the survey digitally on their website.

The Digital Animation website, accad.osu.edu/womenandtech/home.html, contains digital data
from past programs, including all groups’ animations as well as photos of their storyboards, an
informational web page, and digital photos from program activities. This accumulation of digital data
provides documentation of Digital Animation’s evolution as a program, noting significant shifts, like the
move from using Flash 2D animation to using Maya 3D animation software. The program funders change
from year to year, and the program budget does, too. How does this impact the program?

While there are surely other lingering issues, one of the major ones remains how to decide what
Digital Animation does do for participants in the long run. If Digital Animation participants do enter
technology in greater numbers or percentages, is it causally related to the program? What if the participant
population represents a self-selected group of young women predisposed to pursue technology courses or
fields? What if data show Digital Animation participants actually are less likely to pursue future technology
opportunities? Is having a Digital Animation participant decide not to pursue technology afterwards a
failure? Isn’t there some benefit from this process and outcome, too?

The VCAE (2002) framework encourages incorporating long-term reflection for assessing student
work. Stakeholder groups evaluate different aspects of work based on a variety of values, methods, and
criteria. While many of these stakeholders and their feedback have greatly influenced Digital Animation,
Maria Palazzi is actually the most comprehensive repository of program data, reflection, and evaluation across time. She employs multiple evaluation methods and criteria to assess students’ work, experiences, and future educational and career considerations. She reflects on program data and stakeholder feedback, as well as her experiences, observations, and overall sense of the current digital technology field. This accumulation of information, combined with Palazzi’s feminist pedagogical leanings, uniquely situates her as the main assessor of how well the participants acquired and applied knowledge (VCAE Advisory, 2002).

In the next section, I proceed to explore the presence and importance of reflective and responsible interactions with visual culture, a key VCAE aim, within the context of the Digital Animation data.

VCAE as Reflective, Responsible, and Democratic

VCAE, according to the 2002 Advisory, explicitly aims to use reflective and responsible interactions with visual culture as a means of cultivating active, engaged, empowered democratic citizens. These aims resonate well with Digital Animation. Merriam-Webster definitions include:

**Reflective** (ri-'flek-tiv) (adj.) - 1) capable of reflecting light, images, or sound waves; 2) thoughtful, deliberative consideration; 3) reflexive; 4) indicative

**Responsible** (ri-'spän(t)-s&-b&l) (adj.) – 1 a) liable to be called on to answer; 1b) liable to be called to account as the primary cause, motive, or agent; 1c) being the cause or explanation; 2a) able to answer for one's conduct and obligations; Trustworthy; 2b) able to choose for oneself between right and wrong; 3) marked by or involving responsibility or accountability; 4) politically answerable

**Democracy** (di-'mä-kr&-sE) (n.) – 1a) government by the people; especially: rule of the majority; 1b) a government in which the supreme power is vested in the people and exercised by them directly or indirectly through a system of representation usually involving periodically held free elections; 2) a political unit that has a democratic government; 3) the common people especially when constituting the source of political authority; 4) the absence of hereditary or arbitrary class distinctions or privileges

These definitions offer a wide range of possible interpretations. VCAE encourages reflective encounters with visual culture. In many ways, visual culture relies on the first definition of reflective as visual and auditory processes. VCAE aims to have learners thoughtfully and deliberatively consider the visual culture they encounter. In this sense, VCAE again presses for active debate about, and even with, visual culture (Duncum, 2002a, 2002b, 2002c; Freedman, 1997a, 2003b). VCAE can also include the consideration of things related to reflection, like glare and refraction. VCAE supports the reflexive aspect of reflectivity as a process of thoughtful consideration and deliberation about visual culture, the cultural significance of its indicative powers, and ways this impacts identity (jagodzinski, 2003b, 2004; Smith-Shank, 2004).

Digital Animation includes all these aspects of reflective encounters with visual culture. In the Year 1 MoCap lesson, participants used digital data created by tracking and digitally recording the movements of reflective white balls attached to black unitards (ONY1, Day 10, pp. 34 - 35). Using software, these individual dots become a linked skeleton the participants use to create a 3D character.
These kinds of lessons highlight *Digital Animation’s* understanding of visual culture and visuality as objects and as a process of reflection, reception, interpretation, extrapolation, and response.

The summer program also recognizes the importance of thoughtful, interactive consideration of visual culture. Conversations about women and digital animation technology pepper small group interactions, but not uniformly. Guest speakers attend and with information about visual culture and technology education and career opportunities (ONY1; ONY2). Also, Palazzi formally talks to the whole group about how young women relate to technology and the arts (ONY1; ONY2). While watching popular movies, like *Pirates of the Caribbean* and *Lord of the Rings*, group discussions include the roles of women in production, direction, and on-screen and the overall impact of this on the field of digital animation and also on digital animation uses and products. At times, the thoughtful and interactive consideration is not overly deliberate or critical, a point Palazzi laments following both years, continually debating how to include this into the program more explicitly (MP, PC, Y1, Y2).

*Digital Animation* also embodies the other aspects of reflectivity, including reflection, reflexivity, and indication. In 3D digital animation, reflection is an important effect. Animators manipulate aspects of reflection to create more or less realistic environments and models, to heighten visual impact, to emphasize or de-emphasize, and to conform to or disrupt visual expectations. One group uses animation tools to simulate flashes erupting from a stadium crowd in the background; another decides how to create the effects of reflection on a diving mask underwater (ONY2). All groups work with how shading, light, and shadows impact their animations.

*Digital Animation* demonstrates a commitment to digital animation and visual culture as reflexive and indicative. The program curriculum calls for each participant to share their experiences and what they learned during final presentations. In this way, reflexivity is about self-reflection and evaluation. Remember Annie who “thought people have to take years to learn what animation is about, but after two weeks, now she thinks it is ‘simple’ if you have good teachers” (ONY1, Day 10, p. 36)? Annie’s participation in *Digital Animation* allowed her to reconsider her expectations around creating digital animation visual culture. In other cases, these presentations allow groups to discuss the indicative aspects of their animations – they visually reflect environmental conditions and issues our society must address. Another powerful indicative visual cultural sign its all-female population, showing that females can be successful digital animators and drawing attention to gender as a factor influencing visual culture and technology. From a VCAE perspective, visual indicators, reflexivity, literal and figurative reflection, and the processes of reflecting, perceiving, and interpreting visual and auditory stimuli deserve thoughtful, deliberative consideration (VCAE Advisory, 2002). *Digital Animation* shares this sense of importance and emphasizes these aspects throughout the program. *Digital Animation* also shares VCAE’s concerns around responsibility and visual culture. I delineate those further in the next section.

The VCAE 2002 Advisory insists responsibility is a key aspect of examining visual culture and its impacts on democratic citizens and democracy. Responsibility also has many possible meanings. The first
consists of several variations of answering to, accounting for, or causing something. The second emphasizes trustworthiness and morality. The third and fourth involve personal and political liability. At Digital Animation, participants become responsible as individuals and small groups working toward creating responsible visual culture. These participants are not just liable to be called on to answer, account for, and explain; this is their explicit purpose in creating these environmentally responsible animations. The participants produce their animations out of a sense of personal and civic obligation for educating and informing citizens to create awareness, responsibility, and change. Digital Animation provides participants with the opportunity to become politically active and communicate the impact of individuals and groups on local environments, like the destruction of Ohio prairies through farming, housing, paving, urbanization, and commerce (The Butterfly Effect, 2005). These environments are our collective responsibility, and the participants demonstrate this through producing visual culture.

This overall VCAE aim combines reflexivity and responsibility as key components in educating active, engaged, empowered democratic citizens. Official definitions of democracy stress governmental power as belonging to the people, but often exercised through elected representatives. The system hinges on the idea of equality among citizens, regardless of arbitrary distinctions or privileges. VCAE reflects the value of empowerment as a tool for increasing citizens’ knowledge and abilities to participate actively in their societies. Digital Animation reflects this position in its efforts to include more women in the field of technology. If women have no awareness of technology possibilities, little or no experience with technologies, and no confidence or motivation to pursue them, how democratic is that? In these ways, Digital Animation reveals the gender biases in technology, including digital animation technology. Democracy implies inclusion and consideration of all citizens; VCAE believes all citizens need education, skills, and access in locating, interpreting, creating, and disseminating information, particularly in visual culture media and methods (Advisory, 2002).

Digital Animation does not always precisely hew to VCAE’s prescriptions. Often, participants, mentors, and instructors make no formal effort to critically analyze the sociocultural aspects of the images and visual culture the participants are creating (ONY1, ONY2). Additionally, although participants are encouraged to use visual culture for self-expression and private exploration, particularly through using sketchbooks and other arts materials provided by the program, this exploration is never explicitly connected to “questions and issues specifically of cultural experience” (Duncum, 2002a, p. 20).

In particular, the 3D environmental software that re/produces known environments like the Sistine Chapel and fantasy environments includes unnecessarily violent language as technical terminology, like “execute” for starting and running a program. Palazzi and I discuss these issues, but the program participants, and Digital Animation staff make no sustained or systematic inquiries into these issues of language and their contributions to women’s “computer reticence” (Turkle, 1988).
But Why Use the Arts and Visual Culture as the Lure?

In assessing *Digital Animation’s* across the two years of this case study, a lingering issue remains: Why use art as the medium for enticing young women to learn computer technology skills? Why is art, or more broadly visual culture, a good choice? Palazzi notes that many students have an interest in art, including many female students. Because of the importance of art and visual culture in contemporary culture, many young women seem drawn to the arts as means of personal expression and creativity. Palazzi also notes the power of art, in a field like digital animation, to provide a narrative structure for creating meaning. Art can provide the vehicle for communicating information, ideas, awareness, and advice (Personal communication, Y2; Personal communication, May 2008). But maybe art can, and does, offer more.

In *Teaching Meaning in Artmaking* (2001), Walker coalesces her “big ideas” as an organizing structure for artmaking and for instruction in artmaking. These ‘big ideas’ of human concern include identity, conflict, change, power, humans and nature, relationships, etc… Walker (2006) asserts that whether art educators design curriculum and instruction that embraces visual culture, critical pedagogy, or constructivist roots, they share a common belief “that contemporary culture and personal relevance are key factors in meaningful art learning” (p. 191). Walker asserts that “big ideas” often connect artmaking with contemporary culture and “spheres of interest outside of art such as science, politics, religion, and ecology” (p. 192). From this approach, technical and artistic skill is secondary to investment in ideas, their relevance, significant personal meaning-making, and the communication and expression of these ideas (Walker, 2006, p. 195).

Like the *Digital Animation* program, Walker’s (2001) “big ideas” approach encourages researching contemporary artists, presenting information to others, using practices of contemporary artists, and developing technical and media skills through artmaking as tools and options in exploring and expressing big ideas (Walker, 2006, p. 196). Some of *Digital Animation’s* continual questions and struggles may result from the places where the program differs from the big ideas approach, such as the lack of formal critical reflection and editing as well as deeper meaning-making. Walker (2004) asserts that “maintaining reflective documentation of the process as it evolve[s]” is a “crucial aspect of [the] artmaking experience,” without which most students “miss an awareness of the conceptual nature of the artmaking process” (p. 8). Greater awareness of the big ideas approach to the artmaking process, along with explicit and documented critical reflection might provide the *Digital Animation* program and its participants with a sense of the greater depth and importance art can have within larger cultural discourses. Applying this big idea framework and its practices might also help participants forge greater connections and apply critical thinking and analysis skills to a wider range of subjects and situations.

