Paper: The Ecology of Children's Computing

Objectives

Today's youth are growing up in a digital age where information and communication skills are necessary to participate in, and contribute to, the workforce and society at large. Research shows the importance of preparing young people to use high-level ICT literacy skills in the workplace (Autor, Levy & Murnane, 2002, 2003; Levy & Murnane, 2004), as well as persistent inequities in the opportunities disadvantaged young people have to become active, creative and critical users of these tools (The Children's Partnership, 2000). Problems of technology access for disadvantaged families have typically been addressed only in one sphere or another – home, school, or community. Yet studies are increasingly showing that children develop important media skills and knowledge as they move fluidly in and across all of these settings -- family, school, peer groups, and community.

In this study, we explore the "digital divide" not only as an issue of access to technology but of access to *meaningful uses* of technology in multiple settings. By "meaningful" use we mean uses that require higher-order thinking skills for productivity, communication and synthesis of information. We conducted case studies of two urban schools with similar curricula and educational philosophies but different types of school computing practices (a "Deeply-Integrated-Technology" school and a "Superficially-Integrated-Technology" school), and traced how these policies and practices played out in the literacies students were developing in school, at home and with peers. Specifically, we found important differences in the ways students in these cohorts develop digital skills and how they view themselves as technology users.

Theoretical framework

The term "digital divide" is generally used to refer to inequities of physical access to technology. A growing body of research suggests that the problems associated with the digital divide are embedded within cultural and economic conditions that cannot be adequately addressed simply by making computers and the Internet more easily accessible in low-resource communities (Schon, Sanyal, & Mitchell, 1999). Even when there is access at school, youth from different family backgrounds are using computers for very different activities, with youth from disadvantaged families facing greater barriers to meaningful use of the technology.

In order to study the roles that schools play in making computer use more, or less, equitable for children, this study employed two analytic frameworks: a digital literacy framework, and an ecological framework. These have been useful in understanding the social contexts of children's learning, development, and possible uses of computers to support learning and development (i.e. the acquisition of digital literacies) across multiple social contexts.

The digital literacy framework is based on previous research on media literacy (Ba, Tally, & Tsikalas, 2002). It addresses four dimensions: troubleshooting, use of generic tools, communicative literacy, and web literacy. These dimensions help in the analysis of how students are developing digital literacy and technological identities. The ecological

framework is based on Bronfenbrenner's theory of the child's social ecologies for development (Bronfenbrenner, 1979), and Epstein's work on the impact of school, home, and community partnerships on children's learning and development (Epstein, 1997; Epstein et al., 2001). We build on Bronfenbrenner's and Epstein's models of influence across learning environments to increase our understanding of how schools may be acting as catalysts in shaping students' uses of technology outside of school.

Methods

This is a two-year, qualitative study that uses a case study approach in two schools, and combines this with home interviews and observations to document technology literacy practices.

Case study schools

We identified two middle schools that have different approaches to technology reflected by each school's level of technology integration. One school had a clear vision of technology use whereby technology is substantially integrated into curricula. The other school had little vision of technology use. Students use technology in minimal and superficial ways that are not tied to core curricula. Both schools serve similar traditionally underserved populations, and have similar pedagogy that includes supporting student-driven inquiry, small group work and collaboration.

Sampling Strategies

A survey was administered to all 7th graders in both schools (approximately 80 students per school per year). From this initial survey, we selected and worked with 46 students (24 in year one, 22 in year two) and their families.

Both schools serve a predominantly working class, Hispanic population, where the majority of students receive free/reduced price lunch. The participants are mostly 1st or 2nd generation immigrants who are from the Dominican Republic, Cuba, Costa Rica, Honduras, Colombia, Mexico, Puerto Rico, Russia, India, Angola, and Jamaica.

Data sources

Data was collected in multiple settings:

- School

In both the "Deeply-Integrated-Technology" school and the "Superficially-Integrated-Technology" school, researchers conducted individual interviews with 12 students per year in 2002-3 and 2003-4. Interviews included:

  - a 50-question protocol
  - production of a list of "Everything I Do with Technology"
  - production of a pie chart representing the time spent on each technology activity.

Researchers interviewed each school's principal, as well as all teachers that used technology with participating students. Classroom and computer-lab observations were conducted to augment interview data.

