Citation: Herring, Susan C. "Questioning the Generational Divide: Technological Exoticism and Adult Constructions of Online Youth Identity." *Youth, Identity, and Digital Media.* Edited by David Buckingham. The John D. and Catherine T. MacArthur Foundation Series on Digital Media and Learning. Cambridge, MA: The MIT Press, 2008. 71–92. doi: 10.1162/dmal.9780262524834.071

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Questioning the Generational Divide: Technological Exoticism and Adult Constructions of Online Youth Identity

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The Internet Generation

Children born in the mid- to late-1980s and the 1990s have been labeled the "Internet Generation": the first generation to grow up in a world where the Internet was always present.¹ Surveys show that this generation (sometimes also called the "Net Generation," the "Net-Gen," "Generation i," the "Digital Generation," or the "Millenials") socializes more online, downloads more entertainment media, and consults the Web for a wider range of purposes than do present adults or young people of the previous generation.² As a result, members of the younger generation are often more Internet savvy than their teachers, parents, grandparents, and even older siblings. The age gap with respect to technology is referred to here as the generational digital divide, or simply the generational divide.³

The growing awareness of age-based differences in technology skill and use has given rise to rampant speculation about their nature and effects. As with other types of digital divide, the generational divide is typically interpreted to mean that people on one side of the gap—youth—have more access and a greater ability to use new technologies than those on the other side—the adults (and especially, older adults) who had the misfortune to be born before the advent of the Internet. Yet while there is little doubt that young people will determine the future of digital media, if only by virtue of growing older and replacing present day adults as decision makers, it is less clear what the effects of this will be. Will today's young trendsetters become conservative technology users over time, as what was new becomes outdated? Do their usage patterns reflect a life stage that they will outgrow, but that future generations will repeat? Or will they carry their present perspectives over into their adult usage, fundamentally transforming patterns of Internet use?

Neglected in most of this discourse⁴ about the Internet Generation and its transformative potential is the continued presence and influence of adults in the larger digital landscape inhabited by young people. This influence is evident in various ways. Most obviously, adults create and regulate the media technologies consumed by young people, and profit financially from them. More insidiously, mainstream media commentators interpret new technologies and youth practices in normative, moral terms, a process that reinscribes youth as "other."⁵ New media scholars also view the Internet through an adult lens, applying labels such as "unprecedented" and "transformational" from their historically situated perspectives in ways that exoticize technologically mediated communication and its youthful users. While the Internet may seem perfectly ordinary—even banal—to today's youth, it is not a native

medium for most adults who write about it. Yet, with the exception of teen bloggers, it is adults who are doing most of the writing.

In this chapter, I present a view of the generational digital divide that shifts the focus from gaps in technology access and skill to the discrepancy between adult perspectives on new media and youth experiences, and consider the effects and implications of this discrepancy. In the process, I propose that the current so-called "Internet Generation" is in fact a transitional generation, in which young Internet users are characterized to varying degrees by a dual consciousness of both their own and adult perspectives. I further suggest that the birth of a true Internet Generation, which still lies some years in the future, will pave the way for changes in media attitudes and consumption that will be more thoroughgoing, normalized, and hence more difficult to question. It follows from this that we should take advantage of the present transitional moment to reflect across generations about technology and social change.

My argument is structured as follows. The first part characterizes some of the ways in which adults—including new media producers, commentators, and researchers—construct online youth. The second part considers to what extent young people actually orient toward adults in their online behavior, be it through acknowledgment of adult evaluations or through resistance to or subversion of adult proscriptions. I then move on to imagine what the first generation to be raised in a world in which Internet and mobile technologies are taken for granted by everyone will be like. Drawing on previous research on generational shifts in relation to television, I consider how the embedding in everyday life of digital technologies and practices such as computer-mediated communication and entertainment/information-on-demand may serve to naturalize them in ways that produce subtle social and cognitive effects.

The argument concludes by calling for a paradigm shift in research on youth and new media, one that tempers exoticism by moving away from a fascination with *technologies* to a focus on young *people* themselves and their communicative needs as they happen to be expressed through particular media. This proposed refocusing has methodological implications, both for how research on youth and new media can be done and what its findings can be interpreted to show. I suggest that current online youth practices have predictive value, but that these must be qualified by contextualized interpretations.

The chapter concludes with a consideration of the broader implications of the generational divide. I argue that this transitional juncture is historically significant and a potentially rich site for conversation about technological innovation, the forces behind it, and user choice, and that this conversation may serve to encourage young people to reflect on their media practices, rather than being swept along unreflectively on the technocultural tide.

Adult Constructions of Digital Youth

According to Neil Howe and William Strauss in their 2000 book *Millenials Rising*, the younger generation today is the most watched-over generation in memory. Parental expectations and school standards in the United States are up in comparison with Generation X,⁶ the previous generation; children's time is more highly structured and their behavior is more closely monitored. This is presumably in part a reaction against the more laissez-faire styles of parenting favored by Baby Boomers⁷ during the 1960s and 1970s, and in part a reflection of the availability of new technologies that enable increased efficiency, multitasking, and surveillance. To these historically specific reasons must be added the universal tendency for

adult guardians, as more experienced and socially and economically powerful, to seek to protect and control children "for their own good."

Against this backdrop, other adult actors with a variety of motives ranging from crass self-interest to moral proscription to a thirst for knowledge publicly represent young people's experiences through television, movies, print, and—of course—digital media. The focus in this chapter is on adult constructions of youth identities and experiences as these involve the use of new digital media technologies, especially the Internet, the World Wide Web, and mobile technologies. Three forms of public discourse about "online youth" are presented as illustrations: media production, media commentary, and new media research.

Media Production and Advertising

It may seem obvious that adults, not youth, design and produce youth entertainment media. As Howe and Strauss write, "Today's movies and TV shows are the handiwork of Boomers and Gen Xers—not Millennials." The popular music that is a central component of youth experience, even when the artists are young, is also packaged and produced by the adult run music industry. Similarly, popular video games such as *Grand Theft Auto*, which features crime, assassinations, pimping, and violence against women, are designed and marketed to youth by adults. However, although these products are targeted for youth consumption, they do not necessarily reflect youth perspectives. Howe and Strauss assert that Millennials are, in fact, "the first youth generation in living memory to be actually *less* violent, vulgar, and sexually charged than the pop-culture adults are producing for them."