This ability to use art as a medium for learning creates conditions where participants can construct, deconstruct, and reconstruct their own meaning, making personal connections with larger ideas and across
larger subject areas. As successful as Digital Animation is as a program, providing participants with a larger sense of how to think critically, creatively, connectedly, and meaningfully could increase its value to participants. In this way, participants could possibly move from learning skills within the context of creating art, and learn computer and animation skills through the creation of more meaningful, personally relevant, stimulating, and original works. Is this, perhaps, is the real power of using the arts, and visual culture, as the vehicle for learning and for meaning-making? As Walker (2006) asks, almost rhetorically, “Is it that art learning carries greater weight … when ideas count; when personal and cultural connections endow these ideas with relevancy; when artistic skills are linked to ideas and meaning making; and when contemporary artists’ practices contextualize … artmaking? (p. 195)

VCAE as a Vehicle for Social Change

Digital Animation is an active intervention to change the gender inequity in technology using visual culture as its medium. In Digital Animation, participants use visual culture as a medium for gathering, synthesizing, creating, and disseminating information visually and creatively – as a key medium for learning. Participants use visual culture for personal reasons and for public good. They develop skills as computer animators, technology users, artists, collaborators, peer support, and citizens. The NAEA VCAE Advisory (2002) provides a strong framework for analyzing Digital Animation as a VCAE implementation, although the program does not perfectly match each enumerated pedagogical principle and aim.

This case study demonstrates the value of VCAE as more than a tool to deconstruct visual images and respond visually, but as a tool for social change on multiple levels. At Digital Animation, the program confronts gender inequity through technology education for girls while the participants confront local environmental issues through visual culture research and animation. Digital Animation proves VCAE can play a vital role in the design, implementation, and analysis of efforts to rectify sociocultural inequities, like the technology gender gap.

In the next chapter, I return to my initial three theoretical lenses: gender and technology research, feminist poststructuralist pedagogy, and visual culture art education. In this chapter, I revisit each theoretical lens and its contributions to this case study of the Digital Animation program. Then, I consider the gestalt of applying these three lenses to a single case study: what do these lenses reveal as a whole? In this meta-analysis, I consider the implications of this case study for the field of art education and propose new directions and questions for research.
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CHAPTER 6
USING DIGITAL ANIMATION AS AN INSTRUCTIONAL MODEL

Research over the past few decades has shown a decrease in the numbers and percentages of women entering and remaining in many STEM fields, particularly those related to computer technology. More recent data and news reports indicate this situation not only persists but is worsening, with fewer women entering these fields even as the need and earning power for these positions increases. *Digital Animation: A Technology Mentoring Program for Young Women* is an attempt to confront, and hopefully begin to counteract, these trends using the arts as the primary motivation for young women to learn and experience technology. The larger program goal is to determine if, and how, a technology mentoring program using digital animation software can motivate young women to consider and choose STEM courses and careers.

This case study has been an intensive, entangled, multi-year undertaking and still only partially covers a few of *Digital Animation*’s many interesting and informative research possibilities. In this conclusion, I offer a “crystallization” of my interpretations based on the scholarship, data, and analysis of this case (Richardson, 2000), investigating ways *Digital Animation* employs a multi-faceted critical educational approach to achieve its equity aims.

**Revisiting the Organization of the Digital Animation Case Study**

I began this dissertation by contextualizing my case study with relationship to gender and technology research, feminist poststructuralist pedagogy, and visual culture art education. Even more specifically, I located the context of the case itself, the *Digital Animation* technology mentoring program. I reviewed the literature of my three major areas of interest, using key ideas in each to shape individual frameworks for analysis. Using each framework, I combed Year 1 and Year 2 data, investigating links, organizing ideas, and providing examples that supported and complicated the ongoing, developing analysis.

After Chapter 2, I departed from the traditional dissertation format. Instead of a single literature review chapter, Chapters 3, 4, and 5 contain separate literature reviews for each of the theoretical frameworks. The second half of each chapter provides program research data and analysis. In this final chapter, I present a more comprehensive, expansive analysis, uniting the three perspectives in examining the case study data.
Findings: What Are Some Overarching Successful Components?

In earlier chapters, I largely analyze aspects of the Digital Animation program relevant to individual theoretical perspectives, with passing attention to their inextricably intertwined co-existence. In this chapter, I begin with these earlier sketchy, interstitial connections and hypotheses and use these as a basis to develop larger assertions with broader, stronger outlines.

Back to Center Stage: Heading Toward the (Spot)light

Here, I return to my early metaphor of comparing my theoretical frameworks to three separate, primary-colored spotlight beams. As these beams converge, they form a ray of piercing white light, or in my metaphor, they highlight Digital Animation attributes and practices present across all three areas: gender and technology research, feminist poststructuralist pedagogy, and visual culture art education.

For the Digital Animation formal program evaluations, each year I created lists of successful program practices and philosophies. I determined their success based on participant, mentor, and later parent responses in surveys, interviews, and informal interactions. I also considered administrator responses and reflections, outside print sources, and my own personal observations and impressions. Additionally, in the Year 1 program evaluation I linked Digital Animation’s practices and outcomes to technology standards from No Child Left Behind Technology Literacy Requirements, the Ohio Technology Standards, and the National Educational Technology Standards for Students.

Now, I combine elements from these lists with overlapping characteristics of my three theoretical lenses in order to emphasize the commonalities among these perspectives – to illuminate their shared concerns, constructions, and convictions. Again, I group related elements into categories to provide some organizational structure, even as I acknowledge these categories are artificial, arbitrary, and overly reductive. In each category, I consider data from across the theoretical frameworks. Afterwards, I consider what these examples of successful praxis, and their relationships across critical research, may mean for art education.

Overarching Successful Qualities, Philosophies, Strategies, and Praxis

The Digital Animation program intends to recognize, address, and counteract as many obstacles as possible for young women pursuing technology education, careers, and interests. To do this, the program takes a multi-pronged approach, deliberately and explicitly incorporating multiple practices, evaluating their usefulness and success across each program year, and modifying the program accordingly. In this case study, I specifically use gender and technology research, feminist poststructuralist pedagogy, and VCAE to examine critical areas of program planning, construction, practice, and response.

These three theoretical lenses share several crucial commonalities, many specifically enumerated by poststructuralist theory: the importance of language, subjectivity, power, and truth and knowledge. These theoretical lenses provide an awareness of ways language structures technology environments and users, and the impacts this can and does have on young women. Gender and technology research notes the often masculinized and violent nature of computer terminology, as well as the default to primarily
masculine computer users and creators; feminist poststructuralist pedagogy emphasizes that language can create environments where some learners are included while others are excluded; VCAE recognizes this power of written languages but also through the language and communicative power of images.

All three theoretical lenses also focus on the importance and impact of subjectivity on young women and technology. Gender and technology research provides plentiful examples of ways women’s subjectivity is constructed related to technology – as inept, bumbling, uninterested, and afraid. Feminist poststructuralist pedagogy examines how these characterizations and constructions of women as subjects within technology impacts who uses technology, how, and for what purposes. Whether these subjectivities are explicitly or implicitly invoked, many women find themselves discouraged from deep engagement with technology or convinced their interests and goals would not be served or augmented through using or designing technological tools. The rare women who do find themselves an isolated, marginalized minority. From this position, many women struggle to fit in within technology environments and careers, find their career progress a struggle or limited by the glass ceiling, and often face multiple pressures to leave the field. From a VCAE perspective, the subjectivity of women and technology is important in terms of personal impact on learners, particularly as manifest through visual images and cultural norms. Visual culture can create both general and specific images of technology and those persons allowed and encouraged to use it. These images often reinforce cultural expectations and societal norms. Additionally, VCAE stresses the importance of learners being both critical consumers and producers of visual culture, the importance of all learners being complete, autonomous individuals and community members, being fully actualized subjects.

Another common concern across these three lenses is power. Gender and technology research reveals the fact that in the United States and our western culture, white men, primarily, have been able to establish technology as their domain. By erasing or ignoring the earlier roles of women in developing, programming, and using computers, as well as by capitalizing on their privileges and sense of entitlement, men have managed, overtly, covertly, systematically, or obliviously, to establish and maintain technology as a male domain. Feminist poststructuralist pedagogy attributes some of the responsibility for this gender imbalance to the larger cultural gender-based imbalances of power and ways these are propagated. Women have less access to computer technology within homes, in schools, and in their careers. Women have less financial ability, incentive, and opportunity to acquire technology and technology skills. From a VCAE standpoint, women have less access to contemporary means of visual culture production as a result of their disparity in being able to access technology and develop computer skills.

Closely related, all three theoretical perspectives also grapple with issues around technology with relationship to truth and knowledge production and access. Gender and technology scholarship clearly reveals women’s disadvantage in terms of using computers as tools for collecting, creating, manipulating, and distributing information. The low percentages of women entering and graduating from computer degree programs in college demonstrate this discrepancy clearly, but it starts well before then. Young
women in middle and high school take fewer computer courses, fewer Advanced Placement computer tests, have much less quality time or instruction with computers, and often find themselves relegated to lesser or inferior equipment and resources when they do use computer technology, particularly in schools. From a feminist poststructuralist orientation, these young women do not learn the kinds of valuable technology knowledge their male counterparts do or contribute to the continuing development of computer technology. They are also deprived of reaching their full potential in terms of being able to locate knowledge digitally, apply this knowledge, and communicate it to others. They are being ignored as technology and informational knowledge creators and transmitters. In terms of VCAE, young women, like all marginalized people, need and deserve the same kinds of critical skills for analyzing, interpreting, and responding to visual culture as well as for creating visual culture. Without women’s critical involvement in visual culture, their depiction, presence, and existence in visual culture is determined and developed by men and from that particular perspective.

In addition to sharing poststructuralist concerns around language, subjectivity, power, and truth and knowledge, this case study demonstrates other corollary concerns common across the three lenses, or, metaphorically, standing in the center of the spotlight. Each of these lenses is critical, critiquing the status quo and its inherent power imbalances, the constant designation construction, re-construction, and policing of who or what belongs in the center and who or what is relegated to the margins. These perspectives insist on recognizing the cultural construction and material consequences of inequality, both in terms of actual cost and in terms of “opportunity cost,” or what we lose by not allowing or fostering the involvement of diverse people in the creation, implementation, and common use of, in this case, computer technologies. Each lens also presses for changing this status quo, for challenging current hierarchies and working toward equity and justice. While this is a difficult task, always fraught with the danger of replacing one hierarchy with another, their goals are still worth chasing.

Cross-cutting successful program philosophies and practices provide evidence of the power available through the intersection of multiple theoretical frameworks, including access, inclusion and support, collaboration and cooperation, relevance, engagement, and equity. The next sections address these shared tenets individually, providing examples across the three lenses.

