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A Rule Set for the Future

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[T]hanks to science, the whole world is now aflame. Time and space are practically annihilated: night is turned into day; social life is almost revolutionized, and scores of things which only a few years ago would have been . . . impossible are being accomplished daily.

The stage is being set for a communications revolution . . . there can come into homes and business places audio, video and [other] transmissions that will provide newspapers, mail service, banking and shopping facilities, data from libraries, . . . school curricula and other forms of information too numerous to specify. In short, every home and office will contain a communications center of a breadth and flexibility to influence every aspect of private and community life.

Today in our cities, most learning occurs outside the classroom. The sheer quantity of information conveyed by [the new media] far exceeds the quantity of information conveyed by school instruction and texts. This challenge has destroyed the monopoly of the book as a teaching aid and cracked the very walls of the classroom so suddenly, we're confused, baffled. . . . [M]any teachers naturally view the offerings of the new media as entertainment, rather than education. But this carries no conviction to the student.

Quotes such as these have become quite familiar today. They are so ubiquitous that their sources hardly matter (although we will return to them). We are continually reminded that new digital technologies are transforming the flow of information, our experiences of geography, temporality and sociality, and even the individual's sense of self or identity. If, as adults, we feel anxious about the digital revolution or our own technological prowess, we have also learned that youth will lead the way. Numerous popular books have explored the emergence of the "Net" or "Digital" generation, describing in great detail the media-saturated environments that these young people inhabit.¹

If such reports sometimes can seem overly optimistic, others assess the rise of the digital native with blanket condemnation, asserting, as Andrew Keen (2006) has, that new forms of youth-based social networking like YouTube or MySpace "are inherently dangerous for the vitality of culture and the arts."² All of these popular accounts tend toward hyperbole, making it harder to understand the complexity of the moment we are in. This volume identifies core issues concerning how young people's use of digital media may lead to various innovations and unexpected outcomes, including a range of unintended learning experiences and unanticipated social situations. While such outcomes might typically be seen as "positive" or "negative," our investigations push beyond simple accounts of digital media and learning as either utopian or dystopian in order to explore specific digital practices with an eye attuned to larger issues of history, policy, and possibility.

The essays collected here also examine how youth can function as drivers for technological change while simultaneously recognizing that technologies are embedded in larger social systems, including the family, schools, commercial culture, and peer groups. A broad range of topics are taken up, including issues of access and equity; of media panics and cultural anxieties; of citizenship, consumerism, and labor; of policy, privacy and IP; of new modes of media literacy and learning; and of shifting notions of the public/private divide.

The authors brought together in this volume have worked together over the last year under the auspices of the MacArthur Initiative in Digital Media and Learning, but they come from a variety of academic backgrounds, methodologies, and institutional settings. Early in the process of creating this book and as a way of bridging different scholarly approaches and interests, the authors and I mapped out a series of questions that we would collectively explore:

- What's new about "new" technologies? What's not? What is specific to these emergent media? What continuities and discontinuities are there, and why do they matter?
- What cultural fears, hopes, or anxieties do emergent technologies animate, provoke, or otherwise call into being? How do these emotional valences link up with (or not) earlier moments of rapid technological change? In other words, how might we historicize our contemporary moment of technological development?
- How does technological change happen? That is, how do users innovate in unexpected ways that reconfigure technologies to act as drivers for change, and create informal modes of learning? How are youth functioning as early adopters? How do larger cultural, economic, historical, and social forces shape or curtail innovation and impede or facilitate learning?
- How can we best discern and even foster what is liberating, empowering, or enlivening about today's forms of participatory networked culture? Are there recommendations we might make for policy, curriculum, or infrastructure? How do we balance overviews and systemic analyses with textured readings of specific examples?

These are big questions, and, not surprisingly, in investigating them, we haven't as a group reached a neat and tidy conclusion. This volume does not offer a unified perspective on the possible stakes, outcomes, and innovations we might expect of the digital era, nor does it offer a single image or description of the "digital native," although several fine-grained portraits do emerge. Nonetheless, each author agrees that we inhabit a moment of both technological risk and possibility, especially vis-à-vis young people and modes of learning. Drawing from these ten essays, related research, and the questions outlined above, I here offer six maxims to guide future research and inquiry into the questions motivating this study. They form a kind of flexible rule set for investigations into the innovative uses and unexpected outcomes now emerging or soon anticipated from young people's engagements with digital media.

Before delineating this rule set and charting its relationship to the essays in this volume, I first reflect on the title *Digital Youth, Innovation, and the Unexpected*. Other books in this series are organized around ongoing research topics in digital media ("Credibility," "Civic Engagement," even "Games"), or, around larger, interdisciplinary themes of academic inquiry ("Identity," "Race"), all with their own supporting bodies of literature. *Digital Youth, Innovation, and the Unexpected* seems much more diffuse. Indeed, taken together, the several essays included here touch upon all of the topics explored in the other five MacArthur

volumes. While what is meant by “the unexpected” may seem fairly obvious, the word “innovation” is perhaps less clear. It is worth taking some time to unpack this term in relation to this volume’s motivating questions and larger goals.

Understanding Innovation: Some Academic Precedents

Innovation is very much a buzzword in contemporary U.S. culture. National and corporate leaders worry that without innovation, we will lose our national “edge” and be ill prepared to participate in (if not lead) emergent knowledge economies. Many look to new technologies and digital media as platforms for learning vital skill sets for success in this challenging new environment. A quick Google search for the words “corporate” and “innovation” returns over 118 million results. Some of these sites lead to blogs that survey trends and best practices. Many others lead to a growing category of businesses that perform as a kind of “innovation service industry” for corporations, deploying various “cutting-edge” technologies and tools to spur innovation (and, thus, financial success and competitiveness) in business settings. Such tools include “InnovationStyles,” “a web-based assessment, feedback, and coaching system... a practical, proven resource to help you generate innovative solutions to work challenges, foster high levels of innovative teamwork, and develop an organization-wide culture for innovation.”³ The product Web site affirms that the application has been adopted by a wide variety of large corporations, including ATT, IBM, Kraft, P&G, DuPont, Motorola, and Schwab.

These approaches and products often figure innovation in fairly functionalist ways, imagining technology as a quick fix that will fuel creativity, learning, and imagination. Such functionalist conceptions of innovation are, of course, tightly bound up with various historical discourses about America’s uniqueness or ingenuity, that is, with the popular founding myths of the United States as a special hotbed of pioneering and inventive individuals. They bring together a sense of American exceptionalism with a belief that simply using the right tools will get the job done. Such attitudes also extend to the “business” of education, where firms like Pearson reap tidy profits by selling large and expensive software systems to cash-strapped school districts. For instance, their “SuccessMaker[®] Enterprise” is described as “a learning environment that offers a powerful combination of management system, assessment, and curriculum resources,” while “KnowledgeBox seamlessly delivers a wealth of instructional media designed specifically to help meet the varied needs of learners in 21st Century classrooms.”⁴

Scholars have questioned the value of such large technology systems for true innovation in the classroom, observing that they often function as little more than glorified workbooks and promote “unimaginative and deeply traditional methods of learning.”⁵ Likewise, at the university level, some professors have challenged the functionalist ideas at the core of many technology-driven distance-learning initiatives.⁶ These critiques dispute the assertion that innovation (or valuable learning) is a simple consequence or function of particular technologies. They also highlight an important observation about innovation: it is unlikely to be easily standardized and packaged. Apart from these functionalist approaches, how else might we understand innovation?

During the past three to four decades, other perspectives on innovation have emerged from within the university. For instance, the field loosely known as Science and Technology Studies (STS) has investigated both technology and innovation in terms of complex social dynamics, moving away from notions of invention or discovery toward explorations of negotiation and

process. Early STS researchers applied sociological methods to studying science and argued that scientific ideas should be seen as socially constructed forms of knowledge (rather than as objective facts that are simply “discovered”). Put differently, science came to be understood as an interpretative process that was similar to other everyday modes of thinking and analysis. Scientific knowledge could not be separated from larger social and cultural systems; thus, science was (at least partially) constructed by culture and history. By the early 1980s, these new methodologies were also being used to study technology and to understand innovation.⁷ Rather than defining a technology strictly by its function and form, that is, as a closed system, those in the emerging field of STS focused on technologies as being socially and culturally constructed.

