ENGINEERING PLAY

A Cultural History of Children's Software

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The MIT Press
Cambridge, Massachusetts
London, England

This book was set in Stone Sans and Stone Serif by SNP Best-set Typesetter Ltd., Hong Kong. Printed and bound in the United States of America.

Library of Congress Cataloging-in-Publication Data

Ito, Mizuko.
Engineering play : a cultural history of children's software / Mizuko Ito.
p. cm.—(The John D. and Catherine T. MacArthur Foundation series on digital media and learning)
Includes bibliographical references and index.
ISBN 978-0-262-01335-2 (hardcover : alk. paper)
1. Children's software—Development—History—United States 2. Computer-assisted instruction—United States. 3. Computers and children—United States. 4. Entertainment computing—United States. I. Title.
QA76.76.C54I86 2009
790.20285—dc22

2009006116

10 9 8 7 6 5 4 3 2 1

1 Introduction

The relationship between children and computers occupies a special place in the imagination of those of us inhabiting the United States in the early twenty-first century. We think of kids as having a natural affinity to computers, as "digital natives" growing up in a world already saturated with computational media (Palfrey and Gasser 2008; Prensky 2006; Tapscott 1998). At times, though, this affinity becomes a source of fear and suspicion as kids reach out to unfamiliar social worlds online (see Cassell and Cramer 2007; L. Edwards 2005) or become "addicted" to fast-paced or violent forms of computer games (see Gunter 1998; Kutner and Olson 2008). More often than not, however, we see computers as a necessary part of kids' everyday lives and as valuable tools in supporting learning. We worry about a digital divide that puts advanced uses of computers out of some kids' reach (Seiter 2005; Warschauer 2003), so we have pushed for new technology to be present in schools and homes to enrich our children's lives (see Buckingham 2007; Buckingham and Scanlon 2003; Cuban 2001) and been for the most part successful in doing so: computers are ubiquitous in U.S. schools and are present in almost all homes with children (Roberts, Foehr, and Rideout 2005). Just three decades ago, the computer was associated almost exclusively with research, military, and business uses, but today it is widely recognized as a "children's machine" (Papert 1993). This book tells a key part of the story of how this transformation came about, describing how kids, technologists, and educators co-constructed new genres of computer-mediated play for children in the intervening years.

In the late 1970s, the idea of consumer software designed for the education, entertainment, and empowerment of children was barely a glimmer in the eye of a few radical educators and technologists. Released in 1977,

the Apple II was beginning to demonstrate the power of personal computing and programming for hobbyists and educators. Programmers in a home-brewed industry began laying the foundations for a new consumer software industry by sending their products, floppy disks packaged in ziplock bags, to their networks of retailers and consumers. The video game industry hit public consciousness with the phenomenal success of *Space Invaders* in 1978, demonstrating the economic and addictive potential of interactive electronic entertainment. In tandem with these developments, small groups of educational researchers across the country began to experiment with personal computers (PCs) as a tool for creating interactive, child-driven, entertaining, and open-ended learning experiences. The trend toward a more child-centered approach to education and child rearing found material form in these technologies that allowed greater player control and input than traditional classroom media. Across a set of diverse contexts, educators and technologists began incubating a shared cultural imaginary that centered on new learning technologies.

Through the 1980s and 1990s, this experimental effort in software development blossomed into a new educational movement and eventually into a small but influential technology industry. Educators began to embrace these new technologies as alternatives to existing classroom computing, and in homes, learning games became a wholesome family entertainment alternative for young children. This period saw the emergence of a new category of consumer software designed specifically for elementary-age children, which blended different philosophies of education with genres and technologies drawn from interactive gaming and entertainment. Educators and technology designers experimented in creating a new set of media genres and a commercial sector that has variously been called *children's software, learning games,* and *edutainment.* Commercial children's software, designed to be both fun and enriching, lies in the boundary zone between education and entertainment that structures contemporary childhoods in the United States. The history of how children's software emerged as an experimental media category and its subsequent uptake by various social and political actors—including kids, parents, educators, and various commercial enterprises—is a microcosm of the social and cultural contestations surrounding new technology, children, and education. It describes efforts to incorporate gaming idioms into learning agendas and outlines

the different understandings of learning and play that motivated these efforts. It is a story about the promise of technical innovation to transform the conditions of learning and play as well as a cautionary tale about the difficulties of reforming existing social and cultural structures, even with the best of intentions and innovative new technologies.

This book tells this story by describing how this new industry developed certain genres of software and how these genres were reproduced and challenged in the everyday play of kids in an after-school computer club where I conducted ethnographic fieldwork in the late 1990s. Its chapters are organized based on three genres of children's software—the *academic, entertainment,* and *construction* genres—that have manifested themselves in technology design and industry structure, as well as in *genres of participation* with and around the new media forms. The software genres grew out of existing educational approaches and everyday play in our culture at large. Where academic instructional software is based in a primarily behaviorist frame that focuses on the transmission of school-centered content, the entertainment genre is tied to open-ended play that is characteristic of family-friendly entertainment. The third genre is tied to constructivist and constructionist educational approaches that stress authoring and media production as a vehicle of learning. All three are malleable, evolving, but also recognizable patterns in our culture that take shape because they are deeply embedded in institutions and social practice. New technology practice grows out of existing genres, but also reshapes them in important ways.

The book's primary descriptive task is to delineate these genres of children's software in a way that cuts across the usual distinctions we make between moments of production, distribution, marketing, and consumption. My focus is on analyzing how the positioning of and the contestation between different genres and educational approaches are embedded within a broader systemic and historical context. The story I tell is not of an inevitable realization of technological potential, but rather of ongoing struggle, negotiation, and contestation between different actors and social and cultural forces. This work aims to inform contemporary debates in education over games and learning by looking back to the lessons we have learned from an earlier generation of learning-software products. Although the book looks at particular historical moments in the evolution of software for children, the underlying genres I describe are very much still in play today.