**Access**

Access is a factor critical to the success or long-term interest of women, or anyone, in technology. In order for any person or group to learn anything successfully, they must have access. In the case of women and technology, increasing young women’s use of and skill with technology requires their direct access to technology and education and resources. In many developing countries, access and use of computer technologies can be very restrictive, primarily based on gender but also dependent on economic factors, too. Developed countries may not have such overt rules and boundaries, but socio-cultural factors continue to influence who uses computers, when, how long, for what, and at what level of expertise.
In the United States, even as more households have computers and internet access, the placement of these computers and norms around their use have a huge impact on access. Many home computers are in locations that facilitate male access while they discourage or limit female access, such as in a boy’s bedroom or father’s office (Margolis & Fisher, 2003). When computers are in more public or female-friendly household areas, males still tend to monopolize their use (Margolis & Fisher, 2003). Digital Animation participants commonly report stories of fathers and brothers bonding over using or building technology.

These discrepancies carry into many classrooms and educational settings. Again, while males and females may appear to have equitable access to technology, socio-cultural factors promote male technology involvement and discourage females. Digital Animation used non-traditional approaches to promote young women’s access and digital computer technology use. Everyone in the program has individual, direct access to premium, professional digital technology. No one has to jockey for position to get to use the computer that works or that has the best software or hardware (MP, INT, 15Feb05), a contest or process most young women often lose, passively or actively (Margolis & Fisher, 2003; NCES, 1996). No one has to wait for a brother to finish or challenge a group of guys to use the Digital Animation machines.

From a visual culture art education perspective, young women’s access to technology is also an important issue of socio-economic justice. As digital media increasingly occupy, and dominate, our environments and experiences, excluding women from technological and digital media literacy, as well as from the modes of creation and distribution, becomes increasingly, and increasingly obviously, an issue of oppression and discrimination, regardless of its subtleties or façade of fairness. At Digital Animation, participants arrive with a wide range of prior technology access, experience, and skill levels, but almost all express amazement with the range, quality, and sometimes cutting-edge nature of the technology they encounter in the program and the level of access and interaction they have with it (Girls Post-surveys 04; 05). Access is an important component of the overall program’s success across all three frameworks. One parent asserted that the best part of Digital Animation was introducing the participants “to all the available technology out there and letting her get the hands-on experience” (Parent surveys, 05).

Respect, Inclusion, and Support

Another finding from this research is the importance of respectful, inclusive, supportive praxis in young women’s success with computer technology. Digital Animation infuses inclusion, support, and respect prominently throughout the program, with examples ranging across all three theoretical frameworks. The young women in the program both years overwhelmingly report specific examples of feeling successful with technology during the program, even the few expressing mild frustration (EVY1; Girls Post-survey 04, 05). Most participants also reported a sense of improved self-confidence with computing and technology (Girls Post-survey, 04, 05).
Respectful

One of the most obvious values of the Digital Animation program structure and praxis, and one that contributes dramatically to its success, is that of respect. From the beginning of each program, participants get individual recognition, greeting, orientation, supply packets, and attention (ONY1, 05). Participants and parents respond immediately and in kind. Across Year 1 and Year 2, I recorded no discernable issues of disrespect or disruption. One parent stressed the positive impact the environment of respect and recognition had on his daughter, and has more broadly, claiming, “When a person is treated well as she was they are able to accomplish a lot more” (Parent post-survey 05). Parents, teachers, family members, and press representatives consistently express amazement at the quality of Digital Animation’s resources, equipment, planning, staffing, and program implementation (ON 04, 05). Parents and participants also stress their appreciation of small gestures of validation and respect, like the attention to providing a range of lunches and snack options to meet many different dietary needs, tastes, and preferences (Participant post-surveys, 04, 05; Par 05).

Inclusive

One way Digital Animation demonstrates the importance of inclusiveness for young women in technology environments across multiple theoretical frameworks is through its designation as a program for young women only. Parents, participants, administrators, staff, and most mentors believe the single-sex environment underlines, rather than contradicts, the dedication to making young women feel included in a technology classroom, technology environments, and technology fields more generally (ONY1, ONY2; Surveys Y1, Y2). One participant stressed, “I liked that it was a girl program, a chance for young girls to get in touch with technology” (Participant Post-survey, Y1), while others enjoyed their brothers’ jealousy (ONY1). Mentors noted that having all female participants “helps the group dynamics,” “made everyone more comfortable,” and kept girls focused and less self-conscious (Mentor Post-survey, Y1).

Some participants expressed an appreciation for the all-female program; mentors, parents, and administrators were explicit about their support for this component. A few parents claimed the “Best part could be that it was for young women only” (Parent Post-survey, Y2). One mentor stated the “all-female instructional and mentor staff helped create an environment that demonstrated the technological ability and interest of females” (Mentor Post-survey, Y2). Others claimed the all-female program “helped the girls focus,” “made everyone more comfortable,” and gave these females a chance to experience digital technology without the self-consciousness, distractions, and pressures present in most more traditional co-ed technology education environments (Mentor Post-surveys, Y2).

From all perspectives, the participants benefited from their inclusion in a group of young women interested and working in technology. In Year 2, one participant explained that being included in this program “was really fun and good socially.” Mentors, parents, and participants all stressed the importance of social interactions and forming friendships during the program. One mentor declared the “Girls benefited from networking with peers and mentors who have similar interests and ambitions – they made friends
while they learned “ (Mentor Post-survey, Y2). Parents highlighted the importance of personal inclusion, through personal relationships and friendships, on the experiences of their daughters. One parent was glad her daughter “was able to be involved in a program with others who shared her passion for digital animation,” and another appreciated “the validation” of her daughter’s “interest in this area and capabilities” and the “increase of her self-confidence, reassuring her that she ‘is not alone’” (Parent Post-surveys, Y2). Other parents reported their daughters enjoyed “making new friends,” “the fellowship,” and the “wonderful camaraderie” (Parent Post-surveys, 05Y2 One parent exclaimed, “I can’t thank you enough for this opportunity for my daughter. I have never seen her so happy. She has been in her element, and perhaps has “found” herself” (Parent Post-surveys, Y2)

The impact of seeing women represented in technology fields as successful students, professors, administrators, animators, and artists, among other roles, is a key element in the success and effectiveness of this program. Gender and technology research has exposed this technology gender gap, and stresses the need to actively, explicitly, and continually address it, remaining conscious of the persistence and resistance of gender inequity. Parents and program administrators repeatedly recognize and stress the power and significance of these representations. Palazzi includes the mentor component because she recognizes the power of visual images in counteracting stereotypes and creating new, more inclusive possibilities. Palazzi believes the mentors provide real-life, proof-positive that some women love technology, love art and design, and can succeed with both. Almost all parents mentioned their appreciation for the mentors, too. One parent stressed, “Meeting the mentors and seeing them as role models is also a big plus” (Parent Post-surveys, Y2). Perhaps most importantly, almost all participants across both years of the study touted their appreciation of the college mentors as teaching assistants, role models, and friends (Participant post-surveys, Y1, Y2).

Supportive

Supportiveness is another important, and closely related, factor contributing to Digital Animation’s success. The program established and maintained a supportive praxis through several important structural and procedural methods. First, the small group structure of the program emphasized its efforts for inclusiveness, but it also contributes to an overall environment of support.

The mentors form a vital component of this program’s strength, according to all parties involved (Girls Post-surveys, Y1, Y2; Mentor Post-surveys, Y1, Y2; MP INT, 15Feb05; ONY1; ONY2; Parent Post-surveys, Y2). Assigning mentors to specific small groups, a practice started during Year 1 of this case study, was an unequivocal success both years (Mentor post-surveys, 04, 05; MP INT, 15Feb05). The mentors provide participants with an immediate resource for individualized attention, instruction, remediation, and assistance throughout instruction and work time. Mentors provide participants with a clear source of support they can access as often, or as rarely, as necessary or desired. According to participants, mentors are “a lot of help,” “give you more specialized attention,” and are “right there when you need them” (Participant post-surveys, 05).
One returning mentor believed the small groups and mentor structure was instrumental to the
program’s success. She argued:

The groups are big enough that the girls can learn how to divide up work and get an end product
they’re satisfied with, but still small enough that the mentor can easily work with them one-on-one
and get to know them. This helps establish a personal relationship between the girls and the
mentors. Since relationships between females are important in a male-dominated field, the size of
the groups helped foster more intimate and stronger relationships. (MP, PC, Y2)

The mentors and group structure succeeds as a feminist pedagogical approach aimed at providing young
women support to counteract the gender inequity in technology fields.

From a VCAE perspective, the mentors provided physical evidence, images of successful and
diverse women working with technology. A Year 2 participant notes, “I think [mentors] were extremely
helpful … living examples of what we can grow up to be and what we can work for” (Participant Post-
survey, Y2). The mentor structure reduces the hierarchical power structure of traditional technology
education and work environments, bridging the gap between young women and women, and between
women and technology. The mentors function as guides and resources, as friends the participants can relate
to and learn from (Mentor Post-surveys, Y2). One participant believed the mentor and small group structure
“was completely necessary because we didn’t know anything about everything and mentors could help us
individually” (Participant Post-survey, Y2).

The Digital Animation practices that support individual learners are applicable across my
theoretical frameworks. From a gender and technology perspective, female college-aged mentors support
young women’s success with and interest in technology. From a feminist poststructuralist perspective, the
mentors allow individualized pacing of instruction; some learners proceed more quickly or explore the
tasks more completely while others need remediation or troubleshooting assistance. VCAE promotes access
to knowledge, critical investigative and evaluative abilities, and competence with contemporary means of
information distribution. Digital Animation practices also support developing the comfort, confidence, and
curiosity around technology young women often lack (Sanders, 2005). The program recognizes, values, and
supports diverse learners and their learning and expression styles. This recognition, representation, and
support reinforce the value of addressing equity issues from multiple perspectives simultaneously.

**Collaboration and Cooperation**

A closely related finding is the importance of collaboration and cooperation as cross-cutting
contributing factors to the summer program’s success. Almost everything in Digital Animation, after the
program’s main objectives and technology resources, is negotiable. The program establishes and maintains
a collaborative and cooperative environment. During the staff planning week before the program officially
begins each summer, Maria Palazzi and the other ACCAD and Digital Animation staff model these
processes with the mentors. The whole group drafts a tentative program schedule then brainstorms,
develops possibilities, and eventually shapes the animation project’s initial topic and subtopic choices.

Mentors and instructors then negotiate and divide duties, reporting progress or problems to others,
receiving praise, assistance, or suggestions. Palazzi continued this collaboration with the staff throughout the program, presenting objectives or tasks to accomplish and having the mentors make decisions and create a plan (ONY1, ONY2).

In turn, mentors apply and model this process. Mentors often turn to each other first when they need assistance, sometimes targeting another mentor, based on experience or expertise (ONY1, ONY2). Mentors also model this in interactions with their own small groups during the program. Everyone contributes ideas, makes design decisions, works on individual animation tasks, provides and receives feedback, and modifies their plans and actions. Decision-making is a community effort. The final animations include clear, obvious, and successful contributions by all group members, individually and collectively. In this way, the program is responsive to the participants as individual learners, as group and community members, as critical cultural consumers and producers. Initial group interactions involve incorporating ideas, building on them, or modifying them in a fluid, participative manner. This does not mean each participant gets her way all the time, but it does mean everyone’s ideas are valid and deserve consideration.