Adults also profit financially from youth targeted media, and financially control young people's access. Computer and video games, for example, which are consumed primarily by children, adolescents, and young adults, generated 7.3 billion dollars in revenue for the gaming industry in the United States in 2004 alone, up from 7 billion in 2003. While according to the theory of trickle-down economics, young people benefit from a healthy national economy that puts more money into their parents' pockets (and thence into children's allowances), most of this money is not spent *by* them, but rather *on* them, often in copurchases with parents. For example, parents were present fully 92 percent of the time when computer games were purchased or rented in the United States in 2004, in the process presumably monitoring, vetoing, advising, and setting rules about their children's game consumption.

Finally, adult advertisers target youth as consumer markets through new media. Marketing firms build and host website-based "online communities" designed to attract teens and preteens around themes such as sports, fashion, and dating, as vehicles primarily for youth-oriented advertising. ¹² The products advertised through youth-targeted media are sometimes rather adult. One major U.S. beer company designs its website to appeal broadly to teens, with interactive features such as games and music, and downloadable alcohol branded items such as desktop wallpaper and instant messaging icons. The same company recently signed a deal with a leading provider of television content to cell phone users, many of whom are teens and preteens, to broadcast eighteen beer advertisements per hour. ¹³

Intentionally or unintentionally, game designers provide role models on which young players may base their behavior and self-image. Advertisers seek to foster brand loyalty at an early age, and thus to construct youth identities (for example, as "street wise" and "independent") that depend for their performance on commercial products. In the words of youth and new media researcher David Buckingham, "However illusory it may be, the media increasingly offer children an experience of autonomy and freedom, a sense that

they, and not adults, are in charge."¹⁴ This experience, however, is mediated by adults and adult institutions, rather than arising from within the "Internet Generation" itself, whose members are not yet old enough to have attained positions of influence within the media production industry.

Media Commentary

If media producers construct the Internet Generation as self-reliant and "in charge," commentators in the mainstream media often represent young media users as vulnerable and in need of societal protection and direction. To a considerable extent, this discourse reflects what journalists perceive as the concerns of parents and educators about children who spend time on the Internet and the World Wide Web. For many, especially less technologically savvy, adults, the Internet is unfamiliar, intimidating, and potentially dangerous. Many adults are concerned about the risk of children being exposed to pornography or lured through interactions in online social spaces into offline encounters, and the occasional cases in which terrible things have happened to young Internet users do nothing to allay such fears. News reporting often sensationalizes these cases, occasionally giving rise to full-blown "moral panics" in which new media environments are represented as a threat to societal values and interests.

A recent example of a moral panic fueled by news media coverage involves MySpace.com, a social networking site popular with teenagers, in which members create mixed media profiles of themselves, check each other's profiles, and exchange messages. Most profiles are public, and thus MySpace is attractive to sexual predators, as journalists often remind us. One recent article warns:

As 90 million people use MySpace.com around the world, vulnerable users have fallen victim to predators, who have assaulted, abducted and, in some cases, murdered the people they meet online. In addition, thousands of teens and young adults have been led to moral corruption through the images and people they interacted with online. 16

Other articles advise parents to "take action to ensure their children's safety" and prevent them from "be[coming] a victim" through their MySpace participation.¹⁷ References to online youth as "vulnerable," "children," and "victims" are strikingly at odds with the constructions by media marketers of the "street-wise" Internet Generation. Both have in common, however, that they are produced by adults and reflect adult perspectives.

Another moral panic abetted by the media concerns the supposed widespread decline of young people's language skills, as manifested through what David Crystal in his 2001 book *Language and the Internet* termed "Netspeak"—the use of abbreviated and nonstandard spelling and typography in computer-mediated messages. These typing practices have given new impetus to the age-old fear of older generations that language in the mouths (or on the keyboards) of youth is in a state of rapid decay. As pointed out by communications scholar Crispin Thurlow, newspaper and other media reports not only often portray computer-mediated communication (starting with email, then chat, and most recently, instant messaging and text messaging) in a negative light, but also represent young people as communicatively inept. Thurlow cites as an example this 2001 headline from the *Vancouver Sun*:

Online language has developed into a shorthand that all but obliterates the Queen's English. Our kids log on and catch the Webspeak virus. This new communicable disease spreads like jam on toast and, presto, Spell-Drek: The Next Generation. 18

In some reports, the moral implications of youth's online communication practices extend beyond language. According to one article, "Text messaging...is posing a threat to social progress." Another warns, incredibly, that "civilization is in danger of crumbling." Simultaneously, news reports tend to fetishize online communication, citing "humorous, tokenistic displays of text messaging" that are exaggerated or fabricated. In Thurlow's words, "That adults get away with misrepresenting young people on such a scale says a great deal about the relations of power that structure youth." Specifically, "the exaggeration of the distinctiveness of new media language... functions powerfully to 'other' young people by simultaneously exaggerating their differentness; this, in turn, serves to discipline youth and to elevate adulthood." ²⁰

Such media discourse arguably reflects not only (or even primarily) the perspective of individual journalists, but also the normative prescriptions of the larger society. Acting *in loco parentis*, it constructs youth's online behavior through the dual lenses of adult values and adult fears.

Media Research

The third discourse that constructs youth identities in relation to new media is produced by researchers in academic and other institutions. These are the experts whose words are (mis)quoted in news reports and whose recommendations may inform educational policy. Increasingly their writings are available on the Web, making them as accessible—if not yet as ubiquitous—as news media. Youth and new media researchers can be grouped into two types: those who write primarily for a scholarly audience and those who write for the general public. The writing of these groups differs in tone but has in common a tendency to exoticize the object of study by emphasizing its novelty, radical difference from what came before, and transformative potential.