This descriptive task is closely tied to my primary theoretical task, which is to identify the dynamics through which new media become incorporated into and in turn reshape existing social and cultural structure. The emergence of children's software and its subsequent incorporation into existing institutional and industry structures offer an illustration of the dynamics of technology development, diffusion, domestication, and appropriation. By looking not only at the content of software, but also at the broader social and cultural contexts in which the software is embedded, we can understand how it is that technology fails to deliver on some of the explicit claims made by its developers and at the same time is tied to broader systemic changes. I suggest that the issue is not one of technology innovation being incorporated into and stifled by existing discourses and institutions. Rather, new technologies never start out as separate or outside of these existing structures. Change happens as a result of struggles and negotiations *between* different discourses and institutions seeking to shape a new technology and set of genres. In the remainder of this introductory chapter, I describe the conceptual frameworks that I draw from in education and new media studies and then turn to a description of the fieldwork and sites where I conducted my research.

Games and Learning

Interactive media such as computer games, simulations, and digital authoring tools added new impetus to longstanding efforts to integrate play and education in commercial media targeted to families. Educational toys, books, magazines, television, videos, and software have defined a market of products that cater to parents interested in enriching their children's home activities with media explicitly designed for learning. David Buckingham and Margaret Scanlon describe the growing market for these kinds of products as an indication of the "curricularization of family life" (2003, 6), where parents are called on to support educational goals at home. Looking to media as a source of education is tied to what Stewart M. Hoover, Lynn Shofield Clark, and Diane F. Alters (2004) have described as a stance of "reflexive parenting," where parents reflect on their home life in relation to public discourse and expert advice about parenting. Their work discusses "public scripts" about the effects of media on children and how parents feel pressure to manage and regulate media in the home.

These public scripts about media and children are constantly being redefined and contested, and new media are part of this ongoing process of collective negotiation. When PCs became a viable consumer technology, software developers and educators began developing new genres of software and new public scripts about computational media and learning. They argued that new interactive media held out the potential to challenge the dominance of "passive" forms of media that were exemplified by the television. The computer was defined as a "good screen" that was contrasted to the "bad screen" of the television (Seiter 1999) and that contributed to children's learning and enrichment. Whereas video games played on TV screens and in game arcades continue to be defined as problematic forms of media that parents should regulate and control, computers and computer software have occupied a privileged position in the public scripts about media and learning. Buckingham and Scanlon argue that "the home computer could be seen as one of the indispensable 'symbolic goods' of contemporary parenting" (2003, 109).

The question of what constitutes appropriate forms of software for children has evolved in tandem with changing technologies and our changing discourses about technology and learning. The category of learning software for children is a potentially broad one, and one can imagine multiple origin stories and histories. Here I focus on a particular trajectory with origins in the late 1970s and early 1980s, when educators and technology makers built a new industry niche of software products for elementary-age children. This period saw the founding of a category of software that came to be called *edutainment* or, more broadly, *children's software*. These software titles were offered as an alternative to the drill and curriculum-based, computer-aided instruction systems such as PLATO and Wicat that dominated the educational technology field from the 1960s to the 1980s. Instead, they drew from the video game culture being developed for arcades and game consoles and applied elements of that culture to educational technology. Games such as *Number Munchers, Oregon Trail, Reader Rabbit, KidPix,* and *Where in the World Is Carmen San Diego* were in this first major wave of software designed with learning goals in mind and targeted toward the consumer market of families with elementary-age children. In this approach, children's software drew from a longer history of educational reform efforts that looked to play as a site of learning.

Although not the only way in which playful idioms were incorporated into these software titles, the use of electronic gaming idioms is what was distinctive about this particular historical moment in the evolution of the philosophies of "learning through play." In contrast to earlier educative playthings and media—typified by wooden blocks, puzzles, children's literature, and *Sesame Street*—educational software put gaming at the center of the enterprise. By focusing on software and games explicitly designed to mediate between educational and entertainment idioms, I do not mean to privilege the learning claims made by these titles. Clearly, many titles in the mainstream entertainment gaming market embody important learning principles (Gee 2003; Ito 2006b). Rather, the importance of edutainment as a case is that it exemplifies the struggle to identify a cultural and social space between the polarities of education and entertainment that define modern childhoods. The boom and bust of the children's software industry from the 1980s to the early 2000s illustrate the cultural, social, and capitalist contestation over media for children as the industry intersected with changing platforms for digital entertainment.

This educational software movement was not monolithic; it was differentiated by distinct educational philosophies and design approaches (Engenfeldt-Nielsen 2006). I describe these differences in terms of the academic, entertainment, and construction genres of software and participation. These three strands of software development fed into and informed one another to build a new niche software industry. Each involved translating specific educational philosophies and representational genres into a new media platform. I identified these three strands by working backward from the ethnographic record. In the computer clubs where I conducted my fieldwork, what constitutes the general category "children's software" or "learning games" is remarkably consistent; publications aimed at teachers, educationally minded parents, and after-school program staff identify these games as educational and prosocial. I thus use the term *children's software* to refer to a category of commercial software that is targeted toward elementary-age children and that embodies general cultural commitments to learning and developmental goals. Educational or learning games can be considered a subset of this category, which also includes authoring and simulation tools that don't have a strong gaming component. In the description to follow, I sharpen the difference between the three media genres in order to identify competing cultural codes and edu-

cational philosophies embodied in children's software. In the real practices of play and in the design of specific titles, however, these genres are often intermingled. An academic title may embed elements from entertainment media or elements from authoring tools, just as an entertainment-oriented title may work to convey some curricular content.

This book describes a particular moment in the history of children's software and learning games, a period when new markets were developed and key genres were defined. It was a period in which computers became pervasive in children's lives, in schools, and in many homes in the United States as part of the growing consensus about the educative potential of computing. Although the technology and industry have evolved tremendously since the 1980s and 1990s, the genres, discourses, and industry structures established then are still very much in play today. Much of what we take for granted in the relationship between children, learning, and computers was a result of the struggles regarding the technology and its uses during that period. The negotiation between the educational and entertainment genres, between school and home, is a resilient feature of our social landscape and has been concretized through the software genres that this book describes. The academic genre has a niche in supporting and reinforcing certain basic literacy and mathematical skills in connection with school-based accountabilities. The entertainment genre, in opposition to the academic, is defined by a kid-centered and kid-identified visual and peer culture based on media in the home. The construction genre represents the most profound influence of computational media on learning in that it expands the range of opportunities for kids to author and reshape media worlds. In the conclusion, I return to how these genres are playing out in the current landscape of new media and learning.