In storyboarding, each group develops their idea for an animation addressing a particular topic about the focal. The groups echo the mentors’ process and brainstorm ideas, discuss them, sketch them, and work collaboratively toward a plan for their group animation. After storyboarding, groups divide animation tasks. Palazzi insists, “Figuring out how to divide tasks is the key. When the girls feel like they own part of the storyboard, they are more likely to work and be more engaged” (ONY2, p. 4). This kind of involvement is a key to promoting community and collaboration among females in STEM fields, encouraging these young women to develop skills with contemporary tools of digital visual culture production and distribution.

Collaboration also fosters the continual communal consideration of relevance in this project. In the next section, I explore the value of relevance as a successful component of Digital Animation’s program. Relevance

The next finding from this research is that relevance is also an important cross-cutting praxis supporting the success of Digital Animation. Many participants, mentors, parents, administrators, and observers all explicitly acknowledge the benefits of relevance in the program (MP INT 15Feb05; ONY1, ONY2; Participant post-surveys, Y1, Y2; Parent post-surveys, Y2). From a gender and technology perspective, the participants appreciate learning real, professional, and contemporary technology skills, as well as developing a sense of alternative possibilities for technology development and application (Girls Post-surveys Y1, Y2).

Participants acquire these technology skills in the process of creating and publishing an animated persuasive essay focused around local environments and their histories, current status, assets, threats, and roles in our daily lives and ecosystems. Furthermore, participants’ animations were presented to live
audiences and then published on the university’s website, providing a real audience and the chance for their animations to have actual material impact on the future of these environments.

Interdisciplinarity is an important cross-cutting component of Digital Animation’s relevance. Instructors and mentors demonstrate and emphasize connections between program digital animation experiences and course concepts in school subjects like math, science, social studies, English, and arts (ONY1, ONY2). The process of interdisciplinary investigation, synthesis, and re-presentation better embodies the kinds of skills and strategies citizens in contemporary technological societies will need to function and succeed in contemporary cultures, as well as to critique, challenge, and change them. These higher order thinking skills and the ability to access, evaluate, and apply knowledge and concepts from different disciplines and diverse perspectives are becoming much more valuable than prescribed and standardized curricular objectives in the digital information age.

Parents also recognize the program’s efforts toward relevance. Many were impressed and pleased with the technology skills and knowledge their daughters acquired in the two-week time span. They mentioned and appreciated the connections to and across school subjects. Parents also emphasized aspects of relevance that exceed traditional curricular considerations, such as the development of individual and group work skills, social and collaborative skills, confidence, and exposure to technology as a component of commercial, creative, and scholarly work. One participant in Year 2 confessed the program was changing her ideas about the relevance of math skills in her pursuit of digital animation expertise (Natalie, INT, 30Jun05). Mentors verbally reinforce these connections, too, throughout the program to participants on individual and group bases (ONY1, ONY2).

Participants emphasized the program’s relevance as a means of critiquing, incorporating, and (re)producing visual culture. They include pop culture references and influences from movies like the James Bond series and Finding Nemo, children’s books, contemporary Japanese animation, plus a large emphasis on including sound – from pop music to digital sound effects. They incorporated these effortlessly and cleverly within their animations. Initial program research into contemporary digital environmental artists and their works expanded the participants’ sense of digital visual culture and computer technology as scientific and creative tools.

A significant outcome of relevance in this program is the creation of active, engaged learners; every participant in this program participates. In the next section, I further analyze the significance of active learning.

Engaged (Inter)Active Learners

Another finding is the importance of learner engagement to Digital Animation’s successful praxis. The gender gap in technology is more than the result of women actively choosing not to pursue STEM education, careers, or skills, so the strategies for confronting it must address multiple discouraging factors simultaneously. Digital Animation’s multi-pronged successful strategies for engaging young women in technology education include practices that resonate across the three theoretical frameworks. Engaged
learners are (inter)active, creative, critical. They consider possibilities, evaluate information, form and check hypotheses, and continuously modify their ideas.

One Digital Animation effort to engage young women with technology is through an arts-based approach. Digital Animation presents technology as an artistic, creative medium. Participants admitted to the program profess a strong interest in the arts in their application materials (Digital Animation demographic information 04, 05). This focus on creativity provides program participants with an alternative entry point into technology interest and pursuit (Sanders, 2005). Creativity requires engagement – conceptual and physical. 3D digital animation offers the participants a medium for expressing knowledge as an artistic creation, a medium with increasing artistic recognition and importance. The first official program activity involves forming the small groups, reviewing a list of animals and their symbolic associations, choosing individual animals and explaining their choices to the group, visually representing their animals, and creating a small group “totem pole” with the set. Mentors facilitate individual engagement in the activity and participate along with their groups. Mentors also facilitate engagement among all group members, using the arts as a starting point for building interpersonal connections.

The Digital Animation working arrangements and tasks require individual engagement and action. Participation involves each individual creating at least a portion of her group’s animation. The technology is new and challenging, and the program tasks using it are challenging, too. Problems arise frequently, for individuals, groups, and even the entire program; problem solving happens at each of these levels, too (ONY1, ON02). Participants constantly encounter issues, but in solving them, they constantly experience successes and build technology and critical thinking skills and knowledge. Additional important components of Digital Animation’s learner engagement attempts include encouraging playfulness and broad technology exposure.

Giving young women access to technology equipment, formal and individual instruction, and tasks provides a starting point and a basic outline for engagement, but a key element, across all three frameworks, in continuing participant engagement is play. Within technology, much learning occurs through a kind of play – an informed, extended experimentation with tools and ideas. Play allows time for learning at an individual pace, in an experiential manner, and for sheer enjoyment. Play is an active process; it promotes critical thinking and problem-solving. Play can be an individual or group activity. Program instructors and mentors actively encourage and model play while conducting tutorials, trying to solve problems, contributing their own work, and interacting with each other. Parents comment on how much their daughters enjoy the program, evident through conversations, continuing animation work at home during the evenings, and positive changes in demeanor and confidence. Engagement does not start and stop at the classroom door. Almost every program participant expressed their enjoyment of the program, one specifically commenting that she was happy “being able to create something so incredible.” Only a few participants did not want to be involved with future ACCAD opportunities. Play encourages
engagement by instigating the application of ideas and practices from one context into another, by continually altering variables and evaluating results, by considering other possibilities.

*Digital Animation* also counters potential lack of engagement through encountering a wide range of new media, challenging participants, and stimulating creativity. The participants see, touch, operate, observe, interact with, and discuss many technologies: digital animation, Photoshop, word processing, audio and video recording and editing, Internet research, Motion Capture, Virtual Reality, digital art, and many others (ONY1, ONY2). Maria Palazzi hopes broader technology exposure, increased awareness, and positive personal experiences will lead to creating the critical mass of women in technology environments necessary for women to see them as viable, useful, practical options (Sanders, 2005).

Facing challenges and problems required participants to be interactive, too. Those who quickly understood and mastered a concept got mentor or instructor encouragement to try something even more complex or challenging or to continue to play around with tools and controls as a process of learning to use them. When individuals or groups faced problems, interaction was a major way of confronting them. Participants could ask their other group members, their mentor, any mentor, any instructor, or anyone else for assistance or input.

In *Digital Animation* learners (inter)actively construct knowledge that is locally applicable and relevant, as well as subjective, flexible, and critical. Much of their meaning-making involves visual culture as a primary medium for research, documentation, discussion, brainstorming, negotiating, storyboarding, animating, presentation, and dissemination. The participants actively use visual culture processes and products to mediate, understand, critique, create, and communicate ideas. At each juncture, group members discussed what they were learning, what they wanted to communicate about it, how they wanted to do it, and how things were proceeding (ONY2). These practices facilitate active, collaborative knowledge production from all three theoretical perspectives.

A final (inter)active aspect of engaging learners is the focus on physical presentations throughout the program. Mentors present about themselves, groups present on artists working with technology and environmental issues, and groups present storyboards to each other. The program finale involves each group presenting their research process, information, and animation; each member explains her own contributions. Before each presentation, groups organize ideas, create notes, and practice – all active processes.

That these young women are actively, enthusiastically involved with such technology and resources, and learning in at such a rapid pace, contradicts many of our cultural assumptions, rationales, and stereotypes. These contradictions create the space for possibilities, for re-imagining what technology is and could be, for re-imagining it as including women, for welcoming diversity. In short, successfully engaging young women in technology precipitates the need to reconsider and address lingering issues of gender inequities in technology.
Equity! The Clear Light in the Middle

A final overarching successful component of Digital Animation praxis is the commitment to equity. Maria Palazzi founded the program explicitly to address the gender inequities in STEM fields, particularly in computer technology. During both years of the case study, the program projects focused on issues of environmental equity and diversity. Participants challenged their technology conceptions, abilities, and stereotypes, including those around gender. The program design intentionally attempts to decrease and minimize socioeconomic and cultural barriers, and Palazzi continually expresses a desire to reflect the local urban public school demographics. These young women have unfettered access to the common program technology resources. They receive as much or as little individual support as they want or need. The environment recognizes, embraces, encourages, and uplifts them. They feel a strong female presence. They belong in this support and social network. Their skills, knowledge, experiences, and ideas are welcome. Their contributions are necessary. Palazzi hopes broad technology exposure, awareness, and experiences will catalyze the critical mass of women environments necessary for women to see themselves as viable, useful, welcome, respected participants in technology (Sanders, 2005). Each of my theoretical frameworks recognizes the importance of equity, and program equity efforts infuse them all. All three question dominant educational and cultural paradigms that continue to marginalize and oppress groups outside the norm; all three seek to change this status quo. Power does not easily subside or shift. Equity won’t create itself.

Lingering Questions

Despite the program’s shiny sheen of success, some questions and issues remain. Every summer the program operates, the questions shift, albeit sometimes only slightly. In this case study, lingering issues include the length of participant program involvement; the breadth and depth of participants’ technology exposure, direct involvement, and use; evaluating and extending the program’s quality and impact; and increasing the program’s diversity.

The program length is a variable under continual program review. Palazzi has been able to secure enough funding yearly for the summer program operation costs, investing in an intensive, high quality technology experience. But each summer, participants and parents continue to suggest extending the length of the program or letting the participants return multiple summers (Participant post-surveys, Y1, Y2; Parent Post-survey, Y2). Palazzi considers whether the program works better by having more girls participate for shorter periods of time during a single summer, or whether it would be better to have the same participants four summers in a row? What would a successful extended technology mentoring program for young women look like? What would the goals be? How could such a program advance young women in the technology field (ONY1, p. 56)? How can we determine the most effective length and intensity of involvement in a technology mentoring program for young women? What if the current arrangement is best?
Another lingering issue is the level of participants’ direct interactions with multiple media and new technologies. During the major work of producing 3D digital animated shorts, each participant had access to an individual computer station networked into the main ACCAD system resources, including professional grade graphics software and rendering resources. Every participant had the same up-to-date computer workstation with new monitors keyboards, mice, and hard drive units. In some circumstances, the participants’ involvement with the technology was more indirect, such as wearing the Motion Capture suit or working with a mentor in a smaller lab to import, edit, and finalize sound. Sometimes involvement consisted more of exposure to technology, such as wearing the Virtual Reality glasses. Sometimes participant technology exposure was superficial, involving only its mention or discussion, by mentors, instructors, other participants, or guest speakers. How much involvement with technology do young women need in order to feel comfortable and confident with it? How much more do they need in order to actively decide whether or not to pursue technology further? Does increasing the amount of direct, engaged interaction increase participants’ consideration of computer technology for educational, creative, or occupational purposes?

