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Changing Conceptions and Uses of Computer Technologies in the Everyday Literacy Practices of Sixth and Seventh Graders

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This study focused on 189 sixth and seventh graders in two large suburban schools and their use of computer technologies as part of their everyday literacy practices. We were especially interested in the students' conceptions of computer technologies and how computer use varied across grade and reading levels. The study included a survey completed by all 189 students that provided an overview of students' uses of computer technologies and other literacy practices. Interviews with 24 students provided more detailed information on how sixth- and seventh-grade students at different reading levels used and conceptualized computer technologies in and out of school. Findings showed that many students, especially sixth graders, were far less interested in computer technologies than is suggested by common conceptions. Findings also showed an important shift between sixth and seventh graders toward more interest in practices that provided social interaction or entertainment. Some of the conceptions these students held about computer technologies could be attributed to changing social and developmental needs, but a variety of factors, such as literacy skills and contexts of use, influenced these students as well.

In the past decade, American schools have made great progress in getting connected to the Internet. The National Center for Education Statistics [NCES] (Wells & Lewis, 2006) reported that only 3% of American schools were connected in 1994, while 94% were connected in 2005. In a recent issue of *Education Week*, Viadero (2007) noted, "students' use of technology outside school is already outstripping their use of it in the classroom" (p. 33). Even with a growing number of studies on adolescent computer use, less is known about younger adolescents' conceptions of computer technologies, how their literacy skills affect their views and uses, and how these technologies are part of their daily literacy practices. However, the findings of some larger studies such as the Pew Internet and American Life Project (Lenhardt

& Madden, 2005) and the Scholastic Kids and Family Reading Report (2008) suggest that younger adolescents are not as involved in computer technologies as older adolescents, contrary to popular conceptions of all teenagers as deeply immersed in them. We were interested in when younger adolescents began to change their conceptions, what they had to say about themselves as users of these technologies, and how their computer use intersected with their reading skills and habits.

Our study approached questions about both literacy practices and computers and their effects from the perspectives of sixth- and seventh-grade students. We wanted to know how the students used and conceptualized computer technologies as part of their literacy practices and everyday lives and if there were differences between the sixth and seventh graders' uses and conceptions. We were also interested in the various factors that informed their conceptions and uses of computers as part of their everyday literacies. Thus, this study differs from many previous studies in that we were not interested solely in adolescents' uses of technology; rather we wanted to investigate how these sixth and seventh graders differed, if at all, in their literacy practices and conceptions, including their uses of computer technologies.

Developmentally, sixth- and seventh-grade students are at a pivotal point. Their mental and physical capacities are changing rapidly. They are beginning to experience a larger social world. They are not only acquiring new tools for interpreting the cultures that surround them but also learning how to think about those tools in reference to their rapidly changing lives.

Theoretical Framework

We drew upon sociocultural theories of literacy to highlight the ways in which these adolescents' conceptions and practices were informed by contexts of practice and social interactions, ideas that are central to what are called "the New Literacy Studies" (e.g., Barton, 1994; Gee, 1996, 2000, 2001; Street, 1995). In this paper, we use the term "literacy" in the way Barton and Hamilton (2000) described it: "coherent configurations of literacy practices" that are "associated with particular aspects of cultural life" (pp. 10-11). This definition worked well in framing both the conceptions and the practices of these sixth and seventh graders. Barton and Hamilton also recognized the tendency of "powerful institutions" like schools "to support dominant literacy practices" (p. 12) while individuals, on a micro level, often draw upon a range of literacies that reflect particular social domains within a culture. This more nuanced view shows how personal agency and social reproduction intersect in everyday literacies. In the current study, we focus on some of the intersections between agency and reproduction in explaining the differing literacy practices of sixth and seventh graders.

We also framed this study in terms of situated literacies, based on the work of scholars who have conceptualized learning as deeply influenced by social and cultural factors that range from local to global (e.g., Brown, Collins, & Duguid,

1989; Heath, 1983; Lave & Wenger, 1991). We found it useful to think about these students' literacy practices and their conceptions of computer technologies as situated within their daily lives and as shaped by the contexts of school and home. Lave and Wenger (1991) described learning as occurring within a community of practice where understandings of technologies are often transparent but can be made visible by examining "the cultural practice and social organization within which the technology is meant to function" (p. 102). Moreover, the technology "cannot be viewed as a feature of an artifact in itself but as a process that involves specific forms of participation, in which the technology fulfills a mediating function" (p. 102). They noted that the "visibility of the significance of the technology is necessary for allowing its unproblematic—invisible—use" (p. 103). In the present study, adolescents' use of computer technologies was assumed to be typical for adolescents by us as researchers and in popular opinion. However, when examining these young adolescents' literacy lives and their uses and conceptions of these technologies, we found a more complex picture, one in which the significance of these technologies varied greatly depending on grade level and reading level.