Today, there are several STS departments or programs that are well established in universities. STS was in its origins an interdisciplinary field, and, like other such disciplines, there are many variations and debates within it. It is also a discipline that emerged in parallel with other changes in the university in the 1960s and 1970s as various political and social movements led scholars to question modernist or universal claims to knowledge. While STS research sometimes seemed stuck in simply proving that technology or science was socially constructed, some STS researchers instead focused on particular examples of the process of innovation or design while also teasing out larger, more general principles.⁸ Such insights often zeroed in on the *use* of technology as much as on its development, pushing beyond the functionalist understandings of technology and innovation that still drive research in many engineering schools (and in many corporate products aimed at packaging and selling “innovation” and “learning” via the right tool or software program).

If STS investigates technology by keeping the focus squarely on social and cultural systems, Actor-Network Theory (ANT) proposes a simultaneous analysis of the material (i.e., of things) as well as the social. It can be seen as a “material-semiotic” approach that looks at the relationship between things and concepts, examining networks and processes. Bruno Latour formulated some of the central principles of ANT as a way of avoiding dualisms which tended to privilege either nature (scientific realism) or culture (some variations of STS). The larger intent of ANT is to understand humans and nonhumans as equal actors situated within networks that are formed and sustained in order to achieve particular goals, including technology design (e.g., building a car) and information management (e.g., running a stock brokerage or a school). ANT can be located as an offshoot of theories of the social construction of knowledge and clearly relates to several approaches in poststructural theory, including the work of French philosophers Gilles Deleuze and Michel Foucault.⁹ STS and ANT are often framed as competing paradigms, but they converge in their critique of notions of scientific realism or objectivity.¹⁰

While these various methodologies have been in use for decades and might thus be seen as “old news,” the recent surge of interest in forms of networked computing (an interest evidenced by the very series in which this book is located) also points toward a new relevance for these methodologies, particularly in an era in which public conversations about technology tend to shuttle back and forth between wildly utopian and deeply pessimistic strands that each view technology as the direct cause of societal changes, be they good or bad. Methods of scholarship developed in the past few decades afford us vibrant models for thinking about technology *in context* and for understanding innovative or unexpected uses of digital media. If STS can be accused of a certain social determinism and a narrow focus on the micro, and ANT can be guilty of a kind of technological determinism, each offers valuable insights into how people make meaning from (and are also remade by) their multiple engagements with diverse digital technologies.

Not all authors in this volume explicitly situate themselves vis-à-vis these disciplinary traditions, although Christian Sandvig, Henry Lowood, and Steve Anderson and Anne Balsamo do to differing degrees. Still, you might say that this approach influences all the work in this volume, particularly in a shared rejection of functionalist approaches and in a sustained focus on the multiple contexts in which technologies are always embedded. This turn to context reflects these disciplines' own histories as part of a broader intellectual movement that tested universal claims to knowledge across the fields of the humanities, education, media studies, and the qualitative social sciences. I will return to the question of methodology at this essay's close, but, for now, suffice it to say that grand, one-size-fits-all theories are probably of little use in helping us assess the potential outcomes and affordances of the digital era. Rather than attempting to produce a kind of universal manual for innovation, the authors brought together here seek to understand in some detail several examples of innovation and learning that are now unfolding in the digital era. Such finely grained detail may indeed help us to understand ways to foster innovation and design new technologies for learning. Collectively, they encourage us to recognize that innovation as a cultural phenomenon often happens in unexpected places (as does learning) and produces unanticipated outcomes. They remind us to ask who innovation serves and how we might best reap its benefits for broader visions of social equity and justice. And, finally, they underscore that the term "innovation" is value laden and historically complex.

In what follows, I weave together many of the insights offered across the individual essays at hand in order to produce a kind of conceptual rule set for future investigations into the consequences and possibilities of learning in the era of digital media. This rule set is composed of six rules or maxims that dovetail with the sociocultural approaches favored by STS researchers, while also stressing certain larger frameworks that should guide our examinations of digital technologies and learning.

Rule One: Remember History

Undoubtedly there are "origin stories" other than STS or ANT from which we might have begun an investigation of the innovative uses of digital technologies, but these methodologies usefully underscore that innovation and its outcomes are not unique properties born of the digital era. Many of the richest studies emerging from these and related traditions cast an eye to history in order to better understand the present. Such an attitude is in woefully short supply in much of the contemporary rhetoric about digital technologies. This "present-ism" equally inflects commercial and academic settings and lends itself to grand proclamations about how children, learning, and society are all "new" or "different" today because of the rapid uptake of technology. Such language is very much in evidence in the quotes that opened this essay. Each draws upon the language of revolution and rapid, fundamental change to propose that we inhabit a new era like none we have previously experienced: "social life is almost revolutionized," "the whole world is aflame," "the stage is . . . set for a communications revolution," "most learning occurs outside the classroom . . . this challenge has destroyed the monopoly of the book." Claims like these make it difficult to draw connections across different moments of technological change.

The limits of such language (and the obfuscating work it does) become more easily apparent when the sources of these quotations are revealed. The first is from a speech to the American Association for the Advancement of Science by retiring president T. C. Mendenhall. The year is 1890, and he celebrates the advances wrought by electricity. The second excerpt derives from the article, "The Wired Nation," published not in 1995 but in 1970 in *Nation*.

The technology it rhapsodizes is cable television. The final excerpt comes from Marshall McLuhan's 1957 essay "Classroom without Walls,"¹¹ a reflection on learning in the (early) age of television. Well known as a kind of "futurist" in his own era (one resuscitated by *Wired* magazine in the 1990s as their patron saint), McLuhan's views have been frequently criticized for a determinist or functionalist stance toward technology that paid scant attention to social or historical context.¹²

Recent historians of technology, many working explicitly or implicitly within STS traditions, have illustrated the uncanny similarities across various moments of technological "progress." Drawing on a rich array of primary materials (including President Mendenhall's speech), Carolyn Marvin's *When Old Technologies Were New* tracks the disruptions to social order that both electricity and the telephone unfurled while also paying careful attention to the many ways through which existing cultural forces, including class, gender, and nationalism, simultaneously impacted what these once-new technologies might become.¹³ In *Selling the Air*, Tom Streeter reminds us that the largest, most active groups of innovators in technological communications weren't scientists or corporations, but everyday citizens and amateur system operators.¹⁴ He examines a world of network enthusiasts who imagined an essentially free and democratic system of bottom-up, participatory culture and two-way exchange. While this might sound like a tale lifted from the hacker boys of the 1990s or from the creators of YouTube, Streeter is actually describing early ham radio enthusiasts almost 100 years ago. He argues that such hobbyists helped create modern broadcasting but also observes that the one-to-many world of commercial radio and TV that developed in their wake bore little resemblance to the open, plural networks imagined by these youthful innovators. His research again illustrates that "new" technologies always enter into powerful, preexisting social systems, networks of meaning and privilege that can serve to circumscribe how technologies develop and delimit whom they best serve. It also highlights that youth are often early adopters of new technologies, deploying emerging devices and platforms in ways that can outstrip the expectations of engineers and parents. More recently, David Edgerton's *The Shock of the Old: Technology and Global History Since 1900* shifts our attention to "a whole invisible world of technologies," arguing for the study of use and maintenance rather than of invention and creation and for an examination of everyday technologies, from the condom to corrugated metal.¹⁵ He convincingly illustrates that old technologies don't just simply disappear: rather, they are adapted and continue, often in the service of warfare and narrow nationalisms. It is crucial that we study such remediations if we are to understand how technologies morph and change.¹⁶

To underscore the importance of locating through-lines and feedback loops between the present and the past, this volume begins with a section explicitly focused on historical processes of technological development and innovation. Ellen Seiter strikes a productive historical analogy, comparing earlier attitudes about musical education and piano playing with our contemporary focus on computers and learning. Drawing on French sociologist Pierre Bourdieu's categories of economic, cultural, and social capital, she details the various ways in which both musical education and computer education implicitly favor the middle and upper classes.¹⁷ Both musical and computer literacy are more easily achieved when youth have the ability to practice informally at home on new or well-tuned equipment and have social networks in place to support their learning. She convincingly argues that such opportunities will be hard to come by for poor youth in crowded schools and dense urban neighborhoods, illustrating the complex issues at play in a notion like "access."