A related lingering issue is the struggle to expand young women’s conceptions of what technology is, its wide-ranging impact on many other fields, and its huge, untapped creative and practical potential. Palazzi continually wonders how to get participants to see technology “not as a tiny little thing but as this big diverse thing” (ONY1, p. 56). How can Digital Animation harness the power of technology to enhance interdisciplinary modes of research, analysis, creation, and distribution? How can young women participate as active users, designers, creators, distributors, and shapers of technologies? How can current and future technologies be more beneficial and less harmful to women (and other marginalized populations)? How can current and future technologies benefit more women (and other marginalized populations)? How can they reduce harm to women (and other marginalized populations)? What practical global or systematic benefits can technology provide? Digital technology is not just for animating movies and video games; it has huge potential for creating actual material change in people’s lives. What can women contribute and accomplish by developing and applying technologies across disciplinary and media boundaries?

In addition to expanding young women’s conceptions of technology, lingering issues remain around how to maximize the program’s impact. Should the program include more young women each year? What resources would this require? Is acquiring them likely? Should Digital Animation include more school teachers? Should it happen on site at more schools? Should previous participants formally rotate into peer instructor and then mentor positions? Maria Palazzi mulls ways to recruit and retain more teachers in the technology mentoring program, to expose more of them to new and diverse technologies, and train them in using some. Would continuing education or college-level course credits increase teacher involvement? Would payment for participation? Palazzi dropped the teacher component due to poor participation and consequently increased the number of participants in Year 2 of the program from 15 to 18.
Program recruitment, application, and acceptance procedures pose several lingering issues around diversity. First, although the program espouses a desire to reflect the local public school demographic more accurately, participants are overwhelmingly, and increasingly, white and middle class. One mentor stresses the need to recruit “more financially underprivileged participants (post-survey, 04). After Year 1, Palazzi wondered if the decrease in racial and ethnic diversity from the previous year impacted the behavior, speed, and performance of the whole group. Did a more homogenous group of learners proceed more quickly through technology tutorials and tasks? If so, why?

Next, the diversity of the female college-aged technology mentors is limited by the current small pool of women, and smaller pool of women minority, candidates – a situation Digital Animation aims to change. Even though Digital Animation does recruit all the eligible female minority candidates from the regular ACCAD university program, the diversity is still minimal. Before and after Year 1, I believed having female role models and mentors would be enough to encourage young women’s involvement and sense of belonging in technology. After reviewing the data from Year 1 and then comparing it to Year 2, I found that the participants reporting the lowest levels of satisfaction with the program each year, and least likely to pursue future computer technology and animation possibilities were members of racial minority groups. In each year, these participants were from racial/ethnic groups not represented by the mentor population. I remain unsure of the possible significance of these factors and their relationships. Other participants from minority racial/ethnic groups unrepresented by the mentors were extremely satisfied with the program and proclaimed they would likely pursue future technology education. Additionally, some of the most visibly enthusiastic participants across both years were ethnic/racial minorities, some represented in the mentor population and some not. How can Digital Animation more successfully recruit and retain diverse participants and mentors? How will this impact the technology field?

Although there are many more lingering issues, in the next section, I address one vital to this case study: Is the Digital Animation program successful. Does it work?

**Is Digital Animation an Overall Success?**

While the findings highlight successful aspects of the Digital Animation program, the overall success of the program is much more complicated. In the short term, almost every participant expressed their enjoyment of the program, feelings of success, appreciation of the social support, increase in technology knowledge, and interest in continued contact with ACCAD (Participant Post-surveys, Y1, Y2). Parents expressed gratitude for the change in their daughters’ confidence levels, the opportunity to attend this program, the exposure to technology, and an expanded knowledge of technology’s possible roles in their future endeavors (Parents Post-survey, Y2). Most parents’ and participants’ only serious suggestions involved extending the program – for more weeks, more years, more girls (Parents Post-survey, Y2; Participant Post-surveys, Y1, Y2). Overall, participants did report an increase in their likelihood of taking additional technology courses in or after high school, even without the final responses of Year 1’s most noticeably enthusiastic participant.
In contrast, a few participants across both years felt their program participation decreased their desire to pursue future technology courses (Participant Post-surveys, Y1, Y2). One participant felt frustrated with computer programs or functions sometimes freezing or having a program suddenly quit, complaining that computers “just kick off on you;” another pronounced “she had other interests to pursue” instead (Participant post-surveys, 04, 05). By the end of Year 2, Palazzi complicated her own notion of program success, and wondered if having a participant decide she did not want to pursue future technology courses counted as a success in some way (MP, PC, Y2). Does it matter that a majority of those expressing less interest in future technology education or ACCAD opportunities were ethnic/racial minority participants? This is an issue and question that definitely warrants further investigation.

In the mid-term, the program does provide some evidence Digital Animation's progress toward meeting its goals. Each year, several prior mentors return to the program, demonstrating their persistence in technology as well as their commitment to the program’s philosophies and practices. Another compelling mid-term sign of program success is the return of former program participants as mentors (ONY1, ONY2). Also, one parent reported her gratitude that both of her daughters were able to participate in the program a few years apart (Parents Post-survey, Y2).

The long-term goal of the Digital Animation program is to increase participant likelihood of pursuing technology education or career options and remaining in them, eventually increasing the gender equity in technology. During Year 2, I worked with program administrators to design a more longitudinal survey of prior participants’ technology pursuits. At the end of Year 2, longitudinal surveys were mailed to former participants and posted on Digital Animation’s website. Without seeing this data, I have no sense of the overall program’s long-term impact on participants’ eventual education and career choices. My sense is that the long-term success of the program is relative for each participant, but that it has had a positive impact on women entering computer animation and related technology fields. The program staff and participants have imagined and modeled a successful support network for women in technology (ONY1, ONY2). Each additional woman who enters technology may make only a small difference, but we need the accumulation of these differences to ever reach the critical mass necessary for women to achieve gender equity in technology.

The Implications for Art Education

In this section, I examine and imagine the implications of this case study for art education. In Chapters 3 – 5, I analyze the Digital Animation program from each theoretical lens. I consider what each theoretical lens emphasizes about the program and what this means as well as considering what the program emphasizes within each theoretical lens. In some instances within each chapter, I begin exploring the complex rhizomatic interrelationships among these theoretical lenses. Now I turn my attention more fully to this web of connections, considering their cumulative potential and implications for the field of art education.
A prime consideration throughout the course of this case study has been the implications of a program like Digital Animation for art education. In many ways, this program demonstrates VCAE’s value in a multi-pronged approach to confront and correct a persistent sociocultural inequity, in this case the technology gender gap. Critical issues of access, inclusion and support, collaboration, relevance, engagement, and equity permeate this case study; how do these issues matter to art education?

This case study analyzes access as a critical component of Digital Animation’s arts-based approach to increasing gender equity in technology. In this particular case, a VCAE approach challenges restrictive practices around technologies based on socioeconomic factors, primarily gender. While this case does not provide a blueprint for using VCAE to address any and all socioeconomic inequity, it provides a model for using VCAE for practical social justice ends. This model demonstrates the power of combining VCAE with another critical pedagogical orientation, such as feminist poststructuralism, to confront specific forms of social inequities within art education. In what other ways can art education become a more active facet of critical citizenship? How can art education provide and increase access for marginalized learners in ways that confront and change sociocultural inequities?

This study recognizes the importance of access to technology in producing critical digital visual culture. Art education can, and should, promote equitable access to technological modes of visual culture production and distribution. A VCAE perspective considers the inequities involved in the access, production, and distribution of digital visual culture in an increasingly digital society. VCAE entails exposing and critically responding to sociocultural inequities, primarily through visual culture channels. Digital Animation uses visual culture as a means of creative expression and response, and for accessing and disseminating ideas. These multiple purposes reinforce the value of visual culture and art education in constructing a framework for creative and applied critical thinking as well as practical skill acquisition and knowledge production. Digital Animation illustrates an example of art education promoting and providing access as a necessary factor in fostering interest and developing skills to address technology gender inequity.

VCAE encourages equitable access to critical visual culture tools for analysis and response. The Digital Animation program uses access to digital animation technology tools and highly qualified instructional and administrative staff to provide participants with specific, valuable visual culture production skills. A VCAE approach can use multiple media as the means for learning analysis and technical production skills as well as developing interdisciplinary content knowledge and critical thinking opportunities. VCAE can be a means for supporting critical research, analysis, creativity, and technology skills across multiple media, across multiple disciplines, and for multiple social justice aims.

Respect, inclusion, and support are also key factors in Digital Animation’s success, combining VCAE and feminist poststructuralist pedagogical concerns. VCAE practices can support developing comfort, confidence, and curiosity around technology young women often lack (Sanders, 2005). Digital Animation demonstrates the ability of a VCAE approach to infuse respect, inclusion, and support as
principal pedagogical values and practices throughout a program. Successful VCAE practices can include considering multiple points of view, options, interpretations, and subjectivities. For art education, this means an obligation to recognize and include diverse individuals, divergent perspectives, opinions, approaches, and arrangements of value, power, instruction, and education. Subsequently, VCAE advocates the dissolution of hierarchical boundaries between high art and pop culture, between folk art and high art, between craft and design. Art education, through VCAE content and pedagogy, can provide students with a venue for critical investigation, analysis, response, and skills in multiple media. Art education environments can incorporate content and pedagogical practices that encourage respect, inclusion, and support as contributing factors to learner and programmatic success.

The importance of collaboration and cooperation to Digital Animation’s success also holds implications for art education. While some artists pursue creation as an individual act, many artists recognize their embeddedness within a larger construction of painting, animation, illustration, or even within larger cultural contexts such as art. Digital Animation’s success with collaboration and cooperation reinforces their value in VCAE. VCAE is explicit about the interconnectedness and rhizomatic relationships and influences pulsating among visual culture works. Nothing is created in a vacuum. Art education can emphasize the value of individuals and of working together, negotiating, building from others’ ideas, multiple perspectives and options, participating in the larger cultural discourse. VCAE classroom practices can include explicit opportunities for interactions. VCAE, through cooperation and collaboration, can be a bridge into the visual culture aspects of dominant and marginal cultural discourses. Art education can provide learners with tools to recognize connections, work together, and succeed. Flexibility, an important concept within the arts, becomes a crucial VCAE skill.