One need not look far to find cases in point; exoticizing language is present in much of the literature I reviewed in writing this chapter, especially in introductory paragraphs, where it seems intended to demonstrate the value of the research through association with important phenomena such as technology and youth. Much of their importance apparently resides in their difference from what came before. Thus we are told that "the entire nature of the media system is undergoing dramatic change,"²¹ and that "there's a revolution under way among today's kids."²² Specifically, "they are different as a result of . . . exposure to and use of digital media;"²³ more precisely, "they are a new generation who, in profound and fundamental ways learn, work, play, communicate, shop, and create communities very differently than their parents."²⁴ Put simply, "technology has changed the Net Generation."²⁵ Some authors go further yet to assert uniqueness: "Millennials are unlike any other youth generation in living memory."²⁶

In this discourse, the "Net Generation" is not only novel but powerful, indeed transformative. This generation is "already combining demographic muscle with digital mastery to become a force for social transformation."²⁷ Some warning bells are sounded, recalling mainstream media discourses: "New media culture holds both promise and peril for youth,"²⁸ and "there is a growing danger of exclusion and disenfranchisement."²⁹ However, most representations are upbeat. "The New Generation is exceptionally curious, self-reliant, contrarian, smart, focused, able to adapt, high in self-esteem, and has a global orientation,"³⁰ enthuses one writer. For Howe and Strauss, "the name 'Millennial' hints at what this rising generation could grow up to become—... a new force of history, a generational colossus far more consequential than most of today's parents and teachers (and, indeed most kids) dare imagine."³¹

Two points must be made about these acts of characterization, setting aside for the moment their tendency toward hyperbole. First, "exoticization" is a natural carryover of adult experiences and perspectives. For those of us who did not grow up with digital media, they are indeed new and different compared with our past experience, and for some, they have been genuinely transformative. Yet the experience gap between adults and youth can be problematic, given that adults control public discourses about youth. To paraphrase educational researchers Diana and James Oblinger, "having Baby Boomers talk about the Net Generation is not nearly as good as listening to young people themselves."

Second, technology plays a strongly deterministic role in this discourse. Kids "are different as a result of . . . exposure to and use of digital media," "technology has changed the Net Generation," and "digital mastery" will make this generation "a force for social transformation." Thus at the same time that youth are represented as powerful—more even than "most kids dare imagine"—they are also shaped by technology, dependent on it *by definition* for their identity as a generation. Such constructions effectively represent contemporary youth as cyborgs, a merging of human and machine—exotic and "other." Moreover, technological determinism is problematic in that it glosses over contextual factors and social motivations that shape human behavior. Peer groups and social relations are arguably more influential during youth than at any other life stage, and young people use and think about technology differently according to their cultural, economic, and family contexts. Youth researchers know this, yet hyperbole about the power of technology to transform youth still permeates much of the research literature.

In short, many texts by "experts" contribute to constructing the Internet Generation as exotic. Their hyperbolic idealizations reflect the digital optimism of educated, presumably early adopter adults who tend to be pro-technology and committed to integrating technology into their educational vision for youth.

Youth Perspectives

The three forms of adult discourse described above are pervasive in contemporary society. In contrast, young people have fewer rights and opportunities to participate in public discourse. Youth voices as heard in interviews in the mass media and quoted in works of scholarship are mediated by adult institutions and contexts. When youth do speak out directly—such as in blogs on the Internet—their views lack the financial and institutional backing enjoyed by marketers, news producers, and academics, and thus carry less weight. Nonetheless, we must imagine that youth have different perspectives born of their own experiences. This section asks how the so-called Internet Generation views digital media, and to what extent young people's perspectives are affected by adult discourses.

Having raised these questions, I acknowledge that it is probably impossible for me as an adult to answer them in an "unadulterated" manner, and I do not claim to do so here. My interest is to problematize status quo understandings of the relationships among adults, youth, digital media, and the public sphere; it suffices for this purpose to cite evidence that calls previous assumptions into question. The evidence in this section is drawn from youth public discourse: published studies of youth and digital media that incorporate youth voices, transcripts of interviews with youth, and direct youth commentary publicly available on the Internet. In addition to being mediated to a greater or lesser extent by adult institutions, this material is necessarily partial and does not represent all youth, even in the Western, English-speaking contexts where most of it was generated. Nonetheless, it is indicative of the public

discourses in which young people are currently allowed to speak about their relationships to digital media.

How Does the "Internet Generation" View Digital Media?

The available evidence suggests that youth perspectives on digital media differ from adult constructions in a number of respects. First, and most importantly, as Diana Oblinger and James Oblinger observe in their 2005 book, *Educating the Net Generation*, "if you ask Net Gen learners what technology they use, you will often get a blank stare. They don't think in terms of technology; they think in terms of the activity the technology enables." Nor are they inclined to marvel at the novelty of their world, drawing comparisons with pre-Internet times, about which they have limited knowledge. Young people's experiences necessarily lack a historical, comparative perspective. A consequence of this is that technology use in and of itself does not seem exotic to them; rather, it is ordinary, even banal.³⁵

Young people use new technologies for social ends that are much the same as for earlier generations using old technologies. Young people instant message, text message, or email their friends much as my Baby Boomer generation talked on landline telephones. They abbreviate and use language creatively to signal their in-group identity, much as my friends and I wrote backwards (manipulating the affordances of the hand-written medium) and created special writing conventions to pass notes in class. They flirt online, while we flirted on the phone or in the hallways at school. They express their daily angst in blogs, whereas my generation kept hand-written diaries. They painstakingly craft their profiles in social networking sites to win the approval of their peers, while we dressed up to be "seen" hanging out at school dances and community youth events. Moreover, "search engines [function] as a library, . . . product-based sites as a mall, and downloadable movies and games as a theater or video arcade." As was also true when I was young, the ends are more interesting and important to the participants than the technological means, especially if the means have been available all one's life.

Perhaps more surprising, many of what we consider new technologies (instant messaging, blogs, chat rooms, email, cell phones, search engines, etc.) are "transparent" to young users³⁷—they do not consider them to be technologies, except in the broadest sense. In a recent survey, U.S. undergraduates defined technology as new or customizable; for example, a cell phone with standard features is not technology, but a cell phone with new features is.³⁸ For something to be "technology," in other words, it should be novel, challenging, and fun, not merely useful. (Analogously, in my youth, washing machines and telephones were not considered technology, but anything to do with computers was.)

Moreover, contrary to the stereotype that the digital generation is enamored of technology, for many youth, technology use may not be the most fun activity, but rather what is most available, a substitute for something they would rather do. In a recent survey of media use by six- to seventeen-year-olds in the U.K., a majority of teens said that they would rather go out to a movie or do something with friends than stay home and consume media, ³⁹ and they complained that their neighborhoods did not provide enough activities for youth. Increasingly, parents are afraid to let their children go out for fear that they will not be safe, especially in urban areas. According to new media researcher Henry Jenkins, more elaborate indoor media environments have evolved to compensate for unsafe or otherwise inhospitable outdoor environments. ⁴⁰ danah boyd, in her chapter in this volume, argues that social networking spaces such as MySpace.com substitute for traditional offline hangouts, whose numbers have dwindled dramatically in recent decades in the United States.