The lessons from the early years of edutainment software can also inform current debates over games and learning. We are seeing a revival of arguments in favor of the learning benefits of game play as a new set of networked and technically sophisticated games and authoring tools have captured the attentions of a new generation. These arguments are wide ranging, but many replicate those put forth during the early years of edutainment, though with a much broader palette of application. Game developers working in the area of "serious games" or "games for training" have argued that games can cross over the boundaries of entertainment and established institutions and discourses of learning (Michael and Chen

2006; Prensky 2006). Mark Prensky describes what he sees as a "digital game-based learning revolution," which is transforming corporate and military training. "The days of sitting bored to tears in classrooms or in front of boring computer or Web-based training systems are numbered" (2001, 34). Just as early developers of edutainment worked to break down the barrier between the classroom and commercial video games, today's developers are working to integrate curricular and training goals with the interactive mechanisms and visual idioms of entertainment software. If our past experience is any guide, we can expect that new software and markets will emerge to cater to these different educational contexts, but that these efforts will be largely oriented to supporting existing institutional accountabilities.

The growth in the visibility of sophisticated new games is also tied to a burgeoning research literature on games and learning. Much of the current work has departed from the early paradigms that gave rise to edutainment. Most notably, recent research has challenged the assumption that only games with academic content have learning properties, and that gaming should be used to "sugar coat" otherwise unappealing learning tasks. In his influential book *What Video Games Have to Teach Us about Learning and Literacy,* James Paul Gee (2003) argues that successful video games, even those without explicitly educational goals, support sophisticated forms of literacy by situating learning within responsive, embodied, and challenging environments. Gee also stresses the socially and culturally situated nature of the learning that takes place through gaming. Building on Gee's work, Kurt Squire (2007) suggests that state-of-the-art video games provide rich opportunities for learning through immersive action and performance, and he critiques games such as *Math Blaster* that rely on game play as an extrinsic reward to get players to engage with the otherwise boring task of math drills. By contrast, he presents examples of classroom use of *Civilization III,* where the educational content is integrally related to the game-play experience and simulation, and where students are actively solving problems that push them to reflect on the dynamics of history and politics.

Complementing Gee and his colleagues' work, other researchers have argued that games encourage particular kinds of literacies and learning dispositions. For example, Ian Bogost (2007) contends that games are uniquely well equipped to educate players on "procedural literacy," which involves an understanding of the workings of various systems of relation-

ships. He argues that computer games provide a rich set of building blocks that can be manipulated and recombined, whether in learning computer programming, tinkering with a simulation of city or civilization, or building a virtual home. David Shaffer (2006) likewise suggests that the unique properties of simulations make them powerful vehicles for learning. He argues for the learning benefits of "epistemic games" where players can take part in activities that simulate the practices of professions such as historians, engineers, and mathematicians. He sees computer-based games and simulations as powerful tools to "develop the skills, knowledge, identities, values, and epistemology of that community" (164). This set of research conversations is less focused on games as a platform to deliver academic content and more on how game play can support a wide range of learning outcomes, both social and cognitive.

Current research on games and learning has clearly moved beyond many of the conceptual paradigms that structured early educational games, and the field has been enriched and expanded in a way that would have been difficult to imagine in those initial years. My intention here is not to conduct a thorough review of the field of games and learning, which has blossomed in the period between when I did my fieldwork in the 1990s and the publication of this book. My hope, however, is that a look back to a prior period of technical innovation and cultural struggle can help inform current research approaches. The book contributes more to this field than simply providing a lesson regarding the failures and successes of an earlier generation of technical innovation and educational reform. In addition to this historical lesson, it makes an argument for a conceptual focus that challenges certain tendencies in the research literature. Although the field of game studies has made great strides in theorizing the unique structure and learning properties of games, there is still relatively little empirical research on practices of game play and virtually no work that situates this play within an analysis of broader institutional structures such as the marketing and distribution of software, the production of class distinctions, and the discourses of parenting. The focus on game content and design and the relative absence of work on more contextual dimensions reinforce a perception that the technology and media content itself are determining the learning outcomes. We need to do more than simply point to what kids can potentially get out of playing games, however, and consider how these games are embedded in their everyday lives and in

institutional accountabilities. By failing to do so, we will continue to overestimate the force of technology in transforming education and to underestimate the role of institutions and existing practices in determining learning outcomes.

Some work is beginning to examine the contexts of game play, thus extending beyond a narrow focus on the relation between a player and game content.[1] Nevertheless, almost all empirical studies of gaming practice and learning are focused on learning and literacy outcomes rather on broader trajectories of social and systemic change in which these outcomes are situated. Critical studies of gaming and edutainment industries do examine some of these broader dynamics in relation to the content of game software (Buckingham 2007; Buckingham and Scanlon 2003; Kline, Dyer-Witherford, and de Peuter 2003), but they do not bring the analysis down to the level of everyday gaming practice. This book is an effort to integrate these levels of analysis in that it combines detailed practice-based description of game-play practice with analysis of broader cultural discourses and social and institutional structures. It is only through an examination of how game content, design, and play are located within social and cultural structures that we can begin to understand the broader outcomes of our efforts to shape and engineer learning and play. This gap in the literature is not merely an empirical gap, but is tied to a more fundamental set of conceptual and theoretical dynamics that have characterized research on new media and social change. The remainder of this introduction describes my conceptual framework for understanding the dynamics of structural conservatism and change, and then turns to a description of the methods and fieldwork behind this book.