The value of relevance as a successful pedagogical component has considerable implications for art education, too. This case study reinforces earlier VCAE claims that relevance encourages learner engagement and develops skills applicable in today’s visual culture society (Duncum, 2002b; Freedman, 2003a; Freedman & Stuhr, 2004; Mirzoeff, 1999). For art education, this reinforces the value of including contemporary forms of visual culture, especially newer digital media forms with exponentially increased ease of manipulability, sampling, creative cannibalization, audience, and range of distribution. The importance of relevance in this case study also applies to the program’s relevance as a critical pedagogical intervention. If Digital Animation was a program for 18 teenagers interested in computer technology, it could still be amazing, but its real social justice relevance includes addressing local environmental issues and the technology gender gap. Art is a valuable academic subject and thought process that provides opportunities for including content important to students’ lives and identities as well as skills for communicating ideas, desires, experiences, and emotions. VCAE can connect critical thinking to the everyday process of living. VCAE provides options for developing multiple skills and connections across academic and artistic disciplines as well as creative, scientific, expository, and narrative tools. VCAE also promotes the production of visual culture as a critical response, creating student connections with the works
studied. Art education can benefit from emphasizing our educational relevance, but this relevance is critical to learners and provides them with multiple opportunities and motivating factors to be active, engaged learners.

This Digital Animation case study also provides support for the value of engaged (inter)active learners as a hallmark of successful contemporary educational practice, particularly with computer technology. While other programs attempt other means to attract and maintain women in technology courses, programs, and careers, Digital Animation demonstrates the value art education can have in achieving social justice ends and developing engaged (inter)active learners. VCAE and feminist poststructuralist pedagogy characterize learners as active, creative, and critical; Digital Animation demonstrates effective learner engagement using multiple new visual culture media, addressing a real problem, using each participant’s creativity, group and individual responsibilities, direct support and challenges, as well as final presentation and publication. VCAE embraces new media, fluid subjectivities, discursive creative and interpersonal interaction, playfulness, multiplicity, and uncertainty, encouraging learners to explore possibilities, evaluate information, form and check hypotheses, and continuously modify their ideas (Atkinson, p. 31; Eisenhauer, 2003, 2006; Burton, 2006; Walker, et al, 2006). With access, support, and collaboration, Digital Animation's young female participants are active, enthusiastic, rapid technology learners and digital artists, contradicting and changing the cultural assumptions and stereotypes around women and technology. Art education can be a tool to engage learners in active growth and change and as agents of active growth and change.

Equity is a final important thematic characteristic of Digital Animation's success across theoretical frameworks. Digital Animation attempts to increase the gender equity in technology education and employment. Art education can play an active role in exposing, confronting, and changing sociocultural inequities. VCAE, like feminist poststructuralist pedagogy, deconstructs traditional value hierarchies for art and sociocultural categories such as gender, race, class, nationality, and sexuality. Like feminist poststructuralist pedagogy, art education can question dominant educational and cultural paradigms that marginalize and oppress groups outside the norm; it can be an active agent for change, too.

Questions remain about how to apply the lessons and examples of this case study to other programs in art education, more specifically those implementing a VCAE perspective. How can VCAE work in conjunction with other critical pedagogies to address other equity issues? What do we gain as art educators from integrating multiple theoretical perspectives and pedagogies? How can VCAE provide an interdisciplinary learning medium? How can VCAE complement, extend, and link learning across subject areas? Are new media more effective as tools for social justice?

This case study bolsters the growing body of evidence supporting critical pedagogies as a means to recognize and address contemporary equity issues using contemporary digital media. Digital visual culture tools are skills are vital in much contemporary western society (Flood & Bamford, 2007, p. 99; Freedman, 2003). Digital Culture provides an example of applying two critical poststructuralist theories to
address a contemporary sociocultural issue within technology and within visual culture. Art educators can use this as a model, or reference, for constructing VCAE projects or programs that confront other sociocultural equity issues, use other media, and address other situationally- or locally-relevant issues. Art education can be a connective catalyst for learning, creating, appreciating, communicating, and improving.

Implications for Future Research

This *Digital Animation* case study also has implications for future research. *Digital Animation* began distributing and collecting longitudinal participant surveys in 2005, so future research should include examining the longitudinal data, comparing it with case study data, and analyzing the impact. Also, future research directions can include comparative analysis with other case study data from technology education programs addressing the gender gap using other tactics, such as extracurricular robotics clubs, online support groups for young women in technology, or restructuring technology education programs.

*Digital Animation* data also encourages using VCAE as a framework to structure other interventions into sociocultural inequities. *Digital Animation* would be difficult to replicate in other circumstances, but VCAE should provide a skeletal impetus for employing multiple media and critical visual literacy skills to address local and more global problems and issues. What visual culture media best address what needs and problems?

Other possibilities for future research directions include working with the *Digital Animation* to explore the continuing evolution of the program, the research and evaluation questions, and its continuing successes, questions, and struggles. The program still runs each summer, using modified application materials, criteria, and target participant populations. How can VCAE serve as a long-term component in achieving social justice aims? How can art education continue to evolve as a relevant, meaningful, contributing component in contemporary education and society?

Conclusion

In conclusion, *Digital Animation: A Technology Mentoring Program for Young Women* uses an arts-based approach for piquing and maintaining young women’s interests in computer technology. The end result is hopefully an increase in the number of women entering and remaining in technology fields. The program combines gender and technology research and scholarship with strong feminist leanings and a belief in the inherent value and pleasure of using technology as a creative knowledge construction, documentation, and production vehicle. *Digital Animation* teaches digital technology skills, connecting abstract mathematical and scientific concepts to visual and temporal representations; connecting school to (virtual) reality. Some academic subjects begin to have more practical applications for the program participants. All program participants feel successful with technology and have increased technology knowledge and skills as a result of the program.

Using several theoretical lenses to analyze *Digital Animation* data created a wealth of information. Multiple theoretical perspectives complicate the understandings of a case, for better and for worse. The intricacies become inseparable. So often, *Digital Animation* practices address concerns common across
multiple theoretical frameworks. Separating data or analysis into discrete units provides artificial clarity and simplicity; describing its enmeshment can create a convoluted clog. The difficulty lies in simplifying and directing the analysis and application enough for clarity and functionality without oversimplifying it to the point of vague meaninglessness. This mirrors the difficulty of life.

VCAE provides a strong framework for making art education applicable across disciplines in our increasingly digitized technological society. VCAE also provides a strong impetus for making art education relevant to learners’ lives. Many sociocultural inequities exist and persist within and through visual culture; we need critical tools to recognize, expose, and address them effectively. VCAE provides some beneficial tools for navigating and participating in the visual culture discourses in contemporary American society; programs like *Digital Animation* provide the opportunities for applying these tools for practical positive change. One of the major functions of art in any society is to draw attention to societal issues, provoke engagement with difficult ideas, and catalyze change. Often more than one attempt is necessary. VCAE considers these issues, difficult ideas, and changes as applicable to traditional and nontraditional media, culture, communications, and interactions. Multifaceted approaches are crucial in addressing multifaceted problems. VCAE, with its inclusive definition of visual culture media, provides many contemporary options for analysis and deconstruction as well as training and education opportunities and experiences. Both culture and education contribute to and reinforce sociocultural inequities and the factors that perpetuate them; in combination with other critical pedagogies, VCAE can be a successful pedagogical tool for addressing them.

This case study has implications that range further than VCAE, though. This case study demonstrates the value of using critical pedagogies, theories, data, and analysis to continue to improve educational equity. This kind of improvement is necessary to address other persistent inequities along other sociocultural divisions. Inequity impacts more than just women. Multiple critical theories and pedagogies can inform the kinds of multi-dimensional efforts complicated inequities require for resolution. These issues extend beyond educational institutions, too. Critical interventions like *Digital Animation* address larger sociocultural inequities. These interventions emphasize the need for all learners to become critical consumers, producers, and members of culture; they demonstrate the potential and practical benefits of equity to us all. They demonstrate our potential for creating change.
CHAPTER 6 BIBLIOGRAPHY


APPENDIX A

Institutional Research Board Forms and Amendment to Original Protocol
APPLICATION FOR CONTINUING REVIEW OF RESEARCH
The Ohio State University Institutional Review Boards
Office Of Responsible Research Practices (ORRP)
300 Research Foundation Building, 1960 Kenny Rd., Columbus, OH 43210
Phone 614-688-8457, Fax 614-688-0386, http://www.orrp.ohio-state.edu

Previously approved research must undergo continuing review at a frequency specified by the IRB, but not less than every 365 days. Continuing review must be performed at a convened IRB meeting unless the research meets the regulatory criteria (45 CFR 46.110) for expedited review (see below).

CURRENT FORM AVAILABLE AT: http://www.orrp.ohio-state.edu. COMPLETE ALL SECTIONS; QUESTIONS ABOUT THE APPLICATION SHOULD BE DIRECTED TO THE OFFICE OF RESPONSIBLE RESEARCH PRACTICES.

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| MOST RECENT VERSION NUMBER AND DATE (IF APPLICABLE) |

ANSWER THE FOLLOWING (YES OR NO) REGARDING RESEARCH ACTIVITIES AT OSU TO DETERMINE IF YOUR RESEARCH QUALIFIES FOR EXPEDITED CONTINUING REVIEW.

- No subjects have ever been enrolled (at OSU), AND no additional risks have been identified.  □ Yes  □ No
- The research is permanently closed to enrollment of new subjects, AND
  All subjects have completed all research-related interventions, AND
  The research remains active only for long-term follow up of subjects (at OSU).  □ Yes  □ No
- Any remaining research activities are limited to data analysis.  □ Yes  □ No
  - If you answered YES to ANY of the questions above, the research qualifies for EXPEDITED REVIEW.
  - If you answered NO to ALL of the questions above, the research does not qualify for expedited review and will receive CONVENED IRB REVIEW.
  - See last page of the application for instructions and submission requirements.

Are you requesting termination?  □ Yes  □ No
If YES, see last page of the application for instructions and submission requirements.

1) PRINCIPAL INVESTIGATOR (OR FACULTY ADVISOR)
APPLICATION FOR CONTINUING REVIEW OF RESEARCH
The Ohio State University Institutional Review Boards

Office Of Responsible Research Practices (ORRP)
300 Research Foundation Building, 1960 Kenny Rd., Columbus, OH 43210
Phone 614-688-8457, Fax 614-688-0386, http://www.orrp.ohio-state.edu

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If any of the contact information above has changed, please check this box. ☐

2) CO-INVESTIGATOR(S)

Have there been any changes in co-investigators? ☐ Yes ☒ No

(Refer to the co-investigator list provided in the continuing review mailing.)

If Yes, submit an amendment request that includes the contact information and signatures of any new co-investigators.

3) KEY PERSONNEL

List names, campus addresses, phone and fax numbers, and e-mail addresses of all other key personnel (individuals who contribute in a substantive way to the scientific development or execution of the project.) Use continuation pages, as necessary.