In making the case for a more pluralistic literacy education in schools, Kress (2003) argued that there is a "profound difference between the traditional page and its reading path and the new page—derived from the principles of the organization of the screen—and its reading path" (p. 162). The traditional page, according to Kress, offers a clear, well-organized path. All that is required of the reader of the traditional page is to follow the path and to interpret and transform what is on the page. With the new screen path, readers are offered "a range of possible reading paths, perhaps infinitely many" (p. 162). The task of the reader in front of a screen text is to "establish order through principles of relevance of the reader's making, and to construct meaning from that" (p. 162). He further argues that ways of reading are rapidly changing as multimodal communication becomes more dominant and those changes will make reading more challenging, not less: "The demands on readers, and the demands of reading, will if anything be greater, and they will certainly be different" (p. 167). Our research considers, in part, how these middle school readers, representing different reading levels, viewed both traditional reading and multimodal reading on a computer screen and how challenging multimodal reading was for them. In other words, we were examining their uses of computer technologies as situated within a wide range of literacy practices, but particularly examining how their grade level and conceptions of reading and computer technologies shaped their views. In the review below, many of the studies address those practices outside school and how students are engaging in them.

Related Studies on Adolescents and Computer Technologies

Most studies on adolescents' uses of computer technologies, as noted above, have focused on a small number of participants in order to offer in-depth studies of

students' online practices (Albright, Purohit, & Walsh, 2002; Alvermann, 2002; Chandler-Olcott & Mahar, 2003; Coiro & Dobler, 2007; Facer & Furlong, 2001; Grisham & Wolsey, 2006; Guzzetti & Gamboa, 2005; Hunley, Evans, Delgado-Hachey, Krise, Rich, & Schell, 2005; Knobel, 2001; Lei, & Zhao, 2007; Lenhart & Madden, 2005; Lewis & Fabos, 2005; Merchant, 2001; Selfe & Hawisher, 2004; Upitis, 1998; Vasudevan, 2007; Wilder & Dressman, 2006). These studies, mostly qualitative, have provided a close view of problems with access or inequities as well as analyses of the content of online communications or connections to academic achievement. While these studies provided insights into the effects of computer technologies on adolescents, many focused on older adolescents' uses of computer technologies rather than on younger teenagers and their conceptions of these technologies as part of their overall literacy practices.

In an early study on how computers were becoming important in teenagers' literate lives, Bean, Bean, and Bean (1999) offered an intergenerational conversation between Tom Bean, the researcher, and his two daughters, then aged 12 and 16, about the functionality of their literacy practices in their everyday lives. The father asked his daughters to chart their use of time over two weeks and then conducted audiotaped interviews with them about the functions of the various activities they recorded. Both girls spent time with a variety of textual materials, television, and forms of communication. The older daughter spent far more time online during the two weeks of data collection than did her younger sister (13 hours vs. 30 minutes), an important difference that Bean et al. do not explore but that is relevant to our study. The father concluded that "outside the narrow confines of school, adolescents routinely explore multiple sign systems," and he pushed for changes in schooling: "Content teachers must move away from a dependence on didactic, text-bound modes of teaching that place adolescents in passive roles" (p. 447).

In another father-as-researcher study, Merchant (2001), a British researcher, investigated how teenaged girls (aged 14-16), including his two teenaged daughters and four of their friends used language in Internet chat rooms. He was interested in these girls' perceptions of chat rooms and their "learning about new ways of social and linguistic interaction" (p. 293). Data consisted of observations of one online conversation with each girl, a transcript of this conversation, and 20-minute interviews with each of the girls. Merchant concluded that such innovations as he observed in the girls' chats represented "a significant feature of the contemporary world" (p. 305) and that "popular electronic and digital communication, particularly as used by young people, is becoming a site of struggle in which existing forms of linguistic capital are challenged" (p. 305). Merchant provided no information about how the ages of the participants affected the overall use of chat rooms; all data were generically attributed to the girls.

Both Bean et al. (1999) and Merchant (2001) noted a disjunction between their adolescents' in-school and out-of-school uses of computer technologies. Some

studies have specifically targeted the lack of legitimacy in schools for competencies with new forms of literacy. Many literacy researchers (e.g., Alvermann, 2002; DeVoss, Hawisher, Jackson, Johansen, Moraski, & Selfe, 2004; Hull & Schultz, 2002; Vasudevan, 2007) have exposed the sharp divisions between traditional language arts and English classrooms and adolescents' online literacies. Lewis and Fabos (2005) concluded that if educators do not attend to new literacy practices in school, "we may find ourselves schooling young people in literacy practices that disregard the vitality of their literate lives and the needs they will have for their literate and social futures at home, at work, and in their communities" (p. 498).