Justine Cassell and Meg Cramer turn to history to nuance present-day fears that the internet is a welcoming playground for sexual predators and pedophiles. The authors first note that single-offender crimes against girls have actually dropped since 1994, concurrent with the rise of the internet, and then question why popular discourse suggests otherwise. By looking at similar scares during earlier moments of emerging technologies, Cassell and Cramer frame today's fears as a widespread moral panic that covers over social anxieties about "girls as power users of technology." As they argue, such moral panics obscure the positive benefits to girls of internet use and repress the reality that acquaintances and relatives pose a much greater assault risk to youth than do strangers. We might additionally see such panics as convenient smoke screens that blind parents and society to larger systemic issues that oppress youth: increasing poverty, declining public infrastructures, and rampant commercialism (see also Frechette¹⁸). Christian Sandvig's essay also takes a comparative historical approach, mapping the histories of wireless technology and youthful innovation in both the digital and the analog eras. Through a sustained investigation of both "wardrivers" (young people who charted early Wi-Fi signals around 2005) and youthful adopters of analog wireless circa 1920, Sandvig maintains that happy tales of youthful play and innovation occurred regularly throughout the past 100 years. Such stories paint encouraging portraits of participatory culture and youth-driven change that neatly line up with traditional attitudes about American ingenuity. They can blind us to other hard realities such as this: most technology innovators come from very privileged worlds.

Each of these three essays engages the hopes and anxieties specific technologies animate with regard to youth, from dreams of high-tech jobs to anxieties about outside influences entering the home. Having noted several parallels across earlier moments of technological change and the present, the temptation might be to rest smug in the knowledge that "we've seen this all before," but that is not my point in focusing on these historical examples. If we have seen tales of the youthful inventor more than once in the past and grow suspicious of them, we are also tired of old tales of moral panic, particularly when they work to demonize girls or underprivileged youth. Obviously, we cannot discern every unintended consequence, risk, or possibility from the outset or through recourse to the past. We can, however, turn to history to better detect our own blind spots, to predict stumbling blocks, or to look for patterns of lost or realized opportunity. This embrace of the historical extends beyond these opening essays through other sections of the volume. Historical methods are not engaged via a spirit of negativity but, rather, as a ground for learning and for calculating best guesses for the future.

Rule Two: Consider Context

If history can also help us discern the continuities that persist across time, we need also be mindful of the differences a technology might make. While we've seen the limits of generalized proclamations about the newness of "new" technologies, a careful attention to context can help us better assess what social practices and technological forms *are* changing. Across the essays in this book, a doubled stance emerges in relation to technology: technology is understood to be socially constitutive and simultaneously to be socially constitutive, that is, technology is both shaped by history and sociocultural realities, and is also a shaper of those realities and of possible futures. Such a doubled understanding of technology is consistent with STS methodologies and also calls to mind one of the founding works of the cultural studies of media, Raymond Williams' *Television: Technology and Cultural Form*.¹⁹

Williams rejected “technological determinism” as an attitude that depends “on the isolation of technology” from history, social forces, and use, in short, from any context. He dismisses the popular notion that “new technologies are discovered . . . which then sets the course for social change and progress” (13–14). Williams’ book astutely figures television as a complex nexus of cultural, technological, and historical processes, at once an intention and an effect of a particular social order, and it has been extremely influential in cultural and media studies. It argues against positivist studies in the social sciences and sets aside simplistic ideas of media “effects.” The work also famously decries Marshall McLuhan’s theories of electronic media, lambasting his formalist methods in which “the media are never really seen as practices” and “are in effect desocialized.”²⁰ Williams’ criticisms further suggest that McLuhan’s writing is giving the commercial industries just what they want.

Such critiques of McLuhan are fairly easily raised, particularly given his movement toward increasingly “non-academic styles” of writing, his proclamation that the medium is the message/massage, and his tendency to slide into formalist assessments of different types of “hot” and “cold” media. These criticisms shift our focus away from the giddier aspects of McLuhan’s prose (statements like “electric technology is reshaping and restructuring . . . every aspect of our personal life” or “minority groups can no longer be contained-ignored”) toward concrete material realities. The debate between McLuhan and Williams is frequently framed as a debate between determinism and formalism on the one hand and more culturally situated forms of analysis on the other. The former privileges medium and form, while the latter privileges content and context. However, in the past decade, concurrent with *Wired* magazine’s reclaiming of McLuhan, some scholars have begun to parse this debate a bit differently and to argue that McLuhan’s perspective is “intersubjective” rather than simply determinist.²¹ One strength of McLuhan’s writing, beyond its precise attention to the specific properties of a given medium, is its focus on the role of various media in shaping our senses and on the perceptual qualities of media. In *Understanding Media*, he sees media forms as an extension of both the psychic and social complex.²²

There are interesting parallels in the debates between Williams and McLuhan and those between STS and ANT noted above. Williams and many STS traditions can be seen to foreground the social at the expense of an appreciation of the cognitive or esthetic, while McLuhan and some variations of ANT tend to privilege networks and specific media to the exclusion of social and economic structures. There are useful elements to be gleaned from both sides in these debates. In understanding emergent forms of networked media, we need specific formal, esthetic, and material investigations of individual devices, platforms, and practices that simultaneously engage with social contexts. Put differently, we need to understand the specific mechanisms deployed by and the affective or emotional registers activated by our embodied engagements with digital technologies, while also being mindful of cultural context. Simply to argue that technology is, of course, not determinate and is always situated (as STS and cultural studies have taught many of us to do) is also to sometimes miss an opportunity to explore the many ways in which our devices *do* construct us. In an age of “intelligent agents” and everyday engagements with various machine-based intelligences, we should take seriously the notion that our perceptual and cognitive facilities may be shifting, even as we understand that these shifts are part and parcel of larger cultural forces.

From different disciplinary traditions, various essays in this volume grapple with such debates, offering precise case studies that link investigations of particular computing technologies to larger social contexts. For instance, Paula Hooper examines both the technological affordances of programmable media for learning as well as the important role played by

cultural context when such media are introduced into the classroom. Her examination of projects created in the *Turtle* programming language by young girls in an African-centric charter school brings together constructionist ideas (i.e., Seymour Papert's work on the computer as an object to think with²³) and educational theories on the cultural nature of learning. Her work resonates with the work of Ron Eglash,²⁴ who has designed several "culturally situated design tools" to teach STEM concepts.²⁵ Such tools interlace technology and cultural relevance. Instead of imagining that teaching tools are neutral and can be easily adapted to "culturally aware" content, Eglash favors an "ethnocomputing" approach that stresses interconnections between the "universal" and the "local," and between technology and context. Culture becomes part of design, rather than something that gets tacked on after a tool is "finished." Henry Lowood's detailed consideration of machinima—an unexpected development in which video game players use game technologies to make movies—likewise weaves together considerations of what a particular technology makes possible with a spirited examination of specific communities of practice and performance. He argues that machinima developed from a collision of player practices and certain technological features of the game engines built for first person shooter games like *Doom*.

Lowood and Hooper are exploring the use of technology in vastly different communities. A focus on *technology in context* helps each to detail very precise technological affordances. Taken together, their essays remind us, first, that many differences exist *among* young people in terms of technological fluency and access and, second, that youth and adults within a community (like the machinima culture) may share certain dispositions or cultural signposts. While middle-class U.S. parents and youth may experience the internet and digital technologies in very different ways, reinforcing the idea of a digital generation gap, these splits or fissures seem less severe when differences between children across economic, racial, or national lines are explored (see also Buckingham). Finally, in both Lowood and Hooper's work, users merge digital technologies together with commercial media narratives in the context of specific communities, in effect fusing and remaking both the narrative and the tool. From early scrap-booking practices in Studio-era Hollywood to the audio mix tapes of the 1970s to the fan fiction and textual poaching explored by cultural studies researchers, we know that viewers and readers have long "re-mixed" or poached commercial culture.²⁶ But the practices and engagements that Lowood and Hooper are describing might signal more than just a difference in scale or quantity (i.e., more people are now re-mixing.) It is possible that deep interaction with digital forms encourages new flexible models of thinking and doing that in turn facilitate emergent ways of being and learning.