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<td>Vajda, Kathy</td>
<td>OSU – ACCAD, 1224 Kinneal Road, Columbus, OH 43212-1154</td>
<td><a href="mailto:vajda.k@osu.edu">vajda.k@osu.edu</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Campus Phone</th>
<th>Campus Fax</th>
</tr>
</thead>
<tbody>
<tr>
<td>292-3416</td>
<td>292-7776</td>
</tr>
</tbody>
</table>

4) ADDITIONAL CONTACT (OPTIONAL)

Would you like to designate an additional contact (e.g., co-investigator, staff, etc.) for this research? ☐ Yes ☒ No

If Yes, list name, campus address, phone and fax numbers, and e-mail address.

Name (Last, First)
Campus Mailing Address
Campus Phone
Campus Fax
E-mail Address
APPLICATION FOR CONTINUING REVIEW OF RESEARCH
The Ohio State University Institutional Review Boards
Office Of Responsible Research Practices (ORRP)
300 Research Foundation Building, 1960 Kenny Rd., Columbus, OH 43210
Phone 614-688-8457, Fax 614-688-0366, http://www.orrp.ohio-state.edu

5) CONFLICT OF INTEREST (COI)

Does any investigator (principal and/or co-investigator) have a significant financial interest with the entity supporting the research (including speaking fees, consultation fees, stock ownership or other equity or membership in the sponsor over $10,000 per year or representing greater than 5% ownership in the sponsor)?  □ Yes  □ No

If Yes, forward the investigator's (principal and/or co-investigator) current OSU Financial Conflict of Interest Disclosure Form(s) describing the interest to the Conflict of Interest Administrator at ORRP (see ORRP website at http://www.orrp.ohio-state.edu for assistance). Each investigator must have filed a COI disclosure form before participating in the research.

6) RESEARCH STATUS – check only ONE. (Complete entire application regardless of research status.)

□ No human subjects have been enrolled. If so, explain. (Note: use this status also for "program protocols").

☒ Active (see # 7 below)

□ Requesting termination. If so, explain (research and data analysis completed, research never initiated, etc.).

Note: Do not request termination of IRB approval until all research activities involving human subjects (including data analysis with individually identifiable private information) have been completed.

7) FOR ACTIVE RESEARCH ONLY – check ALL that apply

☒ Subject recruitment is ongoing.

□ Subject recruitment has been completed.

□ All subjects have completed all research interventions.

□ Research remains active only for long-term follow-up.

□ Research remains open only for data analysis.

3) LOCATION OF THE RESEARCH

List the specific site(s) at which the OSU research is being conducted. Provide copies of all other IRB approvals and/or letters of support for non-OSU sites, as necessary.

The Ohio State University
The Advanced Computing Center for the Arts & Design
1224 Kinnear Road
Columbus, OH 43212-1154
APPLICATION FOR CONTINUING REVIEW OF RESEARCH
The Ohio State University Institutional Review Boards
Office Of Responsible Research Practices (ORRP)
300 Research Foundation Building, 1960 Kenny Rd., Columbus, OH 43210
Phone 614-688-8457, Fax 614-688-0366, http://www.orrp.ohio-state.edu

9) LAY LANGUAGE SUMMARY OF PURPOSE OF THE RESEARCH (1 or 2 sentences)

Briefly describe the purpose of the research in non-technical language.

The purpose of the Program Evaluation is to determine the effectiveness of the Advanced Computing Center for the Arts and Design’s (ACCAD) mentoring program in digital animation on identity formation and career decision-making of 15 Columbus area high school women participating in the Digital Animation: A Mentoring Program for Young Women, a summer workshop held each summer with the upcoming program running from June 20th through July 1st, 2005. Specifically, the research will evaluate high school women’s changing perceptions of themselves as consumers and/or producers of digital animation. Summer intensive study and follow-up studies throughout the academic years between 2005 and 2006 are planned for the 2004 Program, and between 2005 and 2007 for the upcoming 2005 Program.

10) RESEARCH PROGRESS

a) Summarize the progress of the research at OSU (and other sites if applicable), including any interim findings.

All surveys, observations, and interviews conducted before, during and immediately after the 2004 program have been completed. At the end of the two-week program, 92% of the 14 participants in the 2004 Mentoring Program reported an initial interest in an artistic or creative career. 92% of participants noted at the end of the program that they would consider a science or technology-related field as a career, compared to 86% before the program started. 100% of participants were able to confidently report at the end of the program that they know women who are both good and work with technology, and all of the girls involved in the program plan to go to college. Every program participant expressed their enjoyment of the program, with one specifically commenting that she was happy “being able to create something so incredible.” All participants felt successful during the program, and one participant explained that the program made “technology not so intimidating.” A follow-up survey to track the 2004 participants’ interests and attitudes after their participation in the program will be mailed out by mid-March. Research will continue with a new set of 15 student participants and 7 graduate student mentors in the 2005 mentoring program.

b) Summarize any amendments or changes to the research and any recent relevant literature since the last IRB review.

In addition to the program student participants, the graduate student mentors participating in the program will also be interviewed during the program. An Amendment Form is included with consent forms and two surveys (pre- and post-program). Seven graduate student mentors are expected in the 2005 program with an estimated age range of 21-65. The data gathering tools for the student participants no longer include interview or group discussions, and have been streamlined to three surveys. Attached are the revised pre- and post-program surveys, as well as a longitudinal survey to be sent to 2004 participants by March 1, 2005, and to 2005 participants by March 1, 2006. The Research Proposal has also been amended to reflect all of these changes.

11) FOR RESEARCH ACTIVITIES AT OSU – complete ALL.
If Yes, attach current recruitment materials (ads, radio/TV scripts, internet solicitations, etc.).

c) How is informed consent obtained?  ☒ Written document(s)  ☐ Verbal  ☐ Waiver granted

If written, attach all current consent documents (including any parental permission and assent forms, consent addenda, institutional consent forms, etc.).

d) Is deception of subjects part of the research?  ☐ Yes  ☒ No  ☐ N/A

If Yes, attach current debriefing script or other information sheet(s) used to inform subjects.

14) HIPAA AUTHORIZATION

a) Is individually identifiable protected health information (PHI) used or disclosed in the research?  ☒ Yes  ☐ No

If Yes, describe the PHI involved in the research (demographic information, health history, diagnosis, test results, etc.) and the source(s) of the PHI (OSUMC, private physician’s office, study testing, research database, etc.).

b) Indicate how authorization is obtained for access, use, or disclosure of PHI (check all that apply):

- ☐ Written document(s)
- ☐ Partial waiver (recruitment)
- ☒ Waiver granted
- ☐ N/A

If written, attach current authorization form(s).

15) SUBJECT COMPLAINTS

Have any subjects made complaints about the research?  ☐ Yes  ☒ No

If Yes, describe each complaint (including the number of times it occurred), and list any actions taken by the investigator in response to the complaint(s).

16) VOLUNTARY SUBJECT WITHDRAWAL

a) Have any subjects voluntarily withdrawn consent to participate in the research after initial enrollment?  ☒ Yes  ☐ No

(Note: do not include subjects who were taken off study because of side effects, study endpoints, or completion.)
If Yes, specify number of subject(s) enrolled but no longer participating in study, and list reason(s) for withdrawal (e.g., travel distance, inconvenience, etc.).

b) Have any changes been made to the research, the consent process, or the consent document(s) in response to subject withdrawals?  □ Yes  □ No  If Yes, describe change(s).

17) SAFETY MONITORING

Is there an independent group or Data Safety Monitoring Board (DSMB) responsible for monitoring and oversight of the research to ensure the safety of participants and the validity and integrity of the data?  □ Yes  □ No

If Yes, attach a copy of the most current statement indicating its review of study-wide adverse events (AEs), interim findings, any literature or other information that may be relevant to the research, etc. If statement not available, explain.

If No, describe plan for overseeing and monitoring the research.

While the program is in session, evaluation materials will be distributed and collected by the Principal Investigator. Analysis of the research material will take place after the commencement of the program on July 1, 2009. Permission to gather and indefinitely store the evaluation material will be secured prior to the program with the Participation Consent Form. The evaluation materials remain anonymous and are stored in a secured file room accessible only by the Principal Investigator.

18a) SERIOUS, UNEXPECTED ADVERSE EVENTS, UNANTICIPATED DEVICE EFFECTS OR PROBLEMS – OSU

During the current approval period, have any serious, unexpected adverse events, unanticipated device effects or any unanticipated problems involving risks to subjects or others occurred at OSU?  □ Yes  □ No

If Yes, summarize below.

Note: individual reports of serious, unexpected adverse events, unanticipated device effects or any unanticipated problems involving risks to subjects or others at OSU should be forwarded to the IRB within 10 days (see Adverse Event Reporting Guidelines at http://www.orrp.ohio-state.edu).

(Use “Continuing Review AE Summary – Page 6A” if additional space is needed.)

<table>
<thead>
<tr>
<th>Brief Description of Adverse Event</th>
<th>Was Event Related to Study Intervention?</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>

Page 7
18b) SERIOUS, UNEXPECTED AEs, UNANTICIPATED DEVICE EFFECTS OR PROBLEMS – OTHER SITES

During the current approval period, have any serious, unexpected adverse events, unanticipated device effects or unanticipated problems involving risks to subjects or others occurred at sites other than OSU?  ☐ Yes  ☒ No

If Yes, summarize below.

Note: individual adverse event reports for subjects enrolled at sites other than OSU should be retained by investigators and should not be forwarded to the IRB, unless the investigator believes that the information impacts the safe conduct of the research.

(Use “Continuing Review AE Summary – Page 6A” if additional space is needed.)

<table>
<thead>
<tr>
<th>Brief Description of Adverse Event</th>
<th>Was Event Related to Study Intervention?</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NO</td>
<td></td>
</tr>
</tbody>
</table>

19) PRINCIPAL INVESTIGATOR’S SUMMARY – check Yes, No or N/A for each

a) Are there any preliminary results or other new information that could impact the conduct or design of the research?

☐ Yes  ☒ No  ☐ N/A  If Yes, explain.

b) Has there been any change in the risks, benefits, or alternatives that could affect the willingness of the subjects to continue participation?  ☐ Yes  ☒ No  ☐ N/A  If Yes, explain.

c) Has any new information been communicated to subjects?  ☐ Yes  ☒ No  ☐ N/A  If Yes, check ALL that apply.

☐ Revised consent form  ☐ Subject letter  ☐ Other (specify)

☐ Addendum consent form  ☐ Verbal communication

If not previously approved, submit amendment request that includes the new information and a copy of the proposed communication. (Note: except where necessary to eliminate apparent immediate hazards to subjects or others, before implementation investigators must report proposed changes in the research or informed consent process to the IRB and obtain approval.)
June 3, 2005

Dear Parent/Guardian and Student:

As part of the summer program, your child is invited to participate in a research project, the Program Evaluation for *Digital Animation: A Mentoring Program for Young Women*. This study investigates the personal experiences with digital animation as chronicled by the young women and mentors participating in the Mentoring Program. Findings from the evaluation will be reported formally along with recommendations regarding the program’s effectiveness. The results of the evaluation will be used in the ongoing design and implementation of the mentoring program at ACCAD.