Youth also tend to be less techno-deterministic than adults. Whereas for my generation the Internet is powerful and the object of both fear and desire, young people understand that technology is not a solution to their problems. In the words of one young man, "I have access to 100,000 bands now [via the Internet], but that doesn't mean I'm going to wind up with good music. Technology isn't solving that problem, it just helps people who know what they're looking for, find it. So technology doesn't necessarily make the world a better place; it just makes it more efficient."⁴¹ Kyle M., one of the teen winners of the 2006 Global Kids Digital Media Essay Contest sponsored by the MacArthur Foundation, ⁴² expressed a similar sentiment in his winning essay: "The Internet itself is nothing more than a way of speeding up communication, along with most other everyday activities."

Nor is technology to be feared. For fluent young users who know their way around a range of information and communication technologies, can use them simultaneously (multitask), and are able to learn new ones quickly, technology is at their service—they shape (customize) it, rather than it shaping them. As Dahye H., another Global Kids contest winner, wrote in his essay, "We own these new digital media. We shouldn't be their slaves. We have to be their masters and get all we can out of them."

In light of all this, the label "Internet generation" itself (and its variants such as "Net generation" and "digital generation") must be seen as reflecting the perspective of a demographic for whom the Internet and associated digital media are new and salient, not taken for granted as they are by many of today's youth. That is, it is an exonym—a name used to refer to a group by outsiders (in this case, adults)—rather than an endonym—a name chosen by the group to represent itself. Just as my generation did not self-identify in terms of the reproductive patterns of its parents' generation, but rather had the name "Baby Boomers" assigned to it, the current generation of young people does not self-identify in terms of the technology created by its parents' generation. Nor do most kids self-define primarily in terms of technology, although they acknowledge the prevalence of digital media in their lives.

Orientation to Adult Discourses

The "Internet Generation" is therefore an adult construct. But does this matter to youth? Do young people care how adult discourses construct them and their technology use, or more precisely, can one discern from their words and behavior that they are aware of and orient to adult evaluations? Adults have defined youth since time immemorial, yet children and adolescents often seem remarkably impervious to adult expectations for what they should do and become. Certainly young people often seem to tune the adult world out when they download and listen to music, play video games, IM their friends, and hang out in MySpace. At the same time, there is evidence that many young people are aware of adult representations of their generation and orient to them, while simultaneously orienting to their own experiences. I suggest that this double awareness or "dual consciousness" is particularly characteristic of the so-called Internet Generation.

Advertising Discourses As discussed in the chapter by Rebekah Willett in this volume, a consumer culture of music, games, product brands, and online sites saturates the digital media experiences of contemporary youth, providing resources for their identity construction and self-presentation. Yet advertising sends conflicting messages about what youth are like. While the explicit message is often that teens and preteens are independent minded, discriminating, racially tolerant, media savvy, and "cool" consumers, the underlying reality

is that commercial interests seek to manipulate young people into requesting and buying certain products, thereby restricting their range of action and expression.

There can be no doubt that the Internet Generation is affected by advertising. Children are exposed to thousands of ads by the time they are five years old, contributing to what has been called "the urbanization of consciousness"⁴³ and a single global youth culture characterized by extensive new media consumption and Internet use. By all reports, youth consume advertised products (including alcohol, especially in the college years). But do young people also "buy" the pervasive marketing of youth identity?

There is a long tradition of antimaterialism and anticapitalism in youth culture. Most adolescents are aware of the manipulative nature of advertising, and react to it with attitudes ranging from overt rejection to apparent indifference to mitigated acceptance, where acceptance is mitigated by an awareness that advertising is designed to make money for the advertisers, and therefore is untrustworthy in principle. Nonetheless, critical public discourses initiated by youth about advertising appeared relatively infrequently in the research I conducted for this chapter. Here I am interested especially in young people's reflections on the accuracy of commercial representations of youth identity.

Despite the enormous sums spent annually on marketing research into what young people want, use, and consider to be the latest in cool, some teens consider marketing strategies to miss their target. An article in an online teen magazine produced in New Zealand warns that "[youth] culture is created, presented and sold to us every day. . . . This is a culture presented by marketers. It is inaccurate, it is often negative and it keeps changing."⁴⁴ A high school girl in a focus group in the United States, when asked to comment after watching a public television documentary on youth and marketing on the accuracy of advertising media's portrayal of her generation, is similarly dismissive: "I feel the problem is that we're not represented in our culture. We don't create it and it's not born of anything of us."⁴⁵

Other teens are willing to admit that advertising representations have some basis in truth, but see them as distorted or exaggerated. "They're capitalizing on the fact that people want to be rebellious... but it's not rebelling at all," according to one boy in the same U.S. focus group. Another suggests, consistent with the observation of *Millennials* authors Howe and Strauss, that there is a generational gap in appreciation of sex and violence in the media: "The media's looking at the teenage generation, taking that image, and I think they're notching it up a step. They're making it that much more risqué, and then they're selling it back."

One girl in the group felt that advertising representations of teens were consistent with her own experience, but expressed discomfort with them: "I think it was accurate, but it wasn't me telling them. It was them telling me." These youth are uncomfortable with the idea of adult marketers telling them what they are like, even if they do not disagree entirely with the representations. Little wonder, then, that teens change their evaluations of what is "cool" as soon as today's latest trends hit the wider market. In part, they are seeking to distance and differentiate themselves from adult constructions that they consider manipulative or that they simply recognize as exogenous, and therefore inauthentic by definition.

For each of the critically reflexive teens quoted above, however, many more never overtly question commercial discourses. Moreover, even teens who critique traditional forms of advertising may fail to perceive the extent to which the Internet is a commercial space, despite the fact that two-thirds of all teenagers have either researched products or purchased products online, and marketing is increasingly targeting youth through social networking sites and youth-oriented Web "communities." Many young people appreciate the opportunity to compare prices and get the best deal online, or, as in the case of music downloading, to

get something at no cost. The teens in the focus group, especially the boys, tended to view the Internet as a means of empowerment, a way to escape the limitations on their choices imposed by marketing conglomerates. "What the Internet has done is to diversify the opportunities we have to find something we like," stated one boy, and another added: "I think the Internet is one outlet of independent-minded people."

The number of choices available to young people online is greater than in other domains, and thus the impression of the Internet as an empowering commercial space for youth is not entirely unfounded. However, as Willett points out, even independent choice can be exploited by marketers: youth are exhorted to make individual choices, yet in so doing, they conform to mainstream ideas about youth as individualistic (and about individualism as positively valued in a capitalistic society). According to this scenario, independent choice is an illusion, reminiscent of this lyric from a country-and-western song about a modern teenager in Dallas: "All her friends were non-conformists, so she became a non-conformist, too."