During the second year of the study, researchers conducted one follow-up interview with each member of the year-one student cohort to investigate the development of their technology habits and attitudes over time.

- Out-of-school

In 2002-3 and 2003-4, researchers visited the homes of 23 students (11-12 per school) to interview each family member about his or her computer use and attitude toward technology. When researchers were not able to make a home visit, interviews were conducted over the telephone.

- After-school

During the first year of the study, several participating students at one school also participated in a technology-focused after-school program. The program leader was interviewed, and participants were observed in this setting.

The data collected have been content-analyzed along the following themes:

1. Vision and practices of technology use in the school environment
    i. Modeling of technology's role in education
    ii. Value placed on technology
    iii. Technology's place in broader expectations about students' futures.
2. Students as users of technology
    i. Resourcefulness vs. possession of discrete skills
    ii. Interconnectedness vs. singularity
    iii. Authorship vs. consumption
    iv. Role of technology-using students in disadvantaged families

Findings

In our preliminary findings we describe (1) the mechanisms by which each school conveyed its vision of technology's utility to students and encouraged students' "appropriate" use of technology in line with this vision; and (2) the profiles of young technology users that have emerged from each school environment, including their specific skill sets, their own philosophy of technology use, and their roles as technology users within their families and communities.

School technology vision and practice.

We found important differences between the technology practices at the two study schools, as well as the messages about technology – explicit and implicit – sent by administrators and teachers at each school to students and families. In our paper we discuss the approach to technology advanced by each school in terms of the following:

1) Teacher/administrator modeling of technology's role, including:
- Technology's placement within the curriculum.
- Staff and student use of technology for non-schoolwork purposes.
- Attitudes about computer-produced work.

2) Apparent value of technology as demonstrated by how it is prioritized by the school, including:
   - The condition and placement of hardware and software in the two schools.
3) Place of technology within broader expectations about students' futures.

Student technology users.

The different visions of technology's utility in our two study schools were strongly reflected in the habits of technology use followed by students from each school. Though students from both schools possessed individual technology skills (the ability to use certain software applications, etc.), students from the two schools tended to be markedly different in their overall approach to technology use, in the breadth and hardiness of their interest in using technology to pursue both extrinsically and intrinsically motivated tasks, and in their roles as technology users within their families and communities. We describe the key characteristics of students from the two schools under the following conceptual headings:

1) "Resourcefulness" vs. possession of discrete skills. Resourceful students thought of technology as a range of tools and skills at their command that could be used to address a range of needs, and we observed easy transferability of technology skills from one arena to another (schoolwork to work for the family, school-related communication to personal communication, etc.). By contrast, less resourceful students possessed discrete skills that they applied almost exclusively to those tasks for which the skills had initially been taught.

2) Interconnectedness vs. singularity. Interconnected students functioned within a network of similarly educated and skilled students, networked teachers, and family members (whose interest in computing and presence online was often fostered by the students themselves). As a result their use of technology was supported and furthered by a web of social and work-related relationships that evolved along with each student. By contrast, "singular" students – even those with strong technology skills – often pursued their interests and practiced their skills in relative isolation. We found that the technology use of these more solitary individuals was more vulnerable to shifts in the individual child's interests and agendas.

3) Authorship vs. consumption. Students who placed themselves primarily as "authors" in their relationship to technology were frequent composers of text and multimedia documents, and empowered searchers for technology-based information and entertainment. These students were skilled at adjusting the

purpose of technology resources to suit their own agendas. Students who placed themselves primarily as consumers tended to have a more passive relationship to technology; these students were less skilled at finding information using search tools and tended, for example, to play games for entertainment, rather than using technology tools to compose their own creative work.

4) Role of skilled technology-using students in disadvantaged families.

Each of the previous facets of students' approach to technology use was reflected in, but also reinforced by, their role as technology users within the family.

Importance of the study.

This study clarifies the roles that schools play in making the affordances of computing more socially equitable for disadvantaged children, and enhances research on the digital divide. Specifically, we believe that this study and others like it will inform educators about:

- The ways that school uses of technology have an impact on disadvantaged families' use of technology in out-of-school settings.
- The effect that in-school use of technology that is *well integrated* into the school curriculum affects how children from disadvantaged families use technology.
- The ways that disadvantaged families act to further their children's educational use of technology when technologies are not well integrated into schooling, and the resources required by such families.

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