Technology and Social Change

In any examination of new technology, it is a challenge to avoid the pitfalls of both hype and mistrust, or, as Sarah Holloway and Gill Valentine (2001) have described it, the problem of polarization between the "boosters" and the "debunkers." New technologies tend to be accompanied by a set of heightened expectations, but then are followed by a precipitous fall from grace after failing to deliver on an unrealistic billing. This was certainly the case with edutainment, which boosters hoped would transform learning for a generation of kids. Although the boosters and debunkers may

seem to operate under completely different frames of reference, they share the tendency to fetishize technology as a force with its own internal logic standing outside of history, society, and culture. The problem with both stances is that they fail to recognize that technologies are in fact embodiments, stabilizations, and concretizations of existing social structures and cultural meanings, and that they grow out of an unfolding history as part of a necessarily altered and contested future. The promises and the pitfalls of certain technological forms are realized only through active and ongoing struggle over their creation, uptake, and revision. New technologies go through what sociologists of technology call a period of "interpretive flexibility" during which it is still not clear which social actors will have a role in stabilizing the new technology's meaning and form. As time goes on and different social groups work to stabilize and contest the technology, we move into a period of closure and stabilization. Trevor Pinch and Wiebe Bijker (1987) have described this process in the case of the bicycle in the late nineteenth century, which exhibited a wide range of design variation until it was stabilized into the low-wheeled form with air tires that we still see today. I consider this recognition of the socially embedded nature of technology as one of the core theoretical axioms of contemporary technology studies and as foundational to the theoretical approach I take in this book. In this approach, I draw from social studies of technology that see technology as growing out of existing social contexts as much as producing new ones (e.g., P. Edwards 1995; Hine 2000; Lessig 1999; Miller and Slater 2000).

It may seem self-evident that the representational content of media embodies a certain point of view and set of interests, but what is often less visible is how media is embedded in structures of everyday practice, particular technological forms, and institutional relations. We often see issues such as representations of women or violence in games taking the fore in social controversies, but in this book I argue that the broader institutional and business contexts of software production, distribution, and consumption are also important sites of contestation over the meaning of games. In order to build an agenda for how games can contribute to systemic change in learning and education, it is necessary but not sufficient to analyze representational content and play mechanics. In addition, we need to understand the conditions under which the game has been produced, advertised, and distributed, as well as how it gets taken up, domesticated,

incorporated, and regulated in different contexts of play. In their textbook of cultural studies, Paul du Gay and his colleagues (1997) describe a "circuit of culture" that includes processes such as production and design, advertising, uptake, and regulation. They suggest that in order to understand the meaning of a new technological artifact, we must analyze all nodes in this circuit as well as the interaction between the nodes. In other words, we must realize that a game's design has a structuring but not a determining effect on how the game will be marketed or played, just as existing practices of gaming or education have a structuring but not a determining effect on what kinds of games will get created. In the case of commercial media, although the representational content such as characters and narrative are constantly in flux, the industry relations, distribution infrastructure, patterns of player-viewer engagement, and genres of representation tend to be conservative and deeply engrained within existing social and cultural structures.

The challenge in conducting this kind of analysis is to take seriously the powerful position occupied by the media text and industry apparatus, while also accounting for the role of everyday activity and the agency of media consumers. Within media studies, scholars have documented the ways in which audiences interpret and reposition cultural meanings in ways that the media text only partially determines (see, e.g., Buckingham 1993; Morley 1992; Radway 1991). Granting agency to the audience is particularly significant in the case of children, who have often been defined as passive and innocent receivers of media messages (see Jenkins 1998; Kinder 1999) and as "learners" and "becomings" rather than full social beings who actively construct social and cultural worlds (see James, Jenks, and Prout 1998). In their influential book *Situated Learning,* Jean Lave and Etienne Wenger (1991) argue that learning is an act of participation in communities of practice rather than an individual, cognitive process of internalizing knowledge. This focus on social and cultural context rather than on individual internalization has much in common with work in media studies that argues for the audience's more active and constitutive role. Henry Jenkins (1992, 2006) has put forth the notion of "participatory media cultures," which he originally used to describe fan communities in the 1970s and 1980s and has recently revisited in relation to current trends in convergence culture. Jenkins traces how fan practices established in the TV-dominated era have become increasingly mainstream due to the con-

vergence between traditional and digital media. Fans not only consume professionally produced media, but also produce their own meanings and media products, continuing to disrupt the culturally dominant distinctions between production and consumption. A notion of "participation," as an alternative to "consumption," has the advantage of not assuming that the child is a passive observer or a mere "audience" to media content. It is agnostic as to the mode of engagement and does not invoke one end of a binary between structure and agency, text and audience. It forces attention on the more ethnographic and practice-based dimensions of media engagement and queries the broader social and cultural contexts in which these activities are conducted. A notion of participation is also well suited to the specific characteristics of digital, interactive media. In the consideration of media that require players' activity and are reconfigurable in various ways, models that rely on "reception" and "audiences" fail to capture the roles that game players and technology users occupy (Buckingham and Sefton-Green 2004; Ito 2008).

In addition to arguing for a participatory frame in understanding new media engagement, this book also makes an effort to link this participation to institutional structures and resilient patterns in our culture that contextualize the specific media texts in question. A growing body of ethnographic work in media studies has gone beyond an examination of the audience-text relation to consider the relation between audience and cross-cutting discourses and institutions. For example, Purnima Mankekar (1999) relates audience interpretation of an Indian soap opera to discourses of nationalism and gender, and Lila Abu-Lughod (1995) analyzes Egyptian television in light of contestations over modernity, femininity, and relations with the West. This work is part of an effort to take seriously the role of media in our everyday lives, while also accounting for the highly distributed and often contingent nature of its effects. S. Elizabeth Bird writes, "We really cannot isolate the role of the media in culture, because the media are firmly anchored into the web of culture, although articulated by individuals in different ways. We cannot say that the 'audience' for Superman will behave in a particular way because of the 'effect' of a particular message; we cannot know who will use Superman as some kind of personal reference point or how that will take place" (2003, 3). Other scholars have looked not only at the cultural web of meanings in which media is entangled, but also at the institutional contexts that structure media. Theories about how media

and technology become domesticated in the home or appropriated by particular social groups are an example of this kind of social analysis. Sonia Livingstone's (2002) study of how families adopt new media and Stewart M. Hoover, Lynn Shofield Clark, and Diane F. Alter's (2004) analysis of the intersection of parenting discourses and media regulation in the home are examples of work that has taken strides in this direction. Roger Silverstone, Eric Hirsch, and David Morley argue that the technology "has the capacity to reproduce the social and political values of the society that created them." At the same time, they argue that this " 'politics of technology' . . . is not a totalitarian politics. It has to be understood in its full range, as a mixture of strategy and tactics, subject to the passage of time, and vulnerable to the capacity of local and domestic cultures to spoil or redefine the political and cultural inscriptions which we can now begin to decipher in the structures of the machine" (1992, 3).

Scholars in both technology studies and media studies have been arguing for the importance of analyzing in a grounded way the broader web of social and cultural connections that determine the shape and meaning of new media and technologies. Rarely, however, has this kind of analysis been carried out in a way that links detailed ethnographic fieldwork of media engagement with analysis of institutions linked but external to the site of reception, such as media development, marketing, and distribution. This book is an effort to address this conceptual and methodological problem by conducting an unconventional kind of genre analysis that cuts across various points in the circuit of culture. I use the concepts "media genres" and "participation genres" to read across different social boundaries and to describe how culture gets embodied and "hardened" into certain conventionalized styles of representation, practice, and institutional structure that become difficult to dislodge. I draw from John Seely Brown and Paul Duguid's (1996) notion of genre as something that cross-cuts form and content in media artifacts. For example, in the printing of a book, genres involve things such as typography, layout, paper weight, and binding, "the peripheral clues that crucially shape understanding and use" (132). Participation genres similarly involve the explicit content or focus of an activity as well as the subtle stylistic cues such as stance, gaze, and attitude that help us recognize a specific action as part of a category of practices. In addition to being a property of a media artifact, genre is also a mechanism for linking the artifact to a marketing and distribution

network. Buckingham describes genres as "a form of contract with the industry and the audience: like the star system, it serves an economic function for the industry as a means of regulating the market, while also ensuring that audiences know (more or less) what kind of pleasure they will be getting for their money" (1993, 137). In this sense, participation genres do work similar to that of concepts such as habitus (Bourdieu 1972) or structuration (Giddens 1986), linking specific activity to broader social and cultural structure. More closely allied with humanistic analysis, however, a notion of genre foregrounds the interpretive dimensions of human orderliness. How we identify with, orient to, and engage with media and the imagination requires acts of reading and interpretation. We recognize certain patterns of representation (media genres) and in turn engage with them in routinized ways (participation genres).

If we look more carefully at the arguments for and against the transformative potential of new media in learning, this genre framework helps untangle some of the seemingly contradictory findings and incommensurable viewpoints among them. Although a focus on genre and structure may seem to privilege conservative tendencies, my goal is not to debunk the innovative potential of new media. Productive debate over the role of new media in transforming learning and education is often stymied by a lack of clarity over what kinds of social, cultural, and individual learning outcomes are up for grabs. Boosters of new media will point to local learning outcomes or innovation in technology or educational program design. Debunkers will point to the conservatism of entrenched institutions such as the school and capitalist relations. Both of these dynamics are at play in the story I tell about children's software, and both represent part of the picture of how a new set of technologies was incorporated into our everyday lives. To end here, however, would be to retell a familiar story about the struggle between structure and agency, between entrenched institutions and local innovation. Instead, I propose a different lens for viewing this story.

The struggle I describe is not about active audiences, participatory players, and innovative designers pushing back at the conservative structures of established industries and the expectations of educational institutions. Rather, it is about how *particular* kids and educators at local sites of media engagement and *particular* actors within technology development and media marketing become enlisted in shared sociocultural formations or

genres. Within education, the debates among behaviorist, constructivist, and sociocultural forms of learning theory are cut from the same social and cultural cloth as efforts within the software industry to define the academic, entertainment, and construction genres and as the struggles within families to regulate the balance among schoolwork, play, and self-expression. The key battles that this book describes are not between the audience and the text or between the player and the industry, but between different genres that span production, distribution, marketing, consumption, appropriation, and domestication of software. Both change and the maintenance of stability are outcomes of successful enlistment of a distributed network that is mediated by new media, represented in compelling cultural discourses, embedded in powerful institutions, and performed at local sites of activity. Local innovation or the influx of new technology has no systemic effect unless it links up with other sympathetic parties and practices across the circuit of culture. In the remainder of this introductory chapter, I describe the multisited fieldwork that I conducted in order to investigate this distributed network of relations. The rest of the book discusses these networks as a set of distinct social, cultural, and technical genres.

The Study

This work draws from an interdisciplinary methodological frame that weds ethnography with approaches in technology and media studies that trace highly distributed and technological mediated forms of culture and practice. Anthropology has been grappling with methods for studying culture as it is distributed across wide-ranging networks of media, migration, and commodity capitalism. Calls for multisited ethnography (Marcus 1995; Martin 1994) and anthropological attention to objects such as the state (Gupta 1995; Gupta and Ferguson 1992), commodities (Appadurai 1986; Miller 1997), mediascapes and technoscapes (Appadurai 1990; Appadurai and Breckenridge 1988; Fischer 1991), online communication (Escobar 1994; Marcus 1996; Miller and Slater 2000), and large institutions (Nader [1969] 1972) have stressed the importance of reshaping anthropology to address ethnographic objects that are multisited and technologically mediated. The work that I draw on in media and technology studies rely on ethnographic approaches that are in line with this mode of inquiry. This book's ethnographic innovation is not in describing the unfamiliar, but in tracing unconventional linkages between familiar but dispersed

objects and in describing how acts of play and consumption are related to the structure of technology development and distribution. In contrast to contextualization in a geographic area, George Marcus has argued that "within a multi-sited research imaginary, tracing and describing the connections and relationships among sites previously thought to be incommensurate *is* ethnography's way of making arguments and providing its own contexts of significance" (1998, 14).

The relationships I trace between everyday contexts of play, marketing materials, and the activity of software development are an effort to bring to the surface those connections across contexts that may not be immediately obvious. This effort involves tracing linkages across multiple local sites rather than analyzing the relation between local action and global structure. It resists the notion that a systemic structure exists independently of these local linkages, instead arguing that the sedimentation of local action itself is what constitutes and maintains broader structural patterns in society and culture.

More concretely, this method of fieldwork has meant engaging in a project that dips into multiple field sites that are spatially distributed and separated by institutional boundaries, but are also part of the circuit of culture that constitutes children's software. These sites include after-school clubs where kids and adults engage with children's software, software design and development companies, and marketing and distribution channels for these products. Although my fieldwork in these different sites was not symmetrical—I spent much more time on the player side—I have tried to capture each site's local contingencies. The greater attention to the player-side fieldwork has to do with the conditions under which I conducted the fieldwork as well as with my commitment to capturing the agency and voices of children and to giving them a seat at the table in the debates over new media and learning. Creators and marketers of software and educational reformers have existing platforms through which to disseminate their views. One important role of ethnography is to make visible everyday activity and differing perspectives that are otherwise inaccessible.

Work in the "new paradigm" of the sociology of childhood (James and Prout 1997) has noted the ways in which children's voices and agency are often erased in research. Rather than considering them as complete "beings" who live full social lives rich in culture and knowledge, most work on children considers them incomplete "becomings" on their way to full social and cultural participation (Cosaro 1997). Studies of children are

dominated by psychological approaches that look at childhood in terms of "ages and stages," and that do not take into account the ways in which children are productive actors in the social world (James, Jenks, and Prout 1998). My work documenting the ways in which kids produce meaning through play, appropriating and reshaping the meanings of technology in local micropolitics, is an effort to consider the significance of kids' agency in the here and now of their everyday lives. In line with this approach, I often use the term *kid* rather than *child* because *kid* is the term that school-age children tend to identify with themselves (Thorne 1993, 9). I turn now to a description of the field sites in which I encountered kids and their engagements with children's software, and thereafter to a description of the fieldwork I conducted on the industry side.

The Fifth Dimension

The Fifth Dimension (5thD) consortium is an influential educational reform project with a history spanning decades. Michael Cole, who runs one of the sites that I studied in southern California, is the central organizing figure in this effort, although many other researchers have been involved in the project through the years (Cole 1994, 1997; Cole and Distributed Literacy Consortium 2006; Engestrom 1993; Nicolopolou and Cole 1992; Vasquez, Pease-Alvarez, and Shannon 1994). Since the late 1970s, the 5thD has evolved from a single experimental after-school cooking club for kids to an international educational reform effort that makes use of computers and telecommunications. Club sites are located across the United States as well as overseas. They are funded through grants by foundations such as Mellon and Russell Sage, the government, universities, and a variety of efforts by local communities. The university professors, graduate students, and other staff who work with the 5thD project hold joint identities as local implementers in close touch with the day-to-day operations of the clubs and with the communities in which they are located and as researchers with a reformist voice in the educational research community. The 5thD clubs have become an increasingly influential reform effort through the strong backing by the educational research community and by the local communities in which the clubs are located.

From the outset, the 5thD effort has combined theory and practice. The 5thD is based on a strain of psychological theory informed by the works of Lev Vygotsky (1987) and by the school of Soviet psychology with which

he is associated. In this view, learning is best understood and supported as a socially and culturally situated act of engaging with other people and artifacts rather than an act of individual knowledge acquisition. The 5thD philosophy draws in particular on Vygotsky's theory of learning through the "zoped," or the "'zone of proximal development': the place at which a child's empirically rich but disorganized spontaneous concepts 'meet' the systematicity and logic of adult reasoning" (Kozulin 1986, xxxv). The 5thD activity system has been designed to enable zopeds where children and adults can engage with a computer in joint tasks. The undergraduates staffing the sites are concurrently taking a course in cultural psychology where they are exposed to sociocultural approaches to learning, and their work in the 5thD is framed as observational fieldwork. The 5thD is a laboratory for testing the theories of cultural psychology as well as a way of realizing them in practice.

"Cultural psychology" in the vein of Cole and his collaborators (Cole 1997) found a common approach in anthropological approaches to learning and education, and has been a rich contact point between the disciplines of anthropology and developmental psychology (Brown, Collins, and Duguid 1989; Cole, Engestrom, and Vasquez 1997; Lave 1988, 1993; Lave and Wenger 1991). This interdisciplinary intersection of "sociocultural learning theory" takes a reformist stance toward mainstream American education's psychologization and individuation of education and assessment, arguing for the importance of social and cultural factors in learning (Lave 1988; Lave and Wenger 1991; Varenne and McDermott 1998). Ethnography becomes a method for observing "cognition in the wild" (Hutchins 1995) and for accounting for factors that are systematically excluded from experimental psychology (McDermott, Gospodinoff, and Aron 1978). This line of research also challenges the Piagetian tradition dominant among many educators. Whereas Jean Piaget sees the engine of learning in a child's organic, individualized, but universal developmental readiness, sociocultural learning theory sees learning and development as a social act that varies across different cultural contexts.

I conducted research on the 5thD as part of an evaluation project that sought to document learning processes at the sites through video-based analysis. This project was collaborative, run out of the Institute for Research on Learning (IRL) together with the Laboratory of Comparative Human Cognition at the University of California, San Diego. The bulk of the field-

Figure 1.1
Picture-in-picture format for viewing videotape. SimCity 2000™ © 1993–1994 Electronic Arts Inc. *SimCity 2000* and *SimCity* are trademarks or registered trademarks of Electronic Arts Inc. in the United States and/or other countries. All rights reserved.

work I report on was conducted in the 1995–1996 academic year. Together with a team of researchers, I was involved in videotaping interactions around computers at several 5thD clubs. We taped the social interaction around the screen and captured a scan of the screen itself, then we merged these two tapes into a picture-in-picture format for our review and analysis (figure 1.1). Our team also had access to the on-site field notes that the undergraduate participants wrote up every day that they participated at the site.