To summarize, some youth publicly contest commercial representations of their generation, but such expressions are not common. More frequent are youth discourses celebrating the Internet as an environment in which consumer culture can be routed around or subverted. It is possible that increasing commercialization will eventually have the effect of making the Internet appear more constrained and less cool to a majority of young people, thereby accelerating its progress toward detechnologization—the inevitable future point at which the Internet will no longer be perceived as technology. However, this point has not yet been reached.

Mass Media Discourses Few preteens or teens could claim complete lack of awareness of adult views about online environments. To the extent that they abide by rules of Internet use set down by their parents, schools, or boys and girls clubs, they are orienting to adult concerns, although younger children may be only vaguely aware of the nature of those concerns. When a young person knowingly breaks a rule, moreover, awareness of adult perspectives is heightened, although it may be accompanied by dismissal or rationalization that the rule is misguided and unnecessary. Youth know from their own experience and that of their friends that the Internet is not as dangerous as the popular media make it out to be. They may go ahead and do whatever they are not supposed to—chat with strangers, use Netspeak, swear, post provocative photos, visit pornographic websites—hoping to keep below adult radar. Such behavior constitutes an implicit rejection of adult "moral panics" about youth online.

Rejection of moral panics may also be explicit. The Web is one public forum in which youth voices can be raised. For example, one young man posted a defense of "Internet chat and shorthand text" on his website, arguing that "in SMS and Internet chat, shorthand is the normal way to communicate," and that "criticizing people [for using Internet slang] in informal computer chat rooms, forums, usenet, other informal Internet areas or mobile media is misguided."⁴⁸ Youth are also weighing in on the moral panic about social networking. A male high school student recently blogged, "STOP BLAMING EVERYTHING ON MYS-PACE!... America, give your children some credit. They're relatively intelligent, and they're pretty rebellious when they want to be. They will have their MySpace regardless of what you say, and by telling them they can't handle it, you're not helping the situation at all."⁴⁹

However, orientation toward moral panics need not be rejecting; it may also take the form of explicit accommodation to and endorsement of adult perspectives. Young people generally look up to and want to please adults. Thus, accommodation is especially likely to

occur in contexts in which adults set the larger agenda, such as interviews and contests, but it is also evident in open discourse on the Web. With regard to the examples of online activities discussed above, some youth are strongly critical of Netspeak, are critical and fearful of chat rooms, and are embarrassed about their online socializing, seeing it as a waste of time and something that they expect to outgrow. These attitudes echo the judgments of their parents' generation.

Youth endorsement of moral panics sometimes involves more rigid forms of self-policing than parents or teachers themselves would impose. Thus some websites created by youth for youth forbid the use of Netspeak, 50 and in other discussion forums, it is criticized as "abuse," "idiocy," and "illiteracy," as illustrated by the following comments: "To be honest, although I'm 21 and use IM a lot I avoid netspeak. I just can't bring myself to inflict such abuse on spelling and grammar." "I'm 19 and feel like I'm floating in a great ocean of idiocy (coupled with, obviously, illiteracy)." Some comments adopt an explicitly moral tone: "We should fight. its a good fight... I just see this as a 'moral victory' in which we, the fighters, will go out like the wild bunch, in a deluge of punkspeak, and wave after wave, of gibberenglish" (capitalization and punctuation errors original). 51

Youth also speak out against MySpace, although not necessarily based on their own experience. A teenage girl in an essay posted to a website entitled, "MySpace: Danger or Fun?" states that although she has not herself joined and it sounds like it might be fun, MySpace is not suitable for teens, because "Youths are chatting with people who they don't know and never seen, which poses a danger. These strangers who pretend to be something their not are sick people who have the ability to lure these young people into grave situations." She concludes by calling for age limits or, rather extremely, "some kind of protection to prevent teens from chatting." ⁵²

This last example is striking for the dual, indeed self-contradictory, perspective it expresses: MySpace sounds like fun, but teens should be prevented from using it. The Global Kids essays manifest similar juxtapositions of positive evaluations (from the perspective of the authors and their peers) with negative societal evaluations. There are many good reasons for downloading music from the Internet, opines one boy, and I do it, but "people" should not do it. Chat rooms are a "great tool to enhance personal relationships," writes another, but "I am not going to condone such behavior."

Some essays point explicitly to the mass media as the source of their negative evaluations. One girl justified her negative assessment of MySpace—which she admitted to being "addicted to"—as follows: "I watch all sorts of thrillers where a killer finds a beautiful young girl in her prime by looking at her online journals. He stalks her, finds her, and kills her. They have to base these movies on real events and it scares me." Another girl wrote: "To paraphrase a recent ad I heard on the radio, the internet is a fun place to explore, but it can also be a dangerous jungle....It's hard to ignore the talk of murders, rapes, sexual solicitation, and kidnappings associated with the internet." For every such comment that makes its way into a public space, there must be many others that are thought but not expressed.

To summarize, youth commentaries on issues involving youth and the Internet frequently reject adult moral panics. However, in a number of cases, a dual or ambivalent perspective is evident, suggesting that young people struggle to reconcile the concerns of mainstream media discourses, which are accessible to them directly as well as through parents, teachers, and adult community members, with their own and their friends' experiences of the Internet. It is also conceivable that youth voice negative opinions based on their own online experiences, but I found no examples of this in the contexts I surveyed.

Research Discourses While the pronouncements of most academic researchers never reach the eyes or ears of young people, some popular scholarship about youth does. Increasingly, with the availability of online discussion forums and the possibility for anyone to post book reviews on sites like amazon.com, youth can react to scholarship about them publicly. Two books published in recent years, one by Don Tapscott on the "Net Generation," the other by Howe and Strauss on "Millennials," have triggered a number of public responses, including from young people.⁵³ As with the other adult discourses discussed above, youth responses are varied, ranging from strong rejection to seemingly unquestioning acceptance, and mixed youth–adult perspectives are evident.

The visions of both Tapscott and Howe and Strauss are rejected by a number of young commentators on the grounds that they reflect adult "fantasies" rather than youth realities. One anonymous reviewer on amazon.com highlights the generational divide, writing that Tapscott "is looking at the internet as a man who is 100 years old—before the conception of the internet." Another accuses Tapscott of being "techno illiterate" and exaggerating the extent to which young people are "masters of the technology," characterizing youth instead as mostly "superficial users."

Howe and Strauss's book also comes in for criticism on the grounds of lack of realism. One young reviewer writes: "Although William Strauss and Neil Howe say they are proud of our generation, the only thing the book mentions any pride in is a mere phantastic chimera of how they WANT us to be." Another reviewer objects that "the kids at my high school are nothing like the book says we are. Kids do things whether their parents want them to or not." These young people see their generation as less obedient, trusting in authority, and clean cut than the book represents them as being.

At the same time, there are youth who appreciate the book's aspirations, focusing on what its positive effects might be, rather than its accuracy. One girl who gives the book a positive rating writes poignantly: "So many young people (myself included) are trying so hard to prove themselves in spite of unprecedented amounts of cynicism and elders who insist that 'today's youth are always the worst'—what we really need is for the general public to realize our potential and help us to cultivate it."

Still others appear to accept the authors' vision of what Millennials are like. One youth agrees, for example, that "our generation is savvy, mindful and understanding of the world" (a vision also promoted by some marketers, whom one suspects have read Tapscott's and Strauss and Howe's books). The younger the audience, the more likely it is to accept adult representations unquestioningly, especially when they seem to be pro-youth. One youth elevates the authority of the authors above his or her own experience, writing: "I am 15 and this book really did a great job at helping me know what my generation is about and telling me what expectations my generation has."

This last comment suggests a dual consciousness, in that the writer intimates that he or she is lacking in direct experience of what the book describes, but accepts it nonetheless. A similar willingness to accept the argument in the absence of direct experience is evident in this comment from a Global Kids essay winner: "The changing ways that kids think have three main points. They have a greater acceptance for diversity, are becoming more curious, and have great self-reliance and assertiveness. If this is truly the way minds are changing, I'm happy to be a part of it." I submit that the best way to understand this otherwise paradoxical juxtaposition of certainty and doubt is to see these two attitudes as emanating from different sources: what adults say to be true and the boy's own (lack of) experience. While he is not discussing the *Millennials* book per se, the concepts he invokes are related. Indeed, the book's

claims have been widely disseminated in schools and universities in the United States; he could have heard about them from a teacher or classmates.

A similar phenomenon can be observed in undergraduate educational contexts. When invited to reflect on their generation in relation to technology, some older youth write in voices clearly influenced by adult academic discourses. For example, a recent scholarly book on education and technology includes three chapters by university undergraduates, the first of which begins:

I am a member of the Net Generation. The Internet and related technologies have had a major influence on my generation's culture and development. Many, if not most, Net Generation students have never known a world without computers, the World Wide Web, highly interactive video games, and cellular phones.⁵⁴

With the exception of the first sentence, this sounds very much like the opening of many of the adult-authored works I reviewed for this chapter; the emphasis on the "major influence" of technologies on the generation (and the label "Net Generation" itself) especially suggests an exogenous, adult perspective. In scholarly publishing, students naturally look to adult models for how to write and what is appropriate to say. What some may find disturbing in this case is that students are not only being socialized into academic models of writing, but into ways of defining themselves. This example is not unique.

In this section I have argued that young people's public agreement or disagreement with adult discourses about youth and technology constitute evidence that they orient to those discourses, rather than being impervious to them. Moreover, a number of statements that are publicly available are ambivalent or even paradoxical, supporting the notion that the "Internet Generation" has a dual consciousness of both its own and adult perspectives. While this might be said for all young people who participate in youth subcultures while simultaneously inhabiting the larger adult world, the divide is greater as a result of Internet and mobile technologies, because of the extent to which they have changed communication and information access. Youth cannot easily comprehend the magnitude of this change, whereas adults cannot easily forget it. Both direct immersion in experience and a historical, comparative perspective are important, however, in moving into the future.

The Television Generation and the (True) Internet Generation

If today's youth straddle the digital generational divide, questions then arise as to when the first purely digital generation will come into being—that is to say, the first generation to be raised in a world in which Internet and digital technologies are taken for granted by *everyone*, because they were available to them since childhood—and what that generation will be like.

Strictly speaking, that generation should not arrive in my lifetime, since everyone presently alive who was born before approximately 1985 would need to be retired from active life in order to leave the field to younger generations. Babies born starting around the year 2050—the grandchildren and great-grandchildren of today's "Internet Generation"—will enter a world in which digital technologies will have been an integral part of life for all (although they will almost certainly take different forms), and in which the only reliable memories of pre-Internet life will be found in archives and historical accounts. However, this estimate is probably overly conservative. "Taken-for-grantedness" may come sooner when a technology diffuses rapidly, enters people's homes, or otherwise becomes a part of their everyday lives. The history of television, considered one of the most important technologies of the

twentieth century prior to the invention of the Internet (together with the automobile and the airplane), illustrates this point.

In 1939, when television became commercially available in the United States, an estimated 2,000 sets were in use. By 1955, when I was born, television sets were a common fixture of middle-class homes, numbering in the tens of millions.⁵⁵ I entered the cultural scene as a member of the first "television generation" (roughly, 1945–60). My parents, as adults by the time television entered their lives, had had formative experiences with mass media (radio) that were very different from mine and my siblings'. But they shared television with us: viewing was a family activity, and after my siblings and I left home, my parents' viewing increased. At that point, it began to seem that theirs was the television generation, for as our viewing decreased as we went about establishing our adult lives, they went on to become early adopters of the remote control, VCRs, and cable TV, and the television was always on during my visits home. It seems fair to say that by the mid-1970s, television was fully taken for granted by my parents' generation and in American culture at large. This history suggests a time span of roughly thirty years from popular introduction to widespread takenfor-grantedness. By analogy, the Internet could attain this status by 2015. The process could even be further accelerated if, as some have claimed, technological innovation and change have been progressing at a more rapid rate since the introduction of the Internet.

Is it appropriate, though, to draw parallels between digital media and television? In his introduction to this volume, David Buckingham criticizes Tapscott's overly simplistic contrast between the television generation, characterized as passive, and the Net generation, characterized as interactive. Research has shown that television viewing engages some viewers actively, while not all Internet uses are equally interactive, calling into question this contrast and the techno-positivistic conclusions drawn from it regarding the empowerment of vouth via the Internet. However, a number of important differences between the two media remain. First, unlike the television, which from the outset in the United States adopted an advertising model in order to provide "free" content to viewers,56 Internet content is not (yet) driven by advertising nor (yet) subject to centralized control. While television restricts content provision to a set of government-regulated media providers, ordinary users can and do create Internet content. Moreover, the Internet is a metamedium that allows not only for broadcasting information and entertainment, as has traditionally been the case for television, but for two-way communication (like the telephone) as well as other activities that have no clear technological precedent, such as information searching and customized music access.57

Finally, the evolution of any technology takes place in a specific historical, cultural, and economic context. The rise of television in the United States took place during a period of economic expansion following World War II that saw a significant population shift to the suburbs and the cultural reification of the single-breadwinner nuclear family, on the one hand, and the Cold War and the nuclear arms race, on the other—both factors that significantly impacted my childhood awareness. The former created leisure time for wives and children to stay home and watch TV, and the latter arguably created a need for escapism from fears of impending annihilation (as I perceived it at the time).

The popularization of the Internet, in contrast, took place following a period of economic recession in the 1980s when it was common for both parents to work, and that was characterized by a growing cynicism about politics and corporate economics. Add to this the effects of television, including the blurring of news and entertainment, and the increasing tendency for TV content—more of which was by then being targeted at children—to be

violent, sexualized, and commercialized. The grass roots values espoused by the inventors and early adopters of the Internet can be seen, in part, as a desire for an alternative to the centralized, commercialized, broadcast media that many of my generation (which was also the Hippie generation, it should be recalled) found offensive, manipulative, or simply trite.

Thus, television and the Internet are not straightforwardly comparable. Still, similarities can be noted, especially in the public discourses that have arisen about their effects. As observed by Buckingham in this volume, "Like television, digital media are seen to be responsible for a whole litany of social ills—addiction, antisocial behavior, obesity, educational underachievement, commercial exploitation, stunted imaginations..." (p. 13). In a more positive vein, both media have also been credited with promoting learning, creativity, democracy, and making the world a smaller place. What is certain is that both have seduced many people into spending large amounts of time sitting in front of flickering screens. Both have enjoyed unprecedented reach, and, as with any influential medium, both can be used to further pro-social as well as questionable agendas. Their prevalence and influence are such that both have been claimed to define entire generations.

What does the history of the television tell us about the likely future of the Internet and other digital media? In terms of social effects, societal transformation will be less radical than predicted, and children will not change fundamentally as social or thinking beings. The human race will not become smarter, kinder, or more just overall as a result of digital media, nor will it become dumber, more violent, or less moral. This is not to suggest that there will be no change. We can expect reactions against the practices and values of previous generations, as part of a larger process of historical flux. And some changes will reflect the affordances of the technology and the patterns of use that they support.

Research on television viewing has identified a number of physical, social, and cognitive effects, many of them controversial. The act of sitting and viewing a screen for extended periods of time has been claimed to lead to increased passivity, obesity, and other mental and physical health effects; frequent channel switching and the interruption of programming by advertisements have also been linked to shorter attention spans. Secreen size and viewing distance have been found to correlate with perceptions of social presence—people who view larger screens and view from closer distances identify more with television actors as social beings. Finally, the content of programming has been found to affect children's mood and daydreaming—in one study, for example, viewing violent content led to angrier moods and more aggressive-heroic daydreaming, especially among boys —and a tendency for viewers to perceive incorrectly the prevalence of particular professions, crime, and other features in the real world.

There are so far more claims than empirical evidence as regards the effects of digital media. As early as 1984, it was claimed that personal computers would stimulate children's thinking.⁶² John Seely Brown, former Chief Scientist of the Xerox Corporation, claims that the World Wide Web, due to its multimodal nature, supports multiple intelligences and requires new forms of literacy. Members of the digital generation are thought to be especially skilled at multitasking, or the rapid refocusing of attention from one activity to another, resulting in (or perhaps leveraging) already shorter attention spans. Multitasking can also be seen as a strategy for managing information overload, which is predicted to become increasingly important as the amount of information on the Internet continues to expand.⁶³ In a related fact, young people have been found to engage actively when using digital media, assembling diverse bits of content and communication practices in a kind of *bricolage*, defined by Seely Brown as "abilities to find something—an object, tool, document, a piece of

code—and to use it to build something you deem important."⁶⁴ This activity crucially involves cognitive processes of selection and judgment.

These characterizations have little in common with television effects. Rather than being cognitively and perceptually affected by content that is broadcast at them, digital media users appear more likely to manage and create content and to be stimulated and challenged by these activities in multiple ways. Moreover, digital devices are becoming smaller as digital media become increasingly mobile, which means that their use does not require sitting in one place or even remaining indoors. The expected negative effects of smaller interfaces on perceptions of social presence may be offset by the highly social uses to which such devices (such as mobile phones) are put, as Gitte Stald's chapter in this volume suggests. However, caution should be exercised in generalizing these observations, since not all youth use digital media in the same ways, and some of the observed behaviors may be age-related, rather than conditioned by the media per se. I return to this point below.

By the time the first true digital generation comes into being, we may speculate that new technologies will be on hand, and some that are new at present will have become more widespread, such as artificial intelligence agents and devices for tracking the location of others and accessing information about them. Entertainment media may include customizable virtual realities, to go along with customizable music and news. It is likely that personal and social data will be increasingly shared on the Web. In addition to new media, the embedding in everyday life of computer-mediated communication and information-on-demand may serve to naturalize these practices in ways that produce subtle social and cognitive effects. With no predigital generations around to remind them of other ways of being, this future generation may think and behave in ways different from present generations—for example, as regards privacy, which many adults perceive as eroding dangerously, but which youth appear to manage with less concern. It is then that the effects of digital media may most accurately be assessed.

Implications and Conclusions

Research on Youth and Digital Media

The circumstances that I have termed in this chapter the generational digital divide—especially, the adult construction of "digital youth" as a generational identity—call for a rethinking of research on youth and new media. It is especially important that researchers seek to transcend the seemingly endless flux and change in new technologies and their affordances, as this can lead to exoticism—a fascination with what is new and different—at the expense of a more balanced view that recognizes continuities and trends.

Exoticism can be tempered by a shift from a focus on *technologies* to a focus on young *people* themselves and their communicative needs as they happen to be expressed through particular media.⁶⁵ Whereas ten years ago this was not yet the case,⁶⁶ we understand the effects of computer-mediated communication systems well enough now to move beyond them to a consideration of online practices as forms of discourse and social behavior. Rather than focus on the anonymity afforded by the medium, for instance, one might ask how anonymity functions in online youth culture. To what extent do young people mask their identity in different contexts of computer-mediated communication, and for what intended effects? This perspective may reveal more continuity than novelty in online youth practices, as well as providing nuanced understandings of present day youth's mediated experiences.