The evaluation will include several methods of data collection during the two-week workshop period. These will include survey questionnaires and observations of the participants at work by the staff evaluator. For students, data collection will be conducted during the program with a follow-up survey conducted within one year. Some examples of the types of questions asked in these surveys are:

- Would you consider a job in the arts that uses computers? Why or why not?
- What kind of previous experience do you have with technology?
- How do you relate to technology in your creative work?

All of the data collected will be kept separate from information regarding the identity of the participant so that all of the information collected will remain confidential. The documentation collected during the two-week duration of the program will be kept by ACCAD indefinitely and may be used/reviewed in the future for presentation and/or publication.

Your child can choose not to participate in this evaluation, or if your child agrees to participate she can refuse to respond to any questions that she does not wish to answer. She can withdraw from the study at any time without penalty or repercussion.

If your child decides to participate in the evaluation, please read and sign the enclosed consent form. Your child must sign the form as well. If your child does not wish to participate, indicate this on the consent form but do not sign it. Please return the consent form in the envelope provided. If you have any questions or concerns regarding the Program Evaluation, please contact the Principal Investigator, Maria Palazzi, at (614) 292-2406, mpalazzi@accad.osu.edu, or at the address listed below.

Sincerely,

Maria Palazzi  
Principal Investigator  
Ohio State University  
ACCAD  
1224 Kinnear Road  
Columbus, OH 43212-1154  
(614) 292-2406  
mpalazzi@accad.osu.edu

307
THE OHIO STATE UNIVERSITY INSTITUTIONAL REVIEW BOARD REQUEST FOR
CHANGE(S) TO APPROVED RESEARCH INVOLVING HUMAN SUBJECTS

INSTRUCTIONS: Submit a revised copy of each document for which changes are requested along with completed form. Identify all changes to previously approved documents. Requests involving proposed changes in the conduct of the study must include a revised protocol.

*CHANGES MUST NOT BE INITIATED PRIOR TO IRB APPROVAL*

IRB protocol number: 2003B0107

Protocol Title (currently approved): Program Evaluation for Digital Animation

1. a. List numbers and/or dates for each document for which you are requesting approval (e.g., amendment or revision number; protocol version number; and/or date of protocol, consent form, advertisement, etc.):

   2003B0107

   b. Does request involve change(s) to the protocol title? ☐ Yes ☑ No
      If yes, provide revised title (Note: Do not duplicate information in 1a.):
      The request does not involving changing the protocol title; rather, it involves adding dissertation publication as another intended use.

2. Provide a brief description of the change(s) requested. Include rationale for change(s):
   The change requested is to amend the original research protocol to include Mindi Rhoades as a co-investigator who will be conducting the research for program evaluation and dissertation purposes.

   Rationale: Mindi Rhoades is already the program evaluator and will be conducting the research and using the data for dissertation purposes as well as for program evaluation. The actual research being conducted will not change.

3. Does request involve change(s) in investigator(s) or their status? ☑ Yes ☐ No
   If yes, provide additional information:
   The change involves adding Mindi Rhoades formally as a co-investigator (under the supervision of her advisor, Dr. Candace Stout, in the Art Education Department at OSU).

4. Does request involve change(s) in subject population(s)? ☑ Yes ☐ No
   If yes, provide justification for subject inclusion/exclusion (i.e., ethical and/or scientific):
5. Does request include change(s) to subject recruitment procedures or enrollment numbers? □ Yes □ No
   If yes, provide justification (i.e., ethical and/or scientific):

6. Does request involve change(s) in benefits to subjects? □ Yes □ No
   Explain:

7. Does request involve change(s) in risk(s) to subjects? □ Yes □ No
   Explain:

8. If request involves change(s) in benefits, risks, or other information that may affect subjects' willingness to participate, indicate how new information will be communicated to currently enrolled subjects:
   Not Applicable

9. Does request involve change(s) to the consent form, solicitation script, or other document(s)?
   □ Yes □ No  If yes, include a revised copy of the document(s) with change(s) highlighted.

10. Did the sponsor of the research propose the change(s)? □ Yes □ No
    If yes, include copies of all applicable documentation and/or correspondence.

   Principal investigator's signature __________________________  Date 6/1/05
   Printed Name of PI __________________________

   Return completed form and all necessary documents to:
   Office of Responsible Research Practices, 3rd Floor, 1900 Kenny Road, Campus

   http://www.orrp.ohio-state.edu
Maria Palazzi  
Director, The Advanced Computing Center for the Arts and Design  
OSU – ACCAD  
1224 Kinnear Road  
Columbus, OH 43212-1154  
614-292-3416

Mindi Rhoades  
133 E Tulane Rd  
Columbus, OH 43202  
614-784-1416

Mindi Rhoades:

I write in support of your research study entitled “Feminist Visual Culture Pedagogy and Technology-Based Learning: A Case Study of an Arts-Based Technology Mentoring Program for Young Women.” I understand that participation in this research project is entirely voluntary and that participants may withdraw from the study at any time without any penalty.

Sincerely,

[Signature]

Maria Palazzi, Director  
Associate Professor, Design
Protocol title: Program Evaluation for Digital Animation: A Mentoring Program for Young Women

Protocol number: 2003B0107

Principal Investigator: Maria Palazzi

I consent to my child's participation in research being conducted by Maria Palazzi of the Advanced Computing Center for Art and Design at The Ohio State University and her assistants and associates.

The investigators have explained the purpose of the study, the procedures that will be followed, and the amount of time it will take. I understand the possible benefits, if any, of my child's participation.

I know that my child can choose not to participate, or I can choose not to allow her to participate, without penalty. If we agree to participate, my child can withdraw from the study at any time, and there will be no penalty. I consent to the use of audiotapes and I understand how the tapes will be used.

I have had a chance to ask questions and to obtain answers to my questions. I can contact the investigators at (614) 292-2406. If I have questions about my rights as a research participant, I can call the Office of Research Risks Protection at (614) 688-4792.

I have read this form or I have had it read to me. I sign it freely and voluntarily. A copy has been given to me.

I  DO  □  DO NOT □ wish to participate in the Program Evaluation for Digital Animation: A Mentoring Program for Young Women.

Print the name of the participant:

________________________________________________________________________

Date: ________________________  Signed: ________________________

(Principal Investigator or his/her authorized representative)  (Parent or Legal Guardian authorized to consent for participant)

Signed: ________________________  Signed: ________________________

Please retain this copy for your records
Protocol title: Program Evaluation for Digital Animation: A Mentoring Program for Young Women

Protocol number: 2003B0107

Principal Investigator: Maria Palazzi

I consent to my child’s participation in research being conducted by Maria Palazzi of the Advanced Computing Center for Art and Design at The Ohio State University and her assistants and associates.

The investigators have explained the purpose of the study, the procedures that will be followed, and the amount of time it will take. I understand the possible benefits, if any, of my child’s participation.

I know that my child can choose not to participate, or I can choose not to allow her to participate, without penalty. If we agree to participate, my child can withdraw from the study at any time, and there will be no penalty. I consent to the use of audiotapes and I understand how the tapes will be used.

I have had a chance to ask questions and to obtain answers to my questions. I can contact the investigators at (614) 292-2406. If I have questions about my rights as a research participant, I can call the Office of Research Risks Protection at (614) 688-4792.

I have read this form or I have had it read to me. I sign it freely and voluntarily. A copy has been given to me.

I DO □ DO NOT □ wish to participate in the Program Evaluation for Digital Animation: A Mentoring Program for Young Women.

Print the name of the participant:

Date: ____________________________ Signed: ____________________________

(Participant)

Signed: ____________________________ Signed: ____________________________

(Principal Investigator or his/her authorized representative) (Parent or Legal Guardian authorized to consent for participant)

Please retain this copy for your records.
June 3, 2005

Dear Graduate Student Mentor:

As part of the summer program, you are invited to participate in a research project, the Program Evaluation for Digital Animation: A Mentoring Program for Young Women. This study investigates the personal experiences with digital animation as chronicled by the young women and educators participating in the Mentoring Program. Findings from the evaluation will be reported formally along with recommendations regarding the program’s effectiveness. The results of the evaluation will be used in the ongoing design and implementation of the mentoring program at ACCAD. The evaluation will include several interview questions during the two-week program period.

All of the data collected will be kept separate from information regarding the identity of the participant so that all of the information collected will remain confidential. The documentation collected during the two-week duration of the program will be kept by ACCAD indefinitely and may be used/reviewed in the future for presentation and/or publication.

You can choose not to participate in this evaluation, or if you agree to participate you can refuse to answer any questions that make you feel uncomfortable. You can withdraw from the study at any time without penalty or repercussion.

If you decide to participate in the evaluation, please read and sign the enclosed consent form. If you do not wish to participate, indicate this on the consent form but do not sign it. Please return the consent form in the envelope provided. If you have any questions or concerns regarding the Program Evaluation, please contact the Principal Investigator, Maria Palazzi, at (614) 292-2406, mpalazzi@accad.ohio-state.edu, or at the address listed below.

Sincerely,

Maria Palazzi
Principal Investigator
Ohio State University
ACCAD
1224 Kinnear Road
Columbus, OH 43212-1154
(614) 292-2406
mpalazzi@accad.ohio-state.edu

AMENDED FORM 7
CONSENT FOR PARTICIPATION IN SOCIAL AND BEHAVIORAL RESEARCH

Protocol title: Program Evaluation for Digital Animation: A Mentoring Program for Young Women

Protocol number: 2003B0107

Principal Investigator: Maria Palazzi

I consent to my participation in surveys conducted by Maria Palazzi of the Advanced Computing Center for Art and Design at The Ohio State University and her assistants and associates.

The investigators have explained the purpose of the study, the procedures that will be followed, and the amount of time it will take. I understand the possible benefits, if any, of my participation.

I know that I can choose not to participate without penalty. If I agree to participate, I can withdraw from the study at any time, and there will be no penalty.

I have had a chance to ask questions and to obtain answers to my questions. I can contact the investigators at (614) 292-2406. If I have questions about my rights as a research participant, I can call the Office of Research Risks Protection at (614) 688-4792.

I have read this form or I have had it read to me. I sign it freely and voluntarily. A copy has been given to me.

I DO □ DO NOT □ wish to participate in the Program Evaluation for Digital Animation: A Mentoring Program for Young Women.

Print the name of the participant:

Date: Signed: (Graduate Student Mentor)

Signed: (Principal Investigator or his/her authorized representative)

AMENDED FORM 8


American Association of University Women. (2004b). Tenure denied: Cases of sex discrimination in


http://www.let.uu.nl/womens_studies/rosi/cyberfem.htm


323


325


Haubold, B. (2000, October 23). How closely related are humans to apes and other animals? How do


Indiana University Press.


Huber, B. W. (1987). What does feminism have to offer DBAE? or so what if little red riding hood puts aside her crayons to deliver groceries for her mother?" Art Education 40(3), 36- 41.


of the culture of computer science. In P. Hopkins (Ed.), Sex/Machine: Readings in culture, gender, and technology (pp. 381 – 394). Bloomington, IN: Indiana University Press.


Wasburn, M., & Miller, S. (2005). Still a chilly climate for women students in technology: A case study. In Sue V. Rosser & Mary Frank Fox (Eds.), *Women, gender and technology*. Urbana-Champaign:


