Unexpected Outcomes in Digital Divide Policy:
What Children Really Do in the Public Library

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Introduction

In the last five years, major policies to promote access to new communication technologies have been enacted and debated. In the US, the debate has often been framed by the unfortunate term the "digital divide," a term that suggests access to technology is the most worrisome problem, that this paucity of access is somehow isolated from other social problems and socioeconomic factors, and that access can be described using a binary distinction between "have" and "have not." Policy mechanisms meant to address the digital divide (such as the Federal Communications Commission E-Rate program in the US) have focused on children as a key population—subsidizing access initiatives in schools and libraries.

Over the last century, communication technologies have transformed childhood. Both the form and offerings of communication media have proliferated, and overall use of communication technology among children has steadily increased. The complexity, fidelity, and in some cases the interactivity of communication technology has also increased (Roberts et al. 1999). Mediated communication has become one of the primary socializing agents for children. At the same time, communication technology has come to occupy an increasingly important role in other aspects of everyday life—particularly in the economic. Society is increasingly dependent on skilled labor (Bell 1999, p. 212-265), and access to and familiarity with computers is now seen as essential for participation in economic and social life. Policies focusing on children are important in understanding communication policy generally. Laws that benefit children may be enacted before similar policies that would

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apply to adults because children as a group are seen as unable to demand benefits or protection for themselves, children may require benefits and protection that adults may not (the younger the children, the greater the concern), or for no other reason then appeals on the behalf of children are rhetorically powerful.

Digital divide policy mechanisms intended to benefit children occupy an uneasy space between conflicting impulses: while they appear to be about simply access, they represent a desire both to empower children and also to restrict them. A Children's Partnership report expresses this tension well when it unselfconsciously explains: "because some young people are drawn to online activities that are not always healthy, it is essential that they receive guidance and training to use the medium productively." (The Children's Partnership 2000, p. 20). It is provocative to try to imagine what a child "productively" using the Internet would be doing. From earlier reports on the possible benefits of community technology centers we can gain some clues: skill acquisition, job training, and technological literacy are typically emphasized as positive outcomes by proponents (Mark, Cornebise, and Wahl 1997).

One might suspect that left to their own devices, children would be unlikely to sit down in front of the computer for an afternoon of job training. Subsidized access in libraries is a setting where children are often left to their own devices: much of the access is unstructured, which may not be the case at school. Indeed, Lentz et al found that children using the public access sites in Austin tended to engage in "game playing and other entertainment activities" (2000, p. 18). Two studies of Internet access in public libraries in Canada found that Internet gaming and chat were the most popular uses, particularly among children (Balka and Peterson 2000; Gorgeç, Lew, and Curry 1999). As one author commented, "[o]ur data suggest that even if all…citizens have access to the Internet, few of

them will engage in the sorts of activities that the access strategies have been designed to support" (Balka and Peterson 2000, p. 101).

While previous research has examined use of public access centers, this study attempts to more clearly confront policy initiatives with empirical measures of use. It attempts to build on earlier work by comparing the assumptions and goals of digital divide policies to user behavior, in a sense attempting to move beyond a surprise that children play games to better understand public access sites as objects of public policy. In this, it will consider three policy initiatives affecting access centers, where each initiative envisions children as primary beneficiary. The first initiative deals with access, the second and third deal with content regulation. Although only the first is labeled by the term "digital divide" in public discourse, all initiatives together aim to shape the use of communication technology, especially at public access centers.

Initiative One: Ensuring Access for the Underprivileged

Telecommunications are not used to link all places, but to link "valuable places in a non-contiguous pattern," allowing the "reconfiguration of metropolitan areas around selective connections of strategically located activities, bypassing undesirable areas" (Castells 1998, p. 144). It is true that technology can solve problems, but it may also reinforce the problems of inner cities, depressed areas, and the poor by excluding them. This potential exacerbation of social inequality can produce what some have called the "information poor" (Graham and Marvin 1996, p. 37, 190-206) and others the "digital divide" (National Telecommunications and Information Administration 1999).

A number of government programs seek to combat this problem by introducing technology centers in depressed areas and targeting children as primary beneficiaries. The predominant model for this type of access is an institutional one. The Telecommunications

Act of 1996 is the most prominent recent policy initiative to address the access issue. It explicitly expanded the concept of *universal service* to include such new technologies as the Internet.[2] Traditionally, universal service has referred to programs designed to ensure widespread use of telephony through subsidy.[3] The 1996 act proposed an institutional model in which children are key: schools and libraries serve as the principal place for otherwise disenfranchised users to use advanced communication technology. These institutions receive substantial public funding to provide this service through subsidies to carriers (1996). At the present funding level, up to $2.25 billion will be disbursed per year under this program (Universal Service Administrative Company 1999), which has lately changed its terminology to universal *access* in many circles to better reflect the institutional access model as opposed to the previous subsidy for every home. Other federal programs have also endorsed institutional models for access: e.g., Department of Education grants to Community Technology Centers (CTCs, see US Department of Education 1999) and Department of Commerce grants to Community Access Centers (CACs) from the Telecommunications and Information Infrastructure Assistance Program.[4]

It has been argued that universal service as a concept was originally unique to the United States, in that the rationale given for universal service is unlikely to be based on equity or welfare (Rapp 1996)—many rationales are economic and focus instead on system benefits. In this manner, arguments for universal service are very comparable to those for

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[2] The terminology public, universal, service and access is very confused in this debate: Public Internet access sites are supported by the public via universal service policies (also called universal access policies) in the U.S., and public service policies in European countries provide universal access. This paper will refer to the policy in question as "universal access" and the centers in question as providing "public access," although other literature may refer to such differently.

[3] The phrase "traditional" is somewhat problematic here, as this definition has gradually evolved from subsidy actions of the FCC, and before 1996 had not been codified in law. Some analysts argue that the definition here called "traditional" is invalid, as it is not supported by any initial legislative intent (Mueller 1997). For a clear discussion of recent policy, see Aufderheide (1999).

[4] Now the Technology Opportunities Program (TOP).

universal education (Sawhney 1994). In the US, this policy represents not a belief that all should have access because equity is necessarily a noble goal, but rather an expectation that these technology centers will be used for educational (hence the emphasis on schools), and ultimately economically productive purposes.[5]

Initiative Two: Privacy and Protection from Advertisers

A 1998 Federal Trade Commission survey found that 89% of Web sites "directed to children" collect personal information, but that only 24% of these sites have a privacy policy available for viewing, and as few as 1% to 8% attempt to involve parents in their children's information disclosure—e.g., through consent or notification (Federal Trade Commission 1998, p. 31, 35, 38). The FTC presented this as a case where technology had created new dangers: the harmful disclosure of personal information by children that could not be addressed by existing law (p. 40-41). On the recommendation of the FTC, congress subsequently passed the Children's Online Privacy Protection Act (COPPA) in 1998.[6] The Act regulates sites that are directed toward children or have "actual knowledge" that children under age 13 are users. It requires these sites to obtain "verifiable parental consent" in order to collect or disclose personal identifying information from children, to state what information is collected and how it will be used, and to protect the confidentiality and security of personal information collected. Further, sites may not collect more information that is "reasonably necessary" for a particular activity, and parents must be able to request the information that has been gathered and revoke permission to use it at any time (1999; Federal Trade Commission 1999).

[5] For an overview of competing policy visions for the Internet, see Stefik (1996).
[6] Not to be confused with the Child Online Protection Act (COPA), discussed later as initiative three.

During the policy debate leading up to the Act's passage, it was at times referred to as an effort to protect children from online marketers[7] and the debate was often framed in terms of advertising (cf. American Advertising Federation 1999). In fact, COPPA addresses all data collection from children and regulates any type of site (commercial or otherwise). While it is true that advertisers are a primary interest group in this area, the Act does not address advertisements directed at children as such.[8]

Initiative Three: Protection from Indecent Material

Concern about pornography on the Internet may have entered mainstream public debate in 1995 when *Time Magazine* published a cover story on the results of a (now discredited) study with the headline "CYBERPORN" (Elmer-DeWitt 1995). The policy problem asserted has typically been that changes in technology provide easier access to indecent material, and that children must be prevented from obtaining such material. Numerous policy efforts have sought to restrict obscene or pornographic material on the Internet itself, the most prominent being the failed Communications Decency Act (CDA) and its successor,[9] the Child Online Protection Act (COPA).[10] Other efforts have focused on restricting institutional modes of access to the Internet (i.e., schools and libraries), where children presumably may not be watched by parents. For example, at the end of the first

[7] e.g., the FTC initiative was a product of the Division of Advertising Practices, Bureau of Consumer Protection.
[8] Unless data collection is involved.
[9] Sections of the CDA enacted within §223 of the Telecommunications Act of 1996, were struck down by the U.S. Supreme Court as unconstitutional in 1997 (Aufderheide 1999, p. 183-185). Enforcement of the subsequent Child Online Protection Act is presently blocked pending litigation over its constitutionality (Mendels 1999).
[10] Not to be confused with the Children's Online Privacy Protection Act (COPPA) discussed previously as initiative one.

legislative session of the 106th Congress, four acts requiring some form of library filtering were pending.[11] The youngest children are often portrayed as the most "at risk."[12]

The Case of the San Francisco Electronic Discovery Center

Each of these debates assumes an answer to the question: How do children use public computers and Internet access? Initiative one assumes that an institutional access point is essentially the same as home access, and that what transpires there will be economically productive, broadly construed. Initiative two assumes that children disclose identifying information that may place them in danger, and that when they do they use services directed to children. Initiative three assumes that young children seek pornographic material, and proposed filtering legislation implies that they do so from public places. It is the purpose of this paper to assess whether or not these assumptions have any basis in human behavior. To do this, we conduct an empirical investigation of Internet use by children at a public library in an underprivileged area. Let us now turn from the policies about children to the children themselves.

Setting

This study considers a library program in San Francisco called the Electronic Discovery Center (EDC).[13] An EDC is a cluster of computers[14] in a library branch equipped with broadband Internet access[15] and children's software titles. These clusters are available to use for no charge, and are reserved exclusively to serve children under the age

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[11] H.R. 896: Children's Internet Protection Act, H.R. 2560: Child Protection Act of 1999, S. 97: Children's Internet Protection Act, and S. 1545: Neighborhood Children's Internet Protection Act (American Library Association 1999).

[12] For instance, the *Time* cover pictured a very young child (Elmer-DeWitt 1995).

[13] For an overview of the Electronic Library Project, under which the EDC program was partially developed, see Murase, Boutilier, & Sandvig (1999).

[14] EDC computers at the main library have Pentium 166MHz processors, and are running Windows 95. Each computer is equipped with a Microsoft EasyBall mouse, a keyboard, headphones, and a 15" monitor. Computers are connected via an Ethernet LAN to a Windows NT Server that provides access to CD-ROM towers containing children's software.

of 14 and the adults that accompany them. This study analyzes the EDC at the Main Library.[16]

The ultramodern architecture of what librarians call the "New Main" library is an impressive sight, but more impressive is the contrast between the pristine library building and the adjacent neighborhood of the Tenderloin, one of San Francisco's poorest. Those living near the library have a median family income of $12,754, with 27.5% of the population in the library's census tract in poverty by Census Bureau definitions (US Census 1991).[17] The median family income is below $30,000 in eight of the nine adjacent census tracts (US Census 1999). In comparison, San Francisco as a whole averaged 12.3% of the population in poverty, and a median family income of $37,854 (US Census 1991; US Census 1999).

Within the library, the Fisher Children's Center is an airy, brightly-colored series of rooms on the second floor providing comfortable furniture sized to the dimensions of small children, exhibition space for reading stories and meeting authors, large windows, and sunny spots to play and read. The Center houses the New Main's collections of books, periodicals, and videos for children in several languages. These surround a long, curving wooden librarian's desk, usually occupied by two children's librarians.

[Insert Figure 1 about here.]

The EDC consists of three "islands" of computers in the Fisher Center (see Figure 1 and Figure 2). These islands are located on one side of the wide entryway and fenced by a wall to one side (containing the Fisher Center's bulletin board), half-height book stacks to

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[15] The main library is connected to the Internet via a T-1 line.

[16] The EDC program predates the implementation of subsidies to libraries for universal access under the 1996 Telecommunications Act, but it is exactly the type of program intended to receive funding under the Act, and indeed the library has applied for subsidies and expects to receive them (Boutilier 1998).

the front (picture books and videos) and rear (foreign language books), and the librarian's station. Each square pedestal supports four computers arranged two per side, and each group of two computers has an attendant collection of three child-sized chairs.[18] The library does not employ filtering software; instead each computer is marked with a warning notice posted by the library cautioning that the library does not control the content of the Internet. Two round child-sized tables are nearby, as are two adult-sized well-cushioned chairs for larger visitors. The space of the EDC is not closed off on any side, and there is always a steady flow of people moving near and sometimes through the area. No partitions separate computers, and while the space of the EDC is loosely demarcated by half-height shelving, the EDC is very much a public part of the Center.

Method

A previous study in the EDC presented the findings of 10 weeks of qualitative nonparticipant observation and open-ended interviews of children, parents, and librarians in early 1999 (Sandvig 2000). This paper instead presents quantitative data on Internet use in the EDC, but will draw upon data from the previous study for context.

Over a 16-week period (August 28 to December 17, 1999), researchers unobtrusively monitored the library's computer network for requests using the relevant Internet protocols[19] originating from a computer in the EDC.[20] As this was overwhelmingly Web use, we restricted further analysis to Web traffic. Typically, researchers analyzing network

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[17] Of course, those living near the library are not the only patrons. As the flagship of a large library system, the New Main draws patrons from throughout the city.

[18] When ordering chairs for the center, library planners toured another nearby computer center at the San Francisco Exploratorium (a hands-on museum of science and art) and noticed that groups of children tended to cluster around the few available computers. Anticipating this demand, they placed three chairs in front of every two computers at the EDC (Boutilier 1998).

[19] Requests using the HTTP, FTP, and Gopher protocol were monitored. A telnet application was also provided in the EDC, but observation indicated that use of telnet was comparatively rare.

[20] The caching proxy did not collect data because of network problems on two occasions during this period, once for one hour (December 7) and once for three hours (November 9).

data about the Web rely on logs kept by the Web server—providing the ability to answer some research questions about requests to a particular site (McLaughlin et al. 1999). In contrast, this study gathers data at the gateway from the EDC to the Internet in order to answer questions about Internet use from the EDC.[21] We installed a caching proxy[22] and modified it to observe all transactions in detail.[23]

The caching proxy saved all Web addresses and an assortment of information about each request. We then discarded requests that were not for Web pages,[24] and malformed requests,[25] leaving 203,647 page requests.[26] To bring the sample to a manageable size for coders, a sub-sample of 1,000 page requests was randomly drawn from across all 16 weeks.

For the content analysis, it is impossible to for coders to revisit the Web pages as users saw them. Many Web pages change frequently, are personalized for a particular user, require a sign-in/password, or contain information that is confidential and would violate the anonymity of users (e.g., pages allowing access to Web-based e-mail). While the sampling unit discussed so far was the page request, for the coding unit the addresses requested were truncated to the smallest number of workable significant characters, hereafter called the "site."[27] The "site" was defined as the address produced by concatenating the hostname and domain: i.e., "fantasybasketball.yahoo.com" would be distinct from "chat.yahoo.com."[28] A computer script to truncate addresses reduced the sub-

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[21] Thanks to Jason Coffer, Steve McMahon, and François Bar for proposing and refining this method.
[22] The Squid Internet Object Cache provided by the National Laboratory for Applied Network Research. Thanks to NLANR for providing this tool; if an open-source object cache was not available, this research would not have been possible (see http://squid.nlanr.net/).
[23] The source code of v.1.1 was modified slightly to cause the logging of all headers for each transaction. Thanks to Guillaume Vambenepe for assistance in this effort.
[24] Web pages were identified by selecting for the MIME type "text/html".
[25] That is, requests containing an error code from the caching proxy: generally mistyped or unreachable hosts.
[26] This is analogous to what are often termed "page views."
[27] For sampling units vs. coding units, see Riffe, Lacy, & Fico (Riffe, Lacy, and Fico 1999, ch. 4).
[28] Initially, the stem also included the first directory in the path after the domain name in cases where this resulted in a page that could be retrieved. By this scheme,

sample of 1,000 to 235 distinct sites. After these stems were viewed by researchers from February to March 2000 a computer script applied the 235 codings back to the sample of 1,000, eliminating problems of intracoder reliability—often referred to in this context as stability (Weber 1990, p. 17). In other words, while the same site might appear multiple times in the sample, it was only coded once.

Participants

Approximately 110-200 children use the computers at the EDC each day (Sandvig 2000, p. 11).[29] This means that over the 16 weeks of data collection, a conservative estimate would be that over 12,000 visits by library patrons were recorded and analyzed in this study (it is not known, however, how many of these visits represent regular patrons vs. one-time events). About one child in ten also brings along an older sibling, parent, or other adult (p. 11). Users in the EDC are restricted to a half-hour time period because of the high demand for computer time. As spaces in the EDC are almost always full, more than one child usually uses each computer, allowing them to stay longer (p. 15). The clientele of the EDC contains a mixture of children from the surrounding (poorer) neighborhoods and children that come from the suburbs to visit the New Main (p. 18).

Data collection purposely began after school had started in the local school district, and ended before winter break: this study presents activity that occurred while school was in session. That is, patron visits to the EDC were heaviest after school on weekdays, and all day on weekends,[30] and any use of the EDC for school projects or assignments would be expected to occur during this period (as opposed to the summer).

"http://dir.yahoo.com/Education/" would be distinct from "http://dir.yahoo.com/Reference/". However, in the majority of cases pretested, this did not result in a different functional coding, so this practice was dropped for the simpler (but slightly cruder) hostname and domain.

[29] The extent to which this consists of repeat visitors is not known.

[30] On public school holidays during this period (Labor Day, Columbus Day, Veteran's Day, and Thanksgiving Day), the EDC was also closed.

Measures

Measures fall into two groups: those coded by researchers and those computed by software. For the first group, researchers coded *symbolic* measures (judgements about the content). For the second, computer scripts computed *behavioral* measures (activity of the users) from values saved by the caching proxy software.[31]

Symbolic Measures

To address the question of how children use public computers and Internet access, the first symbolic measure is a functional assessment of the **primary purpose of the site** visited**.** The primary purpose indicated by the site itself was determined to be one of nine mutually exclusive and exhaustive categories. While most sites might allow several kinds of activity, coders were asked to select the "most prominent or "most fundamental" category. Categories were derived from extensive pretesting and revision, but were also chosen to be roughly comparable to other recent studies of Web use by children (particularly, Roberts et al. 1999, Appendix C, p. 31).

(1) **Full-Page Advertising**: separate Web pages exclusively containing promotion for a product or service, a way to purchase, provide information or obtain more information (often called "pop-ups").[32] (2) **Play games**: provides on-line games. Typically, graphical Java applets are featured, but textual word games, quiz games, and puzzles would also apply. Games may be played alone, against the computer (e.g., the applet), or across the network. (3) **Communicate with individuals**: facilitate communication between individual Internet users or small groups by providing real-time chat, instant messaging, asynchronous bulletin-board discussions, Web-based greeting cards, invitations, home page

[31] As an aside, this form of traffic analysis also provides ready access to extensive *structural* measures (features of the content: page size, number of images, etc.), but as these are not of theoretical interest they are not included here.

hosting services, and/or e-mail services. They may cater to a general audience or a more specific group.[33] (4) **Find other sites**: provide a means to find other sites, either for a general audience or more specific group. These sites include "portals," and may provide keyword search services, recommendations/reviews of other sites, and/or lists of links to other sites. (5) **Purchase or research purchases**: provide product information and may allow on-line purchases. They may bear the name of a manufacturer or a retail store, or they may aggregate information from these sources. (6) **Learn about famous celebrities and the events where they appear**: information about film or television celebrities (or their characters and shows), famous animated characters, sports stars, and/or musical groups—or about shows, films, concerts, or sporting events that feature these celebrities. This category requires mention of celebrity, e.g., not television schedules alone, but schedules that emphasize "fan" information or interviews with stars. (7) **Learn about a topic or subject**: information, facts, listings, commentary, or a reference source on a topic that may be narrowly (fishing, employment) or broadly (current events, art, politics) defined—including journalism online and classified ads. (8) **Unclassifiable**. (9) **Unreachable.**[34] Only 1% of page requests in the content analysis were coded into the unclassifiable category, and only 1% were unreachable.

After coding each site by functional category, coders answered a series of binary (does/does not) questions about content contained on the site; the positive conditions are described below.

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[32] Once a site was coded as full-page advertising, no further coding of the content was done for that site, as the content viewed by the original users was often not available (that is, it can not be determined what ad was viewed by what user).

[33] Note that many sites offer some of these features (e.g., free Web based e-mail), but only sites whose primary purpose is one of these services were coded in this category.

[34] Unreachable during coding—as previously discussed, requests unreachable by participants were initially discarded.

Targets ethnic community: may contain the words "Asian" "Latino/a" "Vietnamese" "Chinese" "Black" or similar words. **Targets children**: may be described by the words "children's," "teen's," "kid's," "for kids," "for children," or "for teens," or the site may contain a sub-section labeled this way. **Contains non-English content**: a language other than English appears on the page, or another version of the page is offered in a language other than English.[35] **Contains Advertising**: any explicit advertising (sometimes known as "banner ads") that promotes something *other* than the site itself.[36] The ad need not be contained in a graphic (but most ads found were). In many cases, these ads were marked by the words "ad," "advertising," or "sponsor" and were in a demarcated area of the page. Note that this variable measures explicit advertising within a page.[37] **Makes educational claims**: coders were not asked to judge whether or not content *was* in fact educational (by any definition), but rather to determine if the site *promoted* any of its own content as educational (e.g., may use the words "education," "educational," "reference," "learn," "learning").[38] **Contains pornography**: has any content that is sexually explicit, sexually arousing, offensive to moral standards, or depicts sexual acts. This definition is a combination of the concepts of pornography, obscenity, and erotica as described by Linz & Malamuth (1990, p. 2). Nudity must occur in an arousing, sexual or offensive context to be coded (e.g., anatomical diagrams in a biology site would not be included). It is worth noting that content fitting any definition of pornography (or even nudity) was very rare in the

[35] Note that many of the pages coded "does contain" for this measure contained some non-English content and some English content together—with this method it is impossible to determine which language was read by the user.
[36] E.g., a publisher's site may have information about books that they produce, but this would *not* be categorized as "does contain advertising" because it is not advertising for a topic other than books.
[37] This measure is distinct from entire pages ("pop-ups") whose primary purpose is advertising, which is in the functional category described previously.
[38] This is in no way a learning measure: it is a measure of sites that self-label as education.

data.[39] Pornography was not included as a category in the measure of the site's primary purpose because these are conceptually distinct.[40]

Behavioral Measures

Behavioral measures are calculated by software, and describe the Internet activity in the EDC or actions of particular users.

Duration of page view: subtraction of two consecutive time stamps on a page request that originated from a particular computer. Time was measured with a precision of one-tenth of a second.[41]

Frequency of viewing a type of site: Previous research has tended to measure frequency of viewing one particular category of content over another using the number of page requests (generally because it is simple). Instead, where discussions of frequency appear in this study an analysis unit was computed by multiplying the number of page views by the duration measure to provide a more valid measure of *time spent* on one type of page vs. another. This measure might seem to be problematic because it confounds the time required to download the page with the time the user spends viewing it, but studying sites that use a caching proxy reduces this problem if the universe of content viewed is relatively homogeneous. In the 16-week sample, the latency of all requests was very low.[42] The median latency was .05 seconds (mean = .22, S.D. = .85). 71.2% of the content was retrieved over the Internet, the rest was served from the cache on the library's network.

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[39] We opted for a broader definition than found in other literature because of this.
[40] e.g., there could be a site that allows you to find other sites (primary purpose category 4) that are pornographic ("does contain pornography").
[41] Page views of duration longer than 300 seconds were excluded as outliers—researchers watching children observed no page views of this length use these computers.
[42] The time elapsed from a request from an EDC computer to the completion of the transfer of the content, measured with a precision of one thousandth of a second. This is measured by the caching proxy software as a performance metric.

Simultaneous viewing: an estimate of the number of users in the EDC that are viewing the same site at the same time, in addition to the computer that requests the page. For each page request, a computer script compared the site requested with the last requests made by the other computers in the lab. The script then summed number of computers (beyond the requesting computer) that requested the same site. While it might seem difficult to defend two computers located at opposite sides of the room as being related in a meaningful way, patrons at the EDC were commonly observed walking around to look at other computers for ideas about where to go and what to do. This measure then provides a crude metric for this type of sharing. While there are twelve computers in the lab, this measure ranged from 0 to 8.[43]

[Insert Figure 2 about here]

Intercomputer Sharing Statistic: a more defensible measure of sharing that likely did involve interpersonal contact; this measure adjusts simultaneous viewing to account for the distance between the computers viewing the same site. Observations in the EDC indicated that sharing computers while talking was quite common; the configuration of the room allowed each user to easily see their computer and the computer next to them on their island. They could also easily see the person using the computer opposite theirs by leaning slightly to the left or right to make eye contact (see Figure 2).[44] This measure accounts for the distance between the computers by arranging them on a coordinate grid and then computing Equation 1.

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[43] Note that this measure is subject to influence by the frequency of the type of site requested; more popular sites would tend to appear simultaneously more often regardless of any sharing behavior by users. It is presented primarily as descriptive of the atmosphere of the lab as a whole.

[44] The observation of sharing in these two configurations was quite common, although only those children on the same side of the island could see each others' screens, and only those children on the opposite side of the island could easily see each others' faces. Children would often attempt to get their friends seated either next to them or directly across from them, but if this was not possible, they would also speak to strangers.

$$\sum_{c=1}^{n}\left(\frac{1}{d_c}\right)$$

Equation 1. Intercomputer sharing statistic.

n indicates for each page request, the number of computers simultaneously viewing same site. Where the previous measure summed, instead the distance, *d*, between each computer, *c*, and the computer making the request was calculated. This measure is then the sum of one over the distance between each computer and the requesting computer. It has no natural scale, and is generally suitable only for comparison, not direct interpretation.[45] This measure ranged from 0 to 3.5, and the mean was .46 (S.D. = .69).[46]

Reliability

As several of the measures in this study involve latent content as opposed to manifest content, a second coder analyzed 400 sites randomly selected from the 1,000 site content analysis sample.[47] Coders used a detailed, step-by-step protocol containing examples for each decision. Cohen's κ for intercoder reliability was then computed (cited in Riffe, Lacy, and Fico 1999). Cohen's κ was significant ($p < .01$) and above .70 for every measure except "makes educational claims" ($\kappa = .42$). Cohen's κ was not computed for the "contains pornography" measure because content in this category was so infrequent that the portion of the data that was coded by two coders produced zero instances of it.[48]

[45] As an aside, due to the layout of the lab, the computers of interest directly next to the requesting computer and across from the requesting computer are one foot apart, resulting in a sharing statistic of over 1 if either of these two computers of interest were viewing the same page.
[46] It is worth noting that intracomputer sharing (several people sharing the same computer) was extremely common as well but cannot be measured using this study design.
[47] Thanks to Emily Murase for her assistance in this effort.
[48] Although both coders agreed that zero instances appeared.

Results and Analysis

Although the Internet is often presented as containing a vast amount of information, use of the Internet at the EDC was highly concentrated among just a few sites. While pages from hundreds of Internet domain names were accessed over the 16 weeks, the top 25 domains accounted for 77% of the traffic. Domain names accounting for over 1% of total traffic are presented in Table 1.

As can be seen from Table 2, games playing sites was the most popular use of Web in the EDC (37% of time spent). Java-based game sites such as bonus.com, cyberjoueur.com, and javagameplay.com predominated in this category. Communicating with individuals was also popular (26%). Within this category chat sites predominated (such as chat.yahoo.com, and the chat service at alloy.com), but Web-based e-mail services such as hotmail.passport.com were also significant, accounting for over a quarter of interpersonal communication sites (about 6% of the total). Personal home page hosting sites such as geocities.com (whose specific content would vary widely by page, and thus whose page-by-page content would not be shown by this measure) accounted for the remainder.

When visiting a site to find out about a topic or subject (12%), the most likely topic of interest was cheat codes for games (e.g., bestcheats.com), and learning more about the Pokémon trading card game (pokemon.com, pokemon-trade.com). Beyond this, topics were highly varied. While many on-line magazines targeted toward a child audience exist, and they would likely have been included in this category by coders,[49] children at the EDC did not visit these sites (with one exception: teenmag.com was visited once).

Full-page (or "pop-up") advertising was remarkably common (10%). Recall that this category indicates pages that contained only advertising, and does not indicate the

[49] The site alloy.com, mentioned earlier, is an on-line teen magazine site. Children in the EDC visited only the chat area, however, so visits were categorized as "communicate with individuals".

prevalence of advertising ("banner" ads) on other kinds of pages. Because pop-up advertisements may appear on the screen with other pages, the time spent measure is somewhat problematic for this category, as it cannot be determined what the user is actually looking at. As an alternative, the content percentages were recomputed using number of page requests. This produced the same figure: 10% of the total.

When searching for other sites (6%), yahoo.com was overwhelmingly the most popular. Yahoo's alternative directory that is explicitly for children, (yahooligans.com) was not popular (0.2%), despite being prominently linked from the library's start page during the study.

The celebrities and events (5%) of interest to children in the EDC were typically the television celebrities (e.g., the World Wrestling Federation at wwf.com), musical groups (e.g., the Back Street Boys at backstreetboys.com), and information about current movies (pokemonthemovie.com).

Purchasing or researching purchases (2%) was uncommon. When it did occur, children were usually interested in purchasing game consoles or cartridges (nintendo.com), other toys (etoys.com, hasbro.com), and tennis shoes (footaction.com).

Content features of the sites visited by children are summarized in table 3. Advertising was present on 70% of all sites. Explicit advertising was least common on sites where children could make purchases—because the site is itself advertisement: the general goal of advertising on the Web (to bring customers to a purchasing site) has in this case already been achieved.[50] We can then state that 10% of all Web pages viewed were full-page advertisements (see Table 2), and of the remaining sites, 70% contained banner advertisements.

[50] Note that this measure is distinct from full-page advertising, described earlier.

Although the definition used for "targets children" was very broad (any mention of children would suffice), visits to sites that target children were rare or a minority in several categories of content. Although many sites exist on the Internet that allow chat specifically for children (often requiring parental consent), they were not visited by the children in the EDC, who preferred adult fora.

Similarly, the definition of "makes educational claims" was very broad (any education-related word), yet sites explicitly containing educational content were extremely rare. Search sites commonly have a section labeled "education" (or, if they target children they often use the word "learning"), and they account for most content that makes educational claims.

The viewing of non-English content was generally not very common overall (7%), yet this may reflect a limit on the ease of finding non-English content on the Internet as a whole. Yet, a surprisingly large number of sites whose purpose was communication with individuals did feature non-English content (18%). These were typically chat sites.

Chat sites were also the most likely category of content to target ethnic communities within the category "communicate with individuals." While overall content targeting ethnic communities was rare (3%). It is interesting to note that children seemed drawn to ethnic communities for purposes of chat (9%) more so than for any other type of site.

The relationship between the measures in Table 3 was analyzed using chi-square tests. The presence of advertising ($\chi^2[6, N = 813] = 118.0$) and content targeting children ($\chi^2[6, N = 813] = 443.4$) varied significantly by content category. Content targeting an ethnic community, presence of educational claims, and non-English content occurred too infrequently to analyze using a chi-square test.

The measure of pornographic content is not displayed in Table 3 because it accounts for less than one percent of the total. Eight sites were classified by coders as pornographic. An examination of the sites, however, reveals that one (peep.com) is a misspelling of the 25th most popular site (peeps.com, a music site). A second contains a misleading URL (cartoonheaven.com)—while many sites accessed at the library were about children's cartoons, this one contains pornographic cartoons. In the remaining six sites, only the first page of the site was accessed. The first page in each case contained nudity of some sort, but the bulk of the page contained a warning cautioning minors not to enter the site. In each case, it appears that no further pages were viewed after this point. We conclude that at most 0.6% of the visits were to sites containing pornographic content.

Table 4 summarizes the two measures of sharing by purpose of site. The concentration of visits to a few sites is reflected here, as on average when a page was requested one additional user in the EDC was already viewing the same site at the same time. That is, the mean number of other computers viewing was 1: at any given time, on average two computers (the computer requesting it and one other computer) in the EDC would be looking at the same site (median = 0, S.D. = 1.4). Qualitative information suggests that the children in the EDC are highly influenced by the content viewed by other children, and this finding appears to support that conclusion. The intracomputer sharing statistic, while not directly interpretable by itself, controls the simultaneous viewing measure for distance. This indicates that game playing (.78) was more commonly viewed on computers that were near each other than were other activities. Communicating with individuals (the second highest at .27) was also observed to be a collaborative activity in the EDC, with friends signing on to a chat channel at the same time from nearby computers, then coordinating chatting activities by speaking to each other while typing.

While the sharing variables were interval measures, assumptions for parametric tests were not met and Kruskal-Wallace tests were performed to analyze the relationship between sharing and purpose of site. Simultaneous viewing ($\chi^2[6, N = 813] = 215.0$) and sharing ($\chi^2[6, N = 813] = 196.7$) differed significantly as a function of the primary purpose of the site ($p < .01$).

Discussion

Revisiting Initiative One: Success for an Active Medium of Play

While justifications for Internet access in inner cities often rest on claims of educational benefit, in the EDC content that is explicitly educational was often avoided. In the EDC the Internet appears to be used most often as an active medium of play and leisure. This is consistent with qualitative observations at the same site, where children often explained their use of Internet access at the library as "fun," and rarely arrived at the EDC with a specific informational need in mind or a fact that needed to be looked up (Sandvig 2000, p. 17). Children reported in interviews that one attraction of the EDC is the unrestricted nature of the time spent there: they can choose to look at whatever they want, and they do not tend to choose the explicitly educational.

In this, the EDC is very comparable to children's use of computers in other contexts. For instance, the distribution of the type of sites visited in the EDC is comparable to other recent data on children's Web use in the home and at school. In a nationally representative 1999 survey of 3,155 children aged 2-18, the most frequently reported type of site visited was "gaming" by a large margin, then "sports," and "entertainment" (Roberts et al. 1999, Appendix C, p. 31).[51] In addition 13% of children surveyed reported visiting chat rooms the previous day (p. 52). The EDC is then achieving the public policy goal of access to the

[51] Each child could indicate more than one answer.

Internet for the underprivileged in that the type of content accessed from the EDC is similar to that accessed in the home of those who own computers and Internet connections. If equality is a goal, then this is success by one measure for programs like the E-Rate, but it is a success that does not sit well with many.

Some librarians, volunteers, and parents are unsettled by the use of computers in the EDC for games and chat, and express emotions from disdain to outrage at this "misuse" of the computers. As one volunteer explained while referring to Internet games: "I try to stop them." This is reflective of the place of the Internet in society and the predominance of metaphors such as the "information infrastructure," "digital library," and "electronic marketplace" (cf. Stefik 1996). Agre calls part of this "the individualistic conception of computing" and points out that it is often not a valid one, yet this debate rests on it (Agre 1997, p. 243). By and large, the children at the EDC show little interest in "information" as it is often conceived: they neither want to look things up nor transact purchases. Rather, they want to use the network to play and to communicate with others. Although this conflicts with some visions of the network, this is what children like to do. Despite the outrage of a few parents and the seeming shock of other studies of libraries, it should come as no surprise to us that children play. A more useful avenue to pursue would be to consider what might be achieved with access policies given that children play.

An insight of computer game manufacturers has been that the games most likely to be acceptable to parents (often the purchasers) and to children (the users) are those that take a playful approach to learning—combining arcade-style action with mathematics, for instance. For the Internet is to be realized as a tool for education that is voluntarily used by children, this struggle remains to be grappled with in the area of Internet applications.

Sharing as unanticipated benefit

As evidenced by the sharing measures, children often share the computers at the center. Qualitative data indicates that they watch other users (e.g., see Figure 1, Figure 2). In doing so, they learn about computers from strangers, yet this benefit is not part of the policy debate about public access centers. Observations of children in the EDC confirm that children often learn how to use the computer by watching others, or by asking them questions (Sandvig 2000). It is then a key insight that it is games and chat that are more likely to be shared.

In the early days of the telephone, users would often first encounter the device in a public place such as at a demonstration at a church, or later installed in a business such as a drug store for the public's use (Fischer 1992). With the telephone, learning about a new communication technology occurred in public places; knowledge about computers can be similarly conceptualized. If a policy goal is the building of computer skills in a particular community, a public access center is a nexus around which the community property of knowledge about computers can be built through a mixing of the more- and less- skilled (Agre 1997, p. 244-245). Universal access policies that address the "digital divide," on the other hand, rely on public places as the primary point of access for the disadvantaged because subsidy to every home was thought to be too expensive for advanced information technology.

Revisiting Initiative Two: Will the Real Adults Please Stand Up

Children like to chat and exchange e-mail with friends. Many very young children observed in the EDC have (one or more) Web-based e-mail accounts. Over a quarter of all time spent at the EDC was spent at a site that allowed communicating with other individuals (Table 2), yet only 1% of these sites was explicitly for children (Table 3). Protecting children from information disclosure via chat and e-mail is the focus of the

recently enacted privacy law COPA, discussed earlier. While the data for this study were collected before recent restrictions went into effect, it is still clear by analyzing the law and the sites coded in this study that only the most obviously exploitative sites collecting personal information explicitly from very young children will be affected. While the policy initiative was based on research that conceived the target of policy to be *sites directed to children*, children do not prefer to visit these sites for e-mail and chat.[52]

For instance, one of the most frequently visited places to chat found in this sample was alloy.com (a fashionable teen culture site). Alloy.com does collect personal information, but the privacy policy points out that "Alloy.com is not directed to children under the age of 13" and "prohibits registration" by them,[53] yet most users of the EDC were under 13, and alloy.com accounted for 1.4% of all page requests.

The remedy advanced by regulations so far is chiefly parental consent. At the time of data collection for this study, many children's sites on the Web required parental consent before participation. These sites do not appear in our sample, however, and it seems that children in the EDC do not visit them. Nine of the ten top chat sites in this sample did post privacy policies,[54] but from an examination of the data it does not appear that the children read them. Over the 16 weeks, nine requests for privacy policies of any kind were found in the 203,647 pages requested.[55] Finally, observations of children in the EDC indicate that lying about name, age, and other personal information occurs in during the majority of data collection from young children in public places (Sandvig 2000, p. 14-15). In this manner,

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[52] One clause of the Act provides that operators with "actual knowledge" of visits by children are also obligated, but it is seems that as long as operators do not monitor their own sites, this will exempt them from any obligation (1999).

[53] See [http://www.alloy.com/a2k/privacyterms/privacy.html].

[54] Presence/absence of privacy policy was not initially coded in the content analysis; a May visit to the top ten chat sites in the sample produced this estimate.

the law does not apply to most of the sites visited by children, and even the consent requirements that will exist under the law are easily circumvented. It is not known from these data if the problem of harmful information disclosure by minors exists, but if it does exist, the privacy initiative will not address it because the policy is not written to apply to actual use by children.

Revisiting Initiative Three: The Absence of Indecency

The viewing of pornographic material in the EDC was rare to nonexistent. This is substantiated by interviews conducted in the EDC: while all of the library volunteers interviewed had heard stories about pornographic material being viewed in the EDC, only one volunteer had personal experience, and this was on one occasion. Interestingly, it appears that the public nature of the EDC discourages such viewing, as computer screens are visible to passers-by. Several volunteers recounted the perception that pornography was most likely to be viewed on the screen that was the most hidden from other patrons because of a pillar.

The six instances found where only the first (warning) page of a pornographic site was visited seem explainable by children seeking the thrill of transgression. It is not that the warning notices on the first page work, but rather that the purpose is of the visits was transgression—not to actually view pornographic images but to demonstrate courage in violating a well-known social norm. This low (less than 1%) level of pornography in public libraries is comparable to other reports.[56]

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[55] This is a rough estimate based on the observation that Web addresses for privacy policy often contain the word "privacy." The full sample was screened for URLs containing this word, and nine of the resulting pages were privacy policies of some sort (that is, they were titled "privacy policy").

[56] Surprisingly, replication for this finding comes from a bombastic pro-filtering organization. In an examination of the output of filtering software installed at three public libraries, a Family Research Council booklet emphasizes raw numbers, anecdotes, and graphic news reports. Yet, dividing the number of estimated pornographic sites by the number of total requests yields a percentage ranging from .002% to .53% for each library examined (Burt 2000, p. 1, 39-45). The booklet concedes "…0.53

Here it appears that the overwhelming policy focus on indecent material is erroneous. While young children are portrayed in policy debates as the most in need of protection from pornography, they are also likely to be the least interested in it. While policy debate has focused on preventing access to indecent material from public places via filtering requirements, interviews indicate that the more public an area is, the less likely it is that indecent material will be accessed. Again, the social problem presented by this policy is not grounded in real life.

Conclusion

In the end, Internet policies to date in the three areas examined seem to have notable lacks. Content regulation, be it concerning decency or privacy, appears unlikely to resolve the problems it claims to address. Indeed, content regulation initiatives to date do not seem clearly tied to actual problems in an empirical sense. Access policy is achieving some desired results but also producing unexpected ones. On the whole, all of the policies considered here appear to be somewhat disconnected from the material conditions that they attempt to regulate. To express surprise at this result, as other studies in this area have done, is to employ a straw man. The explanation for this disconnection lies in an understanding of policy as a symbolic and political activity.

Concerns about content place government in an ideological dilemma between responsiveness to concerns of the public on one hand and a commitment to a free enterprise system of control on the other. Much like other political debates about communication (Rowland 1983, p. 297), the underlying pressure of a minimalist regulatory ideal and the actions of interest groups committed to the protection of corporate rights produce policies that are, on the whole, ineffectual. No politician is afraid of alienating the pedophile vote

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percent of all web accesses may not sound significant, this translates into thousands of separate

and the pro-pornography lobby, leaving a policy debate dominated by politically safe topics – and even privacy is politically safe compared to, say, restrictions on advertising. Internet content is then debated as though the chief dangers presented by the network were a shadow land of nasty, lurking strangers (or a child's own dirty urges). Concerns about the digital divide are drawn from a policy vision containing unrealistic conceptions of children busily striving to become better-educated workers suited for skilled jobs—all regardless of any grounding in fact—because such is a politically expedient effort that allows politicians to engage in symbolically rewarding efforts to (1) help children, (2) help the poor, and (3) appear familiar with high technology.

The broader implications from here are somewhat contradictory. In one sense, these results call for an improved effort to ground policy initiatives in a realistic understanding of lived existence, but at the same time they imply that the chances of this happening are low. Internet content and access policymaking for children is so far primarily responsive to entrenched interests, and debates center on topics that are largely free of pressure from them. The practical implications from here, however, are striking. Sharing computers between strangers is an avenue of interaction possible with public access centers in libraries that is impossible with other policy mechanisms, such as subsidy to the home. While play and chat are not socially legitimate needs that are seen to require public funding, it is precisely these activities that are the most likely to promote sharing—a promising avenue for learning about technology, and a promising mode of learning about content that is, as yet, underutilized. In final analysis, the promise of digital divide policies for children is the promise that eventually we will not shun playful behavior, but accept it as human, and harness it where appropriate.

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incidents…" (p. 44).

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FIGURE 1. *Electronic Discovery Center (EDC) in San Francisco. Note that there are three chairs for every two computers.*

FIGURE 2. *A partial view of the EDC while looking toward the door of the Fischer Center. There are four computers per "island," two islands are shown.*

TABLE 1. *Domains accounting for more than 1% of total page requests from the EDC over 16 weeks (Fall 1999)*

		%	Cum. %
1.	bonus.com	28.5	28.5
2.	yahoo.com	12.8	41.3
3.	sfpl.lib.ca.us*	5.9	47.2
4.	doubleclick.net	5.7	52.9
5.	cyberjoueur.com	2.6	55.5
6.	msn.com	2.3	57.8
7.	geocities.com	2.0	59.9
8.	passport.com	1.7	61.6
9.	alloy.com	1.4	63.0
10.	javagameplay.com	1.4	64.3
11.	pokemon.com	1.1	65.5
12.	communityconnect.com	1.1	66.6

N = 203,647

* The large amount of traffic to this domain is an artifact, as the EDC home page is in this domain.

TABLE 2. *Primary Purpose of Sites Used by Children in the EDC*

Primary Purpose of Site	% of Time Spent
Play Games	37 [a]
Communicate With Individuals	26 [b]
Find Out About a Topic/Subject	12 [c]
Full-Page Advertising	10 [c]
Find Other Sites	6 [d]
Find Out About Celebrities/Events	5 [d]
Purchase/Research Purchases	2 [e]
Unclassifiable/Other	1 [e]
Unreachable	1 [e]
Total	100%

Cohen's κ = .82***

Note. Figures with different superscripts are statistically different, $p < .05$
*** $p < .01$

TABLE 3. *Site Features by Primary Purpose of Site*

Primary Purpose of Site	Advertising Present	Targets Children	Educational Claims	Non-English Content	Targets Ethnic Com.
Play Games	92%	88%		7%	
Communicate With Individuals	86	1		18	9%
Find Out About a Topic/Subject	62	51	12%	1	3
Find Other Sites	93	84	89	2	7
Find Out About Celebrities/Events	86	37		1	3
Purchase/Research Purchases	33	48	3	3	3
Unclassifiable/Other	54				
Overall	70%	51%	11%	7%	3%
Cohen's κ	.88***	.71***	.42***	1.0***	.96***

Note. Blank cells indicate zeros. Sites whose purpose was "full-page advertising" were excluded from this analysis.
*** $p < .01$

TABLE 4. *Mean Simultaneous Viewing and Sharing by Primary Purpose of Site*

Primary Purpose of Site	Additional Users Viewing Simultaneously	Intracomputer Sharing Statistic
Play Games	1.7	.78
Communicate With Individuals	.6	.27
Find Out About a Topic/Subject	.3	.14
Find Other Sites	.7	.20
Find Out About Celebrities/Events	.2	.16
Purchase/Research Purchases	.2	.13
Overall	1.0	.46