Two understandings are key in order to translate such a perspectival shift into research practice. The first is that if one wishes to understand the emic or "insider's" perspective of a group, it follows that one should observe and talk with its members. However, traditional ethnography may not succeed in breaking down structural hierarchies between the researcher and the researched in the case of age, where the hierarchies may seem natural and inevitable because of developmental differences. Any serious attempt to avoid cooptation of young people's experiences must therefore consider the more radical possibility of collaborating with youth in an attempt to break down those hierarchies, as suggested, for example, by sociolinguist Deborah Cameron and her colleagues, who provide examples of how this can be done in sociolinguistic research.⁶⁷

The second is the importance of clearly conceptualized methods to tease apart the differences between transitory phenomena, life stage (including developmental) behaviors, and innovations leading to long-term change. These distinctions are crucial if we are to make informed predictions about the future of digital media and their social consequences on the basis of the current generation. Longitudinal studies of a cohort's use of specific media over time will provide the most direct indicators of change, but take years to carry out. Agestratified cohorts can also be studied at a single point in time, and change can be inferred from the differences between the age groups, but this assumes that younger generations will grow up to resemble older generations, which would not be the case for life-stage-related behavior. Past research on youth may help to shed light on the kinds of behaviors that young people can be expected to outgrow. For example, sociological research has found that sociability is greatest among adolescents and young adults, and decreases over the life course.⁶⁸ All else being equal, this suggests that one should interpret observed differences in digital sociability between younger and older users as life-stage related, rather than as indicating an ongoing change in the direction of increased sociability for all digital media users. In this way, the digital media practices of contemporary youth can have predictive value, provided they are carefully interpreted.⁶⁹

Finally, researchers should keep the broader social, cultural, and technological contexts of new media use ever in mind. My comparison of television and digital media hinted at the extent to which even temporally overlapping technologies are influenced by different factors and give rise to different cultures of use. It follows that one should not assume that mobile phones, video games, instant messaging, and music downloads, for example, are part of the same digital media culture, but rather sensitivity should be maintained to the norms and practices that characterize each. Cultures of childhood and youth also evolve, and form an important part of the backdrop to youth media use. In all of these practices, it is important that researchers maintain an awareness of their experiential bias and more powerful discursive position as adults, and make efforts to avoid reproducing the "othering" of youth that is prevalent in public, including scholarly, discourses.

Crossgenerational Conversation About New Media

The acuteness of the generational digital divide described in this chapter is likely to be transitory, in that today's new technologies will eventually be old for everyone. In the meantime, this transitional juncture is historically significant and a potentially rich site for crossgenerational conversation about technological innovation, the forces behind it, and user choice.

Different generations have different unique strengths to bring to this conversation. Youth necessarily lack a historical, comparative perspective. While this could be seen as limiting,

it also potentially allows for genuinely new practices to evolve, free from the burden of excessive reflection and evaluation that often characterizes adult understandings. Adults—and especially older adults—have their own experiences of growing up with different technologies, and their perspectives on technology use (and nonuse) across the lifespan, to contribute.

Such an exchange would be an opportunity for learning. For youth, it could address what Henry Jenkins has called the "transparency problem," or the "challenges young people face in learning to see clearly the ways that media shape perceptions of the world;" in this way, it could lead to the development of broader perspectives and more informed media use. It could also educate adults about the realities of youth cybercultures, which in turn might allay some of the fears and anxieties that feed moral panics, and modulate hyperbolic predictions about digitally empowered youth. Parents and offspring, educators and students, and researchers and researched alike might usefully participate in such exchanges, including via digital means.

Historically, commercial interests and the mass media have not behaved responsibly toward youth, and it is unlikely that their discourses will change to avoid the problems identified in this chapter. In contrast, educators and researchers, I would argue, have a moral imperative to respect youth. One form of respect is to take care not to define the younger generation in terms alien to its members or in terms that construct its members as alien. Definitions are never "just words," especially when the definers hold structural power over the defined, as is the case with adults and youth.

Notes

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- 4. I use the term "discourse" broadly to refer to "a group of statements... concerned with a particular subject area." Sara Mills, Discourse. *The Literary Dictionary*, 2005. http://www.litencyc.com/php/stopics. php?rec=true&UID=1261 (accessed December 28, 2006). The discourses of interest in this chapter are public in nature and both spoken (for example, on the radio or television) and written (for example, in newspapers, books, or on the World Wide Web).
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Vintage Books, 2000). What I here refer to as the "Internet Generation" overlaps with Generation Y but begins several years later.

- 7. Baby Boomers were born between 1946 and 1961 (Howe and Strauss, 2000).
- 8. Howe and Strauss, 2000.
- 9. http://www.theesa.com/files/2005EssentialFacts.pdf (accessed August 12, 2006).
- 10. Howe and Strauss, 2000.
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- 12. http://www.alloymarketing.com/media/teens/onlineadvertising.htm (accessed August 12, 2006).
- 13. http://www.marininstitute.org/alcohol_industry/booze_in_cyberspace.htm (accessed August 12, 2006).
- 14. David Buckingham, Media Education and the End of the Critical Consumer. *Harvard Educational Review* 73, no. 3 (2003): 309–328.
- 15. See the chapter by danah boyd in this volume for further discussion of MySpace.
- 16. http://www.christiantoday.com/news/life/xianzcom.the.christian.alternative.to.myspacecom/425. htm (accessed August 14, 2006). This article goes on to describe a Christian alternative to MySpace.com: Xianz.com, a "safe and pure environment."
- 17. See http://www.webmd.com/content/article/126/116289.htm and http://www.wcnc.com/news/topstories/stories/wcnc-ad-8_14_06-dbav.9a2b178.html (accessed August 14, 2006).
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- 28. Montgomery, 2000a.
- 29. Buckingham, 2003.
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- 34. Keri Facer, John Furlong, Ruth Furlong, and Ros Sutherland, *Screenplay: Children and Computing in the Home* (London: Routledge, 2003); Sarah Holloway and Gill Valentine, *Cyberkids: Children in the Information Age* (London: Routledge Falmer, 2003).
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- 39. Livingstone and Bovill, 2000. Similar findings have been reported by Facer et al., 2003 and Holloway and Valentine, 2003.
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