Rule Three: Make the Future (Hands-On)

I recently spent several hours trapped in an airport after bad weather grounded outgoing planes. As I waited in line to schedule a new flight, I overheard a young boy in front of me ask his mother, "Mom, why can't we just do this trip over." When she asked him what he meant, he replied, "You know, like when I play Mario on my Nintendo. I'd like to play this part of our trip over again." While we could write off such a comment as wishful or magical thinking or as indicative of the cognitive development of a five-year-old, we might also read it as illustrative of the ways in which sustained engagements with digital technologies might generate new dispositions toward process and agency. After all, one of the key affordances of digital technologies is the capacity to iterate and revise, an aspect of the mutability and variability many have noted as core aspects of computing technology.²⁷ Throughout this

volume and in earlier research, scholars have delineated some of the particular pleasures and possibilities of experimenting with digital media technologies. These include a privileging of process over product, a sensation of mobility and control, a feeling of networked sociality, a heightened awareness of audience, learning by doing or tinkering, and an impression of mutability and transformation.²⁸ While each of these affordances might be found in earlier technological forms (and some might be more imagined than real), scholars from diverse disciplines maintain that computational media engage users in qualitatively different ways, even as they refract and reflect earlier technologies and media forms. Katherine Hayles and others have suggested that we now understand our very selves to be posthuman—interwoven with information or data.²⁹

To focus on just one of the properties outlined above, we might discuss the transformative potential digital media tend to signal. There's a heady feeling of possibility laced through our engagements with computing technology: digital code is malleable and subject to manipulation, at levels both accessible and inaccessible to the average user. In a language as simple as HTML, changing the descriptor "FFFFFF" to "FF6600" on a lengthy block of code seemingly transforms the page from a predictable white to a bold orange. A comment posted by a student to a blog seems to appear almost instantly in a public forum. Objects a teen builds on his or her home computer change the landscape of a dynamic virtual community shared by thousands of users. Thus, digital technologies in their very form seem to offer up valuable possibilities for learning by doing, and numerous educators have related success stories and positive outcomes from engaging students with rich, digital media, particularly when these technologies are designed and deployed with a well-honed respect for context. Others have commented on different types of informal learning that seem to very much characterize youth's engagement with digital media.³⁰ In this volume, both Sandvig and Lowood illustrate various kinds of learning that youth undertake outside of formal educational settings as they actively engage with *making* digital objects, processes of learning that are often supported by peer-to-peer communities.

In her contribution to our project, Sarita Yardi offers a case study that examines the potential for youthful innovations with technology to foster both informal and formal modes of learning. The work draws from a larger investigation of a student-designed Internet Relay Chat (IRC) that was quickly taken up by graduate students in an information school at a prestigious public university. Yardi probes the ways in which this forum functioned as a kind of hybrid "third space" for student community and as an active "backchannel" within many classrooms, as students chatted together during class meetings. Based on this example, she hypothesizes that backchannels can be designed that support "active, collaborative, and engaged knowledge production" within educational environments, while also offering users the opportunity to form friendships and to experiment with identities. Much like Paula Hooper, she ends her essay by offering a series of possible protocols that might be considered when designing such forums; these include the need to "teach the teachers" and to create developmentally appropriate environments. While we want to avoid a tendency to fetishize the latest technological trend (after all, we've cycled rapidly from VR to MUDs to Web sites to games to blogs to cell phones and back to virtual worlds in just the last decade!), studies like these highlight the affordances of situated technologies for learning.

Of course, "learning by doing" or "project-based pedagogy" are not unique to the era of networked computing. Such approaches share common terrain with various inflections of constructivism, a theory of learning and childhood development emerging from Jean Piaget's and Jerome Bruner's work.³¹ These theories were taken in more social directions by

Lev Vygotsky,³² concurrent with broader movements to foreground the social construction of knowledge during the second half of the twentieth century, including cultural studies and STS. As Paula Hooper notes, Seymour Papert applied constructivist paradigms to learning with and through computing, inventing the Logo programming language in 1967 as a way to support active learning.³³ Digitally based approaches to “learning by doing” both resonate with other constructivist ideas and also suggest that computational media afford different and unique experiences to learners (such as visualization, complex simulation, and algorithmic thinking), differences that matter. In a project I am currently undertaking with local charter elementary schools in Los Angeles, many of the older staff have been engaged with constructivist pedagogy for decades. They are often amused by the lack of historical perspective of many of the “new” theories of digitally enhanced learning, but they are simultaneously excited by the possibility of renewing broad interest in project- or problem-based learning through digital media. In particular, they hope that an intertwined focus on experiential learning and digital media will offer a viable alternative to today’s rigid focus on standardized testing and to inflexible curricula in American public schools.

Even as they attempt to build new schools and new paradigms at the edges of mainstream education, they are realistic and practical, worrying about many of the issues Ellen Seiter has identified as obstacles to technology-mediated learning.³⁴ These obstacles include lack of access to technologies, issues of maintenance and teacher training, and the very fact that such experimental campuses drain resources from other mainstream public schools. As Seiter and Sandvig suggest, the richest hands-on opportunities for making and doing are most easily available to the richest in society. Histories of earlier media technologies should also give us pause, for, as we have seen, many of these technologies began as open or many-to-many networks. Furthermore, while much hype surrounds Web 2.0 and its capacity to turn consumers into producers, some recent studies suggest that very few visitors to these sites are actually creating media. As of April 2007, only 0.16 percent of visitors to YouTube are uploading media (down from 0.5 percent in July, 2006); the rest are just watching.³⁵ Similar low rates of participation occur on other sites like Flickr. While details of this study might be called into question (for instance, how would one categorize viewers who tag content rather than create it?), the larger concern remains, as do worries that interaction with templated formats like blogs might achieve few of the cognitive benefits derived from working with rich computational media.³⁶

Finally, should we worry that the most engaging forms of self-expression for youth—forms that animate their creative expression much more than the things they are learning at school—are often tightly wedded to commercial enterprises and consumer products? One response would simply be to hope that the skill sets and dispositions born of interacting in and with these multimodal environments will translate into other realms. Certainly, several scholars have made such arguments.³⁷ But others (including many in this volume) have alternately argued that, left solely to commercial forces, such gains will be very uneven in their distribution, likely broadening the “participation gap” and skilling children in forms of consumption rather than in forms of citizenship.³⁸ If, as claimed above, digital media inspire possibility at least partially through their ability to model transformation, transformation has long been promised by earlier forms of consumer culture. Both Marsha Kinder and Susan Willis have alerted us to the often-illusory status of promises of transformation in children’s media products.³⁹ As Willis notes in relation to transforming toys, there is always the risk “that everything transforms but nothing changes.” She describes toys that “weld transformation to consumption” and ascribes the fascination with transforming toys to

a “utopian yearning for change, which the toys themselves then manage and control.”⁴⁰ In a recent article in *Games and Culture* that resonates with Lowood’s examination of the performative aspects of machinima communities in this volume, Mike Molesworth and Janice Denegri-Kent strike an optimistic note about the near-constant modes of consumption encouraged in many digital worlds (from games to *Second Life*). They argue that the fantasy shopping that so many digital products promote might lead to a “renegotiation, subtle, or dramatic, of consumption itself.”⁴¹ Whether or not this will prove true, we also need to entertain the risks inherent in what appears to be an increasing commercialization of digital media aimed at youth. Given the mergers of media and technology corporations and the increasing commercialization of even bottom-up participatory Web sites, there is no guarantee that all children and young people will get to be media makers in any sustained sense. Many of us who work with children and digital media across a range of environments have seen youthful imaginations fired by engagements with the digital (see Evans, Kafai, Hartley),⁴² but we would be negligent to rest content that these sparks will themselves ignite deep social changes or sustain open democratic culture. Those outcomes will require a bigger vision and ongoing efforts to create a broader participatory culture.

Rule Four: Broaden Participation

In his study of wireless hobbyists, Christian Sandvig points out that, rather than “renegotiating consumption” or corporate practices, these youthful early adopters aspired instead to become industry insiders. Several achieved this goal, largely because they already inhabited “an overwhelmingly privileged world.” His accounts of the controversy that erupted when two “wardrivers” sold datasets created by a broad peer-to-peer community to Microsoft call to mind recent controversies about the purchase of YouTube by Google and MySpace by News Corp. These and similar sites have been heralded as triumphs of participatory computing and the ascendancy of the “prosumer” by a wide variety of commentators from both corporate and academic worlds. Although countless users helped to create these sites, filling them with content, their efforts were later sold without their consent to the highest bidder. Following Michael Hardt, Trevor Scholz has described these efforts as a “new kind of ‘immaterial labor’” whose products are not material goods, but rather feelings of ease and community.⁴³ Users generate content and reap such feelings, while “sites like YouTube drive more and more people to [a] very small number of sites.”⁴⁴ For Scholz and others, networked sociality has become a product, and the labor of the many (particularly of youth) fuels the wealth of the few. Nicholas Carr has labeled this practice “sharecropping the long tail,” and calls it “the most interesting, and *unsettling*, economic phenomenon the Internet has produced” (emphasis added).⁴⁵ Others have succinctly outlined the specific economies of Web 2.0 sites:

Web 2.0 is Internet Investment Boom 2.0. Web 2.0 is a business model; it means private capture of community-created value. No one denies that the technology of sites like YouTube, for instance, is trivial. . . . The real value of YouTube is not created by the developers of the site, but rather it is created by the people who upload videos to the site. . . . Private appropriation of community-created value is a betrayal of the promise of sharing technology and free cooperation.⁴⁶

We might extend these examples beyond “community-created” Web sites. In the new networked economy, “regular” readers help fill the databases of Amazon.com by freely posting their book or movie reviews, and avid video game players help fuel corporate capital by posting homegrown game add-ons to corporate sites without compensation. One could argue

that such participation largely works in the service of corporations, seamlessly incorporating users into the forces of commercialization.⁴⁷ Thus, those writing free code for game companies are so effectively invested that they don't even mind that they won't get paid. If these consumer-fans are now participating more fully in media culture and have more bargaining power, what *exactly* are they participating in and bargaining for? This is not simply to revert to familiar arguments that commercial culture dupes its viewers, making them complicit in their oppression. Rather, it is meant to suggest that the transformative potentials of digital media do not just figure either the self or the world as malleable and open to (potentially positive) change: they also figure the self and the world as commodities for sale. This is an emergent digital outcome that deserves more attention.

In acquiring the skills of multimodal production youth may, on the one hand, be equipping themselves to better function in the emerging networked economies (although Seiter reminds us that access to these skill sets is very uneven: low-income youth are more likely to be "trained" than "empowered"). But shouldn't we also consider, on the other hand, that these market economies may not, in and of their own accord, promote or sustain the most compelling aspects of these environments? And, further, might these very skill sets increasingly lead youth to think of community and social space as spaces that are inherently commercialized and part of the market, as Sandvig and Scholz suggest? How might we hold on to a sense of the public (and the public good) when networks are exclusively routed through market spaces and the most engaging forms of identity making are those offered up in commercial venues? What role might libraries, schools, electronic commons, and other places have in creating public environments where youth might create, explore, and connect in ways that don't always circulate back into markets? What spaces and experiences might we provide that allow youth to think of themselves as citizens as much as consumers?

These are pressing ethical and social questions: we need to create structures and supports—from hands-on tools to open peer-to-peer systems to curricula—that mobilize the gains in imagination, creativity, and hope that our interactions with mutable, variable technologies animate. We need to study and foster the excitement and engagement we palpably note when children engage digital media, but we need to do more than that. We also need to "cultivate" and "grow" this excitement in very particular directions with a mind to ethical and socially just outcomes, lest it only be harvested for corporate profit. In the context of the larger assaults on civil liberties and rights that unfold around us daily or in the shadow of the pressing health and hunger crises affecting the world at large, tinkering with technology may seem very much a privilege of the few, a glossy 3D and escapist fantasy through which to avoid the messier, physical world around us. Is there a way to maximize the transfer value of the participation skills convergence culture appears to be inculcating?

It is possible that this participatory mode of popular culture will organically spawn a greater push for participation in democracy and public life, but, as we've often been reminded, earlier moments of open, democratic media have been shut down through commercial centralization. From a very different disciplinary base the Italian theorist, Paolo Virno, sees two possibilities inherent in the present moment of digital production.⁴⁸ First, a new form of public sphere might emerge, one dedicated to "the good life," which, for Virno, means an ethical and just life based on principles such as freedom of language, knowledge as a shared, common good, and so forth. Or, alternately, we might be left with a kind of artificial publicness that fosters none of these traits. (Think of the difference implied in "having a public" versus "having a public culture.") In all likelihood, some members of society will have greater access to "the good life" than others. The conditions of participation in support

of such a life and the oppressive possibilities of the newly networked economies (the 24/7 blur of work and leisure, increased surveillance, decreased privacy, exploited labor) are two sides of the same networked technological environment. For instance, in this volume, Robert Heverly warns that the same impulse to archive the self that fuels many Web 2.0 sites may also pose risks to long-term privacy, particularly given the persistence and reproducibility of digital media. It is much easier to celebrate the pleasures and possibilities of participatory culture than it is to guard against the risks that very culture may mask or pose, but we must try.

The realms of law and policy offer one site for intervention. Heverly surveys a number of legal possibilities that might mitigate potential privacy concerns vis-à-vis children. Joining and amending the activist and intellectual work of Larry Lessig, James Boyle, and David Bollier, Siva Vaidhyanathan has persuasively outlined the need to pursue issues of copyright law.⁴⁹ As he eloquently argues, “it is our duty” to translate the intricacies of copyright law into a public and activist agenda.⁵⁰ We need to drive home the relevance of fair use to everyone “who reads, writes, watches, photographs, listens, sings and remixes.”⁵¹ Both Sandvig and Streeter illustrate that a lack of sustained engagement with policy issues by youthful early adopters was a major factor in the shutting down of the democratic potential of earlier media.⁵² Such policy efforts should also focus on telecommunications policy, aiming for a cyber-infrastructure for the public good that also addresses “last mile” issues. This would necessarily link together nonprofits, schools, foundations, activist groups, and “everyday” technology users (who, of course, are often already situated within these other groups as well).⁵³ Despite the nonregulatory fantasies of the cyber-libertarians, we will also require informed governance and a renewal of the social contract.⁵⁴ Open, peer-to-peer platforms should be encouraged and funded by both foundations and the government, perhaps through partnerships with or a levy on corporations, reworking the idea of “public broadcasting” into forms of public participatory culture for the twenty-first century. As Kleiner and Wyrick observe, “any real hope for a genuine, community enriching, next generation of internet-based services is not rooted in creating privately owned, centralized resources, but rather in creating cooperative, P2P, and commons-based systems, owned by everybody and nobody.” We need to cultivate technological innovations that serve democracy and civil society.

Such legal, technological, and political issues are complex, and much of this may also feel far afield from the MacArthur initiative’s focus on “youth, digital media, and learning.” One outcome of the ongoing conversations this volume’s authors undertook is a realization that many of the issues we need to take most seriously in relation to our digital future are not particularly “youth-specific.” Child-centered policies in the past have often devolved from protectionist attitudes. We might rethink “child-friendly” policies as addressing many of the same issues that affect us all: copyright, privacy, surveillance, access, equity, and social justice. Today’s young digital natives will be the beneficiaries of such policies and efforts over the long term.

Rule Five: Foster Literacies

If legal and policy arenas are important terrains for struggle, we must also foster new critical literacies and support these through education policies, extending and intertwining our current focus on media literacy and information literacy. Various forms of information and media literacy are very much on the national agenda today. All fifty U.S. states include media literacy requirements of some form in their educational standards. Yet the recommendations

vary wildly from state to state and are often buried in the obscure language of standards, with no curriculum in place to achieve these goals. In a climate relentlessly focused on “accountability” and testing, teachers feel pressured to cover “the basics,” leaving scant time to innovate new modes of learning or new models of literacy.

To further complicate matters, the best models of media literacy pedagogy tend to build on students’ own interests, skill sets often honed outside of formal education and through a variety of media platforms from game consoles to web sites to mobile phones. Introducing these modes of learning into the classroom dissolves easy boundaries between “inside and outside,” moves away from textbook-centric toward project-based education, and threatens to destabilize traditional notions of the teacher/student relationship. Small wonder that change has been slow within school systems.

Still, if we hope to realize the promises of participatory media and if public education is to remain relevant to students, we need to develop innovative models of multimedia pedagogy for K-12 and postsecondary learning *in and out of* the classroom, closing the loop between what students do for “fun” and how and what they learn in school. This means that we need to advocate for systemic changes in how we think about education, learning from grassroots practices that are already having success and fostering literacies that will better equip young people for various aspects of the digital future.

Literacy is a recurring theme throughout this volume, one that takes on several different forms and directions. Some authors zero in on what we might discern about literacy by investigating practices that aren’t always seen as explicitly about learning (Cassell and Cramer, Livingstone, Lowood, Samuels, Yardi). Some focus on creating education environments that might enhance critical literacies vis-à-vis digital learning (Anderson and Balsamo, Heverly, Hooper). Others remind us that limitations on access and widespread social inequity are likely to impede literacy for many (Seiter, Sandvig).

Two essays, in particular, take literacy as a central theme. First, Sonia Livingstone offers a nice overview of the origins of literacy as a social force for scrutiny and governance, situating the term within larger cultural and historical contexts. For her (and echoing our earlier discussions of cultural studies and STS traditions), literacy is “a situated form of knowing that bridges individual skill and social practices.” She then details how literacy in the digital age poses particular challenges and urges the combination of two schools of thought on literacy: information literacy and media literacy. Information literacy is often concerned with accessing and evaluating Web content, while media literacy often focuses on various elements of critical understanding and on esthetics and design. Livingstone notes that these two traditions rarely converge and argues for a model of “Internet literacy” that brings the two together. Her conception of literacy dovetails with concerns expressed by Seiter, as she argues for a definition of literacy that doesn’t just aspire to vocational training and individual skill, but, instead, aims at fostering democratic participation and civic culture.

Anne Balsamo and Steve Anderson shift our attention to the university and sketch a vision of literacy that draws insights from the informal learning currently emerging in remix and game cultures. They focus our view on a hypothetical Class of 2020 and argue that these students of the future will need multiple layers of literacy encompassing cultural, technological, economic, social, and epistemological dimensions. They also advocate for “retooling our sense of students not as younger versions of ourselves, but as members of a generation with its own unique disposition” and urge “the creation of pedagogical protocols that acknowledge and embrace their essential mutability.” Such protocols will demand and encourage critical synthesis. They will embrace open, hybrid, and media-rich knowledge and

include the ability to “read and write” in the languages of multimedia. This means teaching students to use *and critique* software (and even code) while also recognizing that low-tech, open, or alternative tools can help decenter the dominant force of commercialization in students’ lives.

There are useful parallels between these two essays. Unlike SuccessMaker, both are interested in a social rather than an individualist or functionalist conception of literacy. Both imagine students as active producers and interpreters of diverse media forms. Each also highlights something that is often lost in popular journalistic accounts of digital natives and the net generation: children’s and young people’s internet skills are often limited in very real ways. For Livingstone, this became apparent through detailed empirical observation within domestic settings. Parents as well as children tend to exaggerate the digital competencies that youth possess. Skills are uneven and often don’t extend to *making* digital objects. Furthermore, students rarely understand the economic structures behind the internet, so encouraging a kind of “market literacy” will be crucial. Likewise, Balsamo and Anderson stress that we cannot take for granted “what kids know” about digital media. They note that even with respect to a popular form of entertainment like video games, “familiarity and access to gaming platforms and gaming literacy remain stubbornly uneven, with disparities that articulate along predictable axes of racial, economic, and geographic differences.” In sketching a new paradigm for twenty-first century education, they also redefine the role of teachers as “*educational designers*, whose expertise may include deep disciplinary knowledge, but whose practice involves mobilizing the efforts of communities and individuals in relation to institutional resources.” Taken together, these two essays suggest that we need to teach the teachers and also the parents, encouraging adults to cocreate literacy practices with youth when appropriate. We will also need to cultivate thought leaders in the community of teachers, in higher education, and in policy venues in order to revitalize the classroom, and we need to make sure that these communities are speaking to each other.

Thus, fostering literacy is much more complex than the ambitious yet simple definitions endorsed in many state standards might at first suggest. All too often, the political and cultural stakes of literacy are suppressed. We should insist that emergent digital literacies (and the learning environments that support them) need to work in the service of democratic engagement and empowered citizenship, which includes an ability to reflect on corporate culture and not simply to aspire to be part of it.

Rule Six: Learn to Toggle

From its outset, this project has tried to avoid the kind of binary thinking that frames digital media as either revolutionary or disastrous. Nonetheless, the contributing authors might be seen to occupy a sort of sliding scale or continuum of relative optimism or pessimism. We have struck a balance across the volume between a careful hope for possible progressive futures and cautionary and more negative tales. As you move from essay to essay, it’s sometimes as if you are pulling focus, zooming in or out in various ways. For instance, Seiter and Heverly zoom out in a manner that allows large social and historical forces to come into play, powerful networks that underwrite and often delimit what the digital can or will be, particularly for those with less social or economic capital. Yardi, Hooper, and Lowood zoom in to the level of the case study, examining detailed instances of agency and possibility. Optimism seems easiest at the microlevel, the terrain of the case study; such optimism often recedes as the analysis ascends to the macro or systemic. The essays by Sandvig, Livingstone,

and Balsamo and Anderson attempt to move between macro and micro, system and subject. If we are to fully understand the innovative uses and unexpected outcomes of digital media and learning, both modes of analysis are crucial. While not every study or research project need encompass both, we do need to learn to toggle fluidly back and forth across scales.

If we need be flexible in terms of the scope and location of our objects of study, we also must develop hybrid methodologies. These ten essays each deploy different methodologies, including ethnography, critical theory, empirical analyses, educational theory, design studies, and media studies. The authors are based in departments of film and critical theory, English, communication, law, sociology, interactive media, information studies, and in educational nonprofits. Some lean toward work that is data driven, while others skew toward the abstract or interpretative; different things “count” as evidence from project to project. This introduction has attempted to frame several lines of thought and analysis that crisscross and reverberate throughout the book, highlighting useful points of contact. This overview involves acts of translation, particularly since our group came to this project with differing vocabularies, even as we shared interests in certain objects of study.

One of the more theoretical essays in this volume is by Robert Samuels. Drawing from and critiquing traditions in both poststructuralism and theories of composition, he argues that we are witnessing a new cultural and social moment that he calls “automodernity.” Automodernity interlaces technological automation and a sensation of human autonomy. He examines several of the symptoms of this new way of being, ranging from emergent forms of collaboration to the shifting boundaries between the public and the private to a tendency to create echo chambers that shut out cultural difference. Though his rhetorical style and interpretative stance hew closely to those of literary and critical theory, his analysis might also be understood as running parallel to debates in other fields. In fact, one might argue that his central thesis navigates a middle ground in the debates between STS and ANT, while deploying very different vocabularies and methodologies. That is, he simultaneously recognizes the agency of nonhuman and human agents (the power of automation) and also zooms out to larger sociohistoric forces. While he recognizes the value of ethnographic or sociological analyses, he also insists that “traditions in critical theory, rhetoric, and philosophy offer other modes of thinking about the age we inhabit.”

Many authors in this volume recognize the need to articulate a hybrid methodology or theory: Hooper brings together cognitive and cultural analyses, Sandvig melds the traditions of media history, STS, and policy studies, and Balsamo and Anderson bring together science fiction and media and technology studies. Some might view their futuristic tale of the Class of 2020 as more “literary” than scholarly, but I’d argue that we should retain a place for speculative fiction in our methodological approaches. Such tales can harness the power of the imagination to help dream up (and, hopefully, realize) more just futures. If students’ “future” literacy requires critical synthesis and code switching, so do our own scholarly methods. The need to toggle applies across multiple realms: from the individual to the systemic, but also from the niche methodology to more transdisciplinary approaches. We will also need to switch between and connect to different sites of investigation: homes, libraries, leisure spaces, virtual worlds, schools, and so on. Different sites or objects of study and different intellectual approaches should function as nodes within a broader network of analysis.

This volume reaches no easy consensus about the likely outcomes of digital media use and innovation, underscoring the very early stage at which we find ourselves in imagining the transdisciplinary teams that will be needed to realize the potential promises of participatory

culture. Bringing together diverse skill sets and approaches risks boring the experts. For instance, my quick earlier glosses of STS and ANT or of constructivism will likely bore or frustrate experts who have spent a lifetime parsing the nuanced debates within these fields. The university rewards and encourages very narrow niche knowledges, but such modes of thinking reveal substantial shortcomings when faced with complex social problems that need refracting from multiple points of view. This is not to say that we should jettison the specialized knowledge that emerges from the academy, but we do need to learn to translate niche knowledge concepts into broader frameworks and also to test claims made in one field through engagements with another. This might mean bringing relatively abstract claims into productive collision with “hands-on” work with learning, but it could also mean pressuring “practical” concepts for less-than-apparent meanings or consequences (i.e., challenging the notion that “tools” are somehow neutral.) And, while policy is an important terrain for research and action, our efforts in this area should not only be based on the insights of those who study policy and political economy. Informed policy and economic analyses will crucially depend upon those who work “closer to the ground”: ethnographers and educators, but also specialists in media and cultural studies. Too often these disparate disciplines work in isolation from one another.

Of course, rich collaboration is hard; various languages and vocational biases are always in play, if often unrecognized. For example, the research team in the charter schools I work with spent months in ongoing conversation in order to develop a shared vocabulary. From my training as a humanities and media scholar of a particular era, I tend toward interpretative methods that take for granted the social construction of knowledge, gender, and technology. I have a seemingly innate suspicion of certain empirical or cognitive traditions, but I need to overcome this. I also like details and examples (even if I mostly “analyze” or “interpret” them) and tend to glaze over a bit when faced with universal theories or large policy issues. I need to get over that too. Others might have reached a point of absolute frustration with educational bureaucracy and find themselves largely drawn to subcultural or edge practices. None of these biases is inherently wrong (or more wrong than another), but our dispositions as academics or cultural workers of particular types often make it hard to build bridges or to connect with those whose training or interests reside elsewhere. Often, we seem more willing to learn from youth than from scholars outside of our own narrow fields. We might here take a lesson from communities like Wikipedia and try to build research environments that foster a respect for the varied strengths a team of participants might bring to a problem. Some, like Diana Rhoten, have even suggested that virtual networks have the potential to reduce some barriers to robust collaboration, at least within scientific research communities.⁵⁵

Alternately, the very binary forms and partitioned logics that underwrite digital media may make it that much harder to draw connections and to toggle back and forth from the node to the network. We require both fine-grained detail and also systemic or structural analyses. Individual projects might primarily focus at one level or scale, but they should connect up with larger initiatives that deploy hybrid methodologies and understand the mesh-like affordances of networked social systems. Nodes are often easier to see for those doing empirical work, but these approaches can also miss larger systemic issues. We describe the internet through words like “networks” and “webs,” as some thing or some place that is knitted together. We imagine it as richly linked and as about connections, but we must also take seriously the possibility that digital forms privilege fragmentation and, in an era of rapid commercialization, walled silos that rarely interconnect. Here we see a tendency toward homogenization where we only connect to those who are pretty much like us to begin with.

Some have described these differences as the difference between the open architecture of Usenet and the self-referential world of blogs. Neither of these realities is yet fully dominant or inevitable, but we need be mindful of them both.

A Final Note on Rule Sets

The six rules or maxims outlined here form a conceptual rule set for an emergent field, highlighting key issues and concerns. While the idea of a rule set may sound prescriptive, in computing usage rule sets are often highly flexible and contingent. They are meant to be tailored and adjusted for concrete applications and to mutate over time. New rules will likely be added. Old rules may be overwritten or reconfigured. The end goal of this rule set is to help us identify and build supports in and around digital culture that might tip the odds in favor of open systems and foreground larger questions of democracy and justice. This can happen across many levels and through many tactics, many of which are discussed in this volume. We can foster the production of socially relevant and culturally diverse games, software, and computational objects through partnerships between educational sites (both universities and K-12), nonprofits, foundations, and private companies. We can develop curricular supports and modifications that allow the use of existing products and virtual worlds in classrooms and after-school programs. We must also advocate for access to and various forms of public space in the digital realm, from commons to open-source platforms to generous understandings of copyright and licensing. While setting up easy dichotomies between “the market” and some imagined “we” that exists outside of commercial pressures (and pleasures) probably won’t get us very far, it is still important to hold on to an idea of public life that exceeds things that can be monetized. We can’t leave this to the market unless a market is the only form of civil society we can envision. The market has little at stake in certain forms of speech, broad inclusion, and an expansive sense of the public good. If we believe there are certain foundational aspects of a democratic and just society and continue to believe in something that we might call the public good, we must also actively advocate and struggle for bringing these forms into being. The more optimistic authors in this volume believe that, in their engagements with the digital, youth are already beginning to imagine themselves as empowered to create new worlds. Other authors worry that we’ve heard all this before and that our enthusiasms for emergent technologies often make it hard to see (and thus organize against) the larger social and political forces that limit the beneficial outcomes we see bubbling up in moments of technological change. As Anderson and Balsamo note, “The production of unintended consequences is inevitable; accommodating them is not. Anticipating them is an act of conscious engagement; designing against them is an ethical investment in the future.” Consider this rule set a first installment toward that goal.

Notes

1. Marc Prensky, *Don't Bother Me Mom—I'm Learning* (Minneapolis, MN: Paragon House Publishers, 1999); Don Tapscott, *Growing up Digital: The Rise of the Net Generation* (New York: McGraw-Hill, 1998); Neil Howe and William Strauss, *Millennials Rising: The Next Great Generation* (New York: Vintage Books, 2000).
2. Andrew Keen, Web 2.0: The second generation of the internet has arrived. It's worse than you think, *The Weekly Standard*, February 2, 2006, <http://www.weeklystandard.com/Content/Public/Articles/000/000/006/714fjczq.asp>.

3. See <http://innovationstyles.com/isinc/default.aspx>. Also see the following sites: Innovation Tools: <http://www.innovationtools.com>; Business Innovation Insider <http://www.businessinnovationinsider.com/>; Innovation.net: <http://venture2.typepad.com/>; Permanent Innovation Blog: <http://www.permanentinnovation.com/blog/>; and InnovateAmerica: <http://innovateamerica.org/index.asp>. While there are both subtle and substantial differences across these various blogs, products, and businesses, all can be said to partake of an attitude of cyber-libertarianism.
4. See <http://www.pearsondigital.com/successmaker/> and <http://www.pearsondigital.com/knowledgebox/>. Langdon Winner has highlighted the impacts of neoliberal economies on education, noting that "Financial analysts at firms such as Lehman Brothers and Montgomery Securities now track education as an emerging profit sector" valued at over \$600 billion a year.
5. Ellen Seiter, *The Internet Playground: Children's Access, Entertainment, and Mis-Education* (New York: Peter Lang, 2005).
6. For one version of this critique, see Langdon Winner's "The Handwriting on the Wall: Resisting Technoglobalism's Assault on Education." He argues that "the 'business' of education now looms as a potentially enormous profit center of great interest to corporations" and that buzzwords like "innovation," "leadership," and "creativity" are often deployed to mask the increasing corporatization of the university.
7. The "turn to technology" within STS is often said to have been spurred by the publication of MacKenzie and Wajcman's *Social Shaping of Technology* and of *The Social Construction of Technological Systems* by Bijker, Hughes, et al.
8. See Michael Guggenheim and Helga Nowotny, Joy in Repetition Makes the Future Disappear. A Critical Assessment of the Present State of STS, in *Social Studies of Science & Technology: Looking Back, Ahead*, ed. Bernward Joerges and Helga Nowotny (Dordrecht: Kluwer, 2003), 229–260. For a critique of certain similar tendencies within the field of cultural studies, see Meaghan Morris, Banality in Cultural Studies, in *Logics of Television: Essays in Cultural Criticism*, ed. Patricia Mellencamp (Bloomington: Indiana University Press, 1990), 14–43.
9. Gilles Deleuze and Felix Guattari *A Thousand Plateaus: Capitalism and Schizophrenia* (Minneapolis: The University of Minnesota Press, 1987); Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (London: Routledge, 1992); Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Milton Keynes, UK: Open University Press, 1987).
10. This discussion of STS and ANT is, of course, reductive and cursory. It sidesteps many of the debates within and between the fields but does, I hope, illustrate the relevance of these recent traditions of thought to the larger questions that this volume pursues.
11. Marshall McLuhan, *Classrooms Without Walls*, *Explorations* 7 (1957).
12. The sources of the quotes are as follows Carolyn Marvin, 242; Tom Streeter, 309; Marshall McLuhan, "Classroom Without Walls."
13. Carolyn Marvin, *When Old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century* (New York: Oxford University Press, 1990).
14. Tom Streeter, *Selling the Air: A Critique of the Policy of Commercial Broadcasting in the United States* (Chicago: University of Chicago Press).
15. David Edgerton, *The Shock of the Old: Technology and Global History Since 1900* (Oxford, UK: Oxford University Press, 2006).
16. Jay Bolter and Richard Grusin, *Remediation: Understanding New Media* (Cambridge, MA: MIT Press, 1999).

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21. Paul Grosswiler, *Method is the Message: Rethinking McLuhan Through Critical Theory* (Toronto: Black Rose Books, 1997); Glenn Willmott, *McLuhan, or Modernism in Reverse* (Toronto: University of Toronto Press, 1996).
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23. Seymour Papert, *The Children's Machine: Rethinking School in the Age of the Computer* (New York: Basic Books, 1993).
24. Ron Eglash, Culturally Situated Design Tools: Ethnocomputing from Field Site to Classroom, *American Anthropologist* 108, no. 2 (2006): 347–362.
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27. Lev Manovich, *The Language of New Media* (Cambridge, MA: MIT Press, 2001); Jay Bolter and Richard Grusin, *Remediation: Understanding New Media*, 1999.
28. James Gee, *What Video Games Have to Teach Us About Learning and Literacy* (New York: Palgrave, 2003); Jenkins, *Convergence Culture*; Jenkins, *Textual Poachers*; John Seely Brown, Growing Up Digital, *Change* 32, no. 2 (2000): 10–11, <http://www.aahe.org/change/digital.pdf>; Tara McPherson, Reload: Liveness, Mobility, and the Web, in *New Media, Old Media: A History and Theory Reader*, eds. Wendy Hui Kyong Chun and Thomas Keenan (New York: Routledge), 199–209.
29. N. Katherine Hayles, *How We Became Post-Human: Virtual Bodies in Cybernetics, Literature and Informatics* (Chicago: University of Chicago Press, 1999).
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31. Jean Piaget, *The Psychology of the Child* (New York: Basic Books, 1972); Jerome Bruner, *Acts of Meaning* (Cambridge, MA: Harvard University Press, 1990).
32. Lev Vygotsky, *Mind in Society* (Cambridge, MA: Harvard University Press, 1978).
33. Papert, *The Children's Machine*.
34. Seiter, *The Internet Playground*; see also Mark Warschauer, *Technology and Social Inclusion: Rethinking the Digital Divide* (Cambridge, MA: MIT Press, 2003).

35. This study was undertaken by Bill Tancer, an analyst with the Web audience measurement firm Hitwise. For a gloss on the report, see http://news.com.com/Study+finds+weak+participation+on+Web+2.0+sites/2100-1032_3-6177059.html.

36. For instance, Dmitri Siegel introduces the notion of the “templated mind” in the online blog/magazine, *Design Observer*. While the article focuses on the effect of DIY aesthetics on the profession of design (with elitist overtones), I find the idea of the “templated mind” fascinating, as it suggests an ongoing standardization of the forms of the Web that could derail the more transformative potential of the medium.

37. Jenkins, *Convergence Culture*; Jenkins, *Textual Poachers*; Ito, *Japanese Media Mixes*, 149–171.

38. Frechette argues that there are tight feedback loops between advertisers like Disney and the many commercial products designed to filter or screen children’s Web access. Pybus has noted that popular children’s sites like NeoPets deploy an immersive advertising strategy that seamlessly blends advertising into networked spaces of play, creating emotional ties between participation in social, virtual worlds and consumer products; Jennifer Pybus, *Affect and Subjectivity: A Case Study of Neopets.com*. In *Politics and Culture* 2, no. 2 (2007). <http://aspen.conncoll.edu/politicsandculture/page.cfm?key=557>.

39. Marsha Kinder, *Playing with Power in Movies, Television, and Video Games: From Muppet Babies to Teenage Mutant Ninja Turtles* (Berkeley: University of California Press, 1991).

40. Cited in Kinder, *Playing with Power*, 136.

41. Michael Molesworth and Janice Denegri-Kent, Digital Play and the Actualization of the Consumer Imagination, in *Games and Culture* 2, no. 2 (2007): 131.

42. Janet Evans, *Literacy Moves On: Popular Culture, New Technologies, and Critical Literacy in the Classroom* (Portsmouth, NH: Heinemann, 2005); Yasmin Kafai et al., *Forthcoming. Beyond Barbie and Mortal Kombat: New Perspectives on Gender and Computer Games* (Cambridge, MA: MIT Press); John Hartley and Kelly McWilliam, *Story Circle: Digital Storytelling Around the World* (Malden, MA: Blackwell, *Forthcoming*).

43. Trevor Scholz, What the MySpace Generation Should Know About Working for Free, in *Re-public*, 2007, <http://www.re-public.gr/en/?p=138>.

44. Scholz here cites Nicholas Carr and observes that “user-generated content was the main reason that the top ten websites in the world accounted for 40 percent of total page views.” He describes this as “mind-boggling” evidence of “monocultures.”

45. Nicholas Carr, “Sharecropping the Long Tail,” online blog, entry posted December 19, 2006, <http://www.rough.type.com/archives/2006/12/sharecropping.t.php>.

46. Dmytri Kleiner and Brain Wyrick, “InfoEnclosure 2.0,” *Metamute*, <http://www.metamute.org/en/InfoEnclosure-2.0>.

47. For a detailed reading the economic structures of our networked, post-Fordist economies in relation to the feelings of control, transformation and mobility proffered by digital technologies, see McPherson.

48. Paolo Virno, “Interview with Paolo Virno by Branden Joseph,” *InternetActivist.com* January 17, 2006, <http://info.interactivist.net/article.pl?sid=06/01/17/2225239&mode=nested&tid=9>.

49. Lawrence Lessig, *Code and Other Laws of Cyberspace* (New York: Basic Books, 1999); Lawrence Lessig, *The Future of Ideas: The Fate of the Commons in a Connected World*, Reprint ed. (New York: Vintage, 2002); James Boyle, “A Politics of Intellectual Property: Environmentalism for the Net?” 1997, www.law.duke.edu/boylesite/Intprop.htm; David Bollier, *Silent Theft: The Private Plunder of Our Common Wealth* (New York: Routledge, 2003); Siva Vaidhyanathan, *Copyrights and Copywrongs: The Rise of Intellectual Property and How It Threatens Creativity* (New York: New York University Press, 2001).

50. Vaidhyanathan, *Copyrights and Copywrongs*, 254.

51. *Ibid.*, 253.

52. Jeanne Allen makes a similar argument regarding early “ham TV” operators. Many are surprised to learn that early innovations in television technology included two-way multicast potential, a use promoted by amateur hobbyists. Allen details this history and argues that corporate interests were able to end run user aspirations because amateurs did not press for “a widely diffused grass-roots egalitarian form of communication” (116); Jeanne Allen, *The Social Matrix of Television: Invention in the United States*, in *Regarding Television*, ed. A. Kaplan (Los Angeles: AFI, 1983).

53. On the important role to be played by nonprofits, see Kathryn Montgomery and Barbara Gottlieb-Robles, *Youth as e-Citizens: The Internet’s Contribution to Civic Engagement*. In *Digital Generations: Children, Young People, and New Media*, eds. David Buckingham, and Rebekah Willet (London: Lawrence Erlbaum Associates, 2006), 131–147.

54. Langdon Winner, *The Handwriting on the Wall: Resisting Technoglobalism’s Assault on Education*, in *Tech High: Globalization and the Future of Canadian Education*, ed. Marita Moll (Ottawa: Fernwood Publishers, 1997); Tom Streeter, *The Romantic Self and the Politics of Internet Commercialization*, *Cultural Studies* 17, no. 5 (2003): 648–668.

55. Diana Rhoten, “Final Report, National Science Foundation. BCS-0129573: A Multi-Method Analysis of the Social and Technical Conditions for Interdisciplinary Collaboration,” 2003, <http://www.hybridvigor.net/publications.pl?s=interdis>.