The site that was most central to this research and also the oldest current 5thD site is located at a Boys and Girls Club off a busy thoroughfare in a suburban neighborhood in Southern California. Between three and four o'clock, when I would usually arrive at the club, kids are walking in from the school across the street or are being driven in by parents or other caretakers to spend their hours between the end of school and the end of the parental workday. The Boys and Girls Club is a "safe" place for kids to spend this two-hour or more gap in their day. If one enters the club during these hours, one is greeted by a cacophony of kids' voices as they mill about the club's central room, which is occupied by pool tables, a few coin-op arcade games, fooseball, soda and candy machines, and clusters of sofas. Adult staff circulate among the kids, playing with them, organizing activities, and occasionally acting as disciplinarians.

At the far end of the main room is a door to the art room, filled with art supplies of various sorts as well as computer parts from old Apple computers and PCs that kids are allowed to tinker with during special workshops. Outside, on the other side of the building, are a basketball court and a pool. Off to one side is the door to the library and the club's "educational" area, which includes the room where the 5thD site is housed. Half of this educational area is occupied by bookshelves with reference books and by round tables generally devoted to homework. On this side is also a small computer area that is not part of the 5thD club, with a PC connected to the Internet and some Mac Pluses for doing writing assignments. On the other side of the room, separated by a cubicle-like partition, is the 5thD. Tables rim the 5thD space, occupied by ten or more computers and a printer or two. One table off to the side also houses the folders for each 5thD citizen, which track their progress through the games and other activities. It also houses "the maze," a wooden structure with miniature rooms and doors where kids move small objects called "cruddy creatures" that represent the kids themselves. As they progress in the club's activity system and master different games, they move their cruddy creatures through different rooms of the maze. A poster above the maze describes the "consequences chart" that dictates what games they can play in each room and how to proceed from room to room. Playing with commercial children's software dominates the activities at the site, but there are also rooms in the maze that propose playing board games, making a video, and doing other activities not on the computers. When a kid completes all rooms of the maze, he or she wins the title "Young Wizard's Assistant" and is able to play the high-end games at the site and is responsible for teaching others.

When the 5thD is not in operation, a piece of poster board closes off this area of the club. As 3:30 approaches, the time when the 5thD opens, some of the kids at the Boys and Girls Club begin to move from the basketball court and pool tables and start to mill around the 5thD area, attentive to the university undergraduates who are beginning to trickle in. The site coordinator is turning on the machines, getting the maze organized, and checking in on the undergraduates as they arrive. When the site opens, kids start pairing off with undergraduates, grab their folders, and eventually settle at a computer, while the site coordinator directs traffic. Things are chaotic and lively as kids and adults jostle around the

computers and try to figure out what software is available on what machine or who is working with whom. Although some 5thD sites have a formal sign-up sheet to manage who gets to participate each day, participation at this particular site is managed informally, and kids jostle for position at computers and with undergraduates. Some kids might also be writing e-mail to other 5thD sites or to the Wizard, the mythical entity who oversees the clubs and sometimes appears on a live computer-based chat. Some of the 5thD clubs do not allow free circulation between the 5thD and the Boys and Girls Club at large, but at this site both kids and undergraduates circulate between the 5thD, the library area, and other parts of the Boys and Girls Club. Kids often stop by briefly to observe or intervene in other kids' play or get bored at a particular game and decide to go play pool or to mingle with kids at other parts of the clubs. Kids might also decide that they would rather play a game with a friend, leaving some undergraduates with no kids to partner, so that they end up playing with each other, trying to learn a new game. There can be as few as three and as many as fifteen kids at the 5thD site. On a crowded day, latecomers have to wait for their turn with an undergraduate and often stand observing other kids play.

This particular club caters mostly to middle-class, white and some Latino kids whose working parents need an after-school activity for their kids. In contrast to the kids at some of the other 5thD sites, many of the children attending this club have computers at home, so the site has become an extension of home entertainment activities and an opportunity to engage in these activities in a peer group. A small but highly visible group of technically savvy older boys, ages ten to twelve, often dominate the higher-end machines at the club, exchanging tips and opinions about current games. Girls attend the club in somewhat lower numbers than boys. The dominance of the older boys in the group led for a brief period to the institution of a "girls only" day each week, where girls could play on the machines that they wanted without having to negotiate with the boys. Familiar gender dynamics are present in the male dominance of technology at the club, even though club operators attempt to increase girls' representation.

Less than a mile away, another site where I observed serves a predominantly working-class Latino community. At this site, the 5thD operates in a trailer that it shares with a Head Start program, located on the property of a church. The children who attend this 5thD site come for the 5thD activities alone rather than to use other facilities, as is the case at the Boys and Girls

Club. The site coordinator is the mother of one of the children and speaks Spanish and little English. During 5thD operations, a lively mix of languages can be heard as English-speaking university students mingle with bilingual children and the occasional Spanish-speaking parent or community member. All the curricular materials are available in both English and Spanish. The space is cramped, with computers rimming each wall around the round central table for activities such as drawing and board games. There is a stronger presence of parents and families at this site because of community ties through the church, and active efforts have been made to recruit parents to help staff the site. Older children sometimes bring their small siblings, and children just starting kindergarten and learning to read are often there as well. With the exception of a few Spanish-language games, most of the software is similar to the software at the Boys and Girls Club site, as are the curricular materials. In contrast to the Boys and Girls Club site, however, most of the children at the church site club do not have access to computers at home, and their parents generally lack access to them at their workplaces. The site became an opportunity for both kids and their parents to engage with new technology that they would otherwise have limited access to (Vasquez, Pease-Alvarez, and Shannon 1994).

The third site at which I observed was one that I, my advisor Ray McDermott, and other IRL staff (Anne Mathison, Shelley Goldman, Dena Hysell, Charla Baugh, Gary Geating, George Lopez, and Ingrid Seyer) started in Menlo Park. Our first session was in the fall of 1995, the second year of the project. This effort was motivated by my desire to interact with my research subjects on a more regular basis and by the spirit of community service. In alliance with the East Palo Alto Stanford Summer Academy (EPASSA), a summer camp run by Stanford University, we recruited middle-school kids from East Palo Alto and Redwood City to come to IRL on weekends and play with educational games and Internet technologies. The EPASSA staff helped us coordinate a meeting at which the EPASSA families could see what was happening in the club and we could explain our research.

Of the fifteen or so families that attended the informational session, six became regular participants and occasionally brought their friends. All participating families were middle-class and working-class African Americans, with the exception of one Latino family. Other than the Latino boy, the kids did not have access to computers at home and had limited exposure at school. Project members and a number of other people hired

on a temporary basis staffed the club in lieu of the undergraduates who generally act as tutors at 5thD sites. Because we were also dealing with an older age group and had access to the high-end technology at IRL, we were able to experiment with more kinds of software and activities than other 5thD sites have, including Web page design and digital video production. Throughout the 1995–1996 school year, we met weekly, with between three to seven kids, and most sessions were taped. As the year progressed, many of the kids would also appear at IRL during the week to make use of computers for homework and for fun. During the summer of 1996, the club's core members ran their own summer program at IRL, working as teachers for kids enrolled in a special EPASSA elective. The kids from this local club are in many ways my primary informants, although they are not necessarily the ones most heavily represented in this book. They are the kids I not only observed through the video record, but also interacted with on an ongoing and regular basis as informants, interlocutors, and video-gaming companions.

The 5thD is a unique setting that enabled me to observe interactions with children's software in a social environment, but it differs in many ways from the place where more conventional interactions with computers take place—the home. There is a stronger peer-group influence in the 5thD than in the home, and the adult presence in the form of undergraduate tutors and educational researchers is unconventional. The 5thD provides more access to a greater variety of software products in the genres that I am investigating, whereas in the home, educational software more commonly plays second fiddle to console gaming and television. The 5thD magnifies children's interest in educational genres of software by creating a peer-status economy around play that would otherwise gravitate toward mainstream action games and television. The adult supervision also emphasizes the academic content embedded in the games, making the 5thD's overall setting more attentive to educational concerns than are most home contexts. Another difference is that some of the social distinctions that operate within unsupervised play contexts are erased. Girls are actively recruited to engage with the technology, and at many of the sites computer access is given to children who do not have computers at home. In contrast to schools, the 5thD provides a more fluid and open-ended environment where kids can move between activities and engage in social interactions with other kids and adults.

To borrow a term from Joseph Giacquinta, JoAnne Bauer, and Jane Levin (1993), the "social envelope" surrounding computing in the 5thD is distinctive. These authors' work documents how use of educational computing in the home is rare, in large part because of the difficulty of choosing and purchasing these products and because parents need to encourage kids to use such products even when they are present in the home. The 5thD, by contrast, is an environment that maximizes engagement with the media that was the focus of my fieldwork. Although this context was idiosyncratic, it did provide a rare opportunity to conduct extended observations of how kids engage in these products. The 5thD effort is part of the same cultural fabric and historical conditions that gave rise to the children's software industry. Both the organizers of the 5thD and the early developers of children's software were part of a movement toward more progressive and child-centered forms of education that made use of new technology as an ally in their efforts. In other words, the 5thD was not simply a "neutral" site in which to observe play, but was itself part of the broader set of institutional conditions and discourses that I analyze in this book.

Industry Research

The industry side of my research relied on a more limited ethnographic toolkit and was more targeted than the work that I conducted at the 5thD, so I can describe it more briefly. After completing fieldwork at the 5thD, I began an effort to document what happens on the other side of the circuit of production that brings the software to the kids' hands in the first place. I began research on the history and context of the software industry, conducted a series of interviews with software developers between 1998 and 2000, and observed and had a series of informal conversations with people at trade shows and industry events. I conducted most of the interviews in person in the greater San Francisco Bay Area, but did four phone interviews as well.

In addition to the interviews, I conducted a literature review on children's software and the industry. I looked at Web sites with industry statistics and news, as well as at bulletin boards that discussed related topics. In contrast to the mainstream entertainment industry of computer gaming, relatively few publications deal specifically with children's software, and much of the information I was able to find was on targeted Web sites oriented toward tech-savvy parents and teachers. I turned to news

media for access to much of the industry backstory that was otherwise locked up in proprietary reports. I conducted a review of references to the industry in the *New York Times* and *Wall Street Journal*. With the help of two research assistants, I did a comprehensive search in these two publications for appearances of the topics "children's software" and "computer games" in the period from the early 1980s to the year 2001; we also searched for all of the key corporations I was tracking. Although there are many gaps in the public record, I was able to gain an overview of the corporate players involved. I also reviewed advertisements for children's software over a period of a year and a half in 1999 and 2000 in the magazine *Family PC*.

Organization of the Book

The next three chapters draw from my research on both the 5thD and the children's software industry, organized by the focal three genres: academics, entertainment, and construction. The academics genre, discussed in chapter 2, is centered on software to support school-based content and is marketed to middle-class families oriented to academic achievement. The history of this genre traces the early origins of edutainment and how it was transformed from an experimental educational reform movement to a niche industry that now relies on established formulas developed in this early period. In their play with the games in this genre, kids are quick to recognize each game's achievement goals and to orient themselves to fulfilling the conditions to move ahead in a task and "beat" the game.

Chapter 3 describes the genre of family-friendly entertainment that emerged in tandem with the development of more sophisticated multimedia capabilities in PCs. In contrast to the software titles in the academic genre, the titles in this genre rely more on open-ended exploration and do not focus on delivery of school-based content. They are closer to the family-friendly entertainment characteristic of children's television. Educators and developers of this genre of software appeal to parents' desires to support children's play and pleasure. Although adults will try to orient kids toward the more school-like content in some of these games, kids tend to see play in this genre as a process of open-ended exploration focusing on the pleasure in visual and interactional special effects.

Chapter 4 examines the construction genre, which has its roots in educational efforts to promote computer programming. Games in this genre involve tools and simulations that enable kids to author, construct, and manipulate digital media; they appeal to identities of technical mastery and empowerment and are marketed based on their ability to provide tools for creativity and self-expression. Kids' engagement in this genre often involves projecting their own lifeworlds and identities into the online space, in often unpredictable ways.

The conclusion returns to some of the issues raised in this introductory chapter, examining the ways in which this case study of children's software can inform unfolding developments in the area of new media and learning.