As Barton and Hamilton (2000) and Gee (1996) noted, schools can shape particular literacy practices simply by reifying or ignoring them. When schools ignore students' developing online literacies, they lose opportunities to shape their conceptions of online technologies as tools for learning and for powerful ways of communicating with others in their culture, or even across multiple cultures. This emphasis on disparities between school literacies and those literacies adolescents are developing outside of school, especially with computer-based technologies, is addressed by a number of literacy scholars (e.g., Alvermann, 2002; Gee, 2005; Lankshear & Knobel, 2002; Williams, 2005). Williams, like these other scholars, addressed the primary disparity in terms of a "disconnect" between more traditional literacies valued in schools and "vernacular literacy practices" (2005, p. 704) the students voluntarily master outside of school.

Other studies have focused on adolescents' writing online. Lewis and Fabos (2005) examined adolescents writing instant messages and how this kind of writing was connected to developing social relations. Lankshear and Knobel (2002) investigated adolescents' writing in online "zines" where they could self-publish on topics of interest to them. Online journaling was the focus of a small study by Guzzetti and Gamboa (2005). They investigated two high school girls' journal writing. The girls were in Advanced Placement English classes and were highly competent users of technology, had no problems with access, and were described as "prolific writers" (p. 175). The purpose of the study was to "explore how and why adolescents choose to read and compose online journals" (p. 168-169). The researchers found that these girls' online practices not only signaled their social identities but also "obscured the line between out-of-school literacy practices and in-school literacy by connecting and interchanging their electronic journaling with their in-school discussions and assignments" (2005, p. 199).

Two single case studies of disaffected male high school students (Knobel, 2001; Vasudevan, 2007) show how school literacies often alienate disaffected or struggling students who may have developed competencies with technologies that are typically not valued in traditional school curricula. Both studies are framed using arguments from New Literacy and critical literacy scholarship.

Studies on adolescents and computer technologies have also been done in

educational psychology. Two recent studies are relevant to our study in that they addressed younger students' conceptions of computers. Yan (2005) investigated 322 computer users from four age cohorts (5-8, 9-10, 11-12, and adults). He found that age, more than experience online, was an important factor in children's ability to understand the technical and potentially harmful aspects of the Internet: "Children begin to understand the Internet as a complex artifact cognitively and socially during the 9-12 age range" (p. 394). In a second study, Yan (2006) found that younger adolescents were developing conceptions of the technical complexity of the Internet at a different pace than conceptions of its implications for social uses. He concluded, "by Grades 5 and 6, children have reached the adult level of understanding of the technical complexity of the Internet. However, it is not until Grades 7 and 8, early adolescence, that children reach the adult level of understanding of the social complexity of the Internet" (p. 426). These findings echoed some of the findings of the present study.

Not All Adolescents Are Interested or Competent Users

In spite of studies, such as Yan's (2005, 2006), that suggest important age differences in adolescents' understanding of technology, a common theme in much of the literature on teenagers and computers is that all adolescents comfortably inhabit a technological world and have expertise with computer technologies. However, these kinds of assumptions do not take into account the variability of adolescent computer use at different ages and more nuanced social and contextual factors that influence use, especially among younger teens.

Contrary to popular conceptions of all youth as competent computer users, Facer and Furlong (2001) discovered that a number of adolescents were not engaged in using computer technologies, especially younger adolescents. In their study of 855 British adolescents between the ages of 9-14 who used computers in limited ways or not at all, they found that many of these youth were "low or ambivalent" users but for varied reasons. Facer and Furlong described three themes that emerged among the respondents: issues of access, relevance to everyday activities, and "the potential of formal educational contexts for reproducing anxieties and inequalities of access" (2001, p. 455). Moreover, they found that "many of these young people had clearly defined perceptions of the benefits and functions of computer technology and that these perceptions did not necessarily correspond with the ways in which they constructed their own identity" (2001, p. 459). Many of these adolescents rejected online activities as the province of other social groups from which they felt alienated. These findings reflect a more complex picture of adolescents' conceptions of computers in terms of social relations.

Particularly relevant to our study were two studies that looked at technology use as part of students' overall literacy practices and that considered the effects of reading skills on computer use. Wilder and Dressman (2006) explored some of

those complexities of adolescent computer use in their study of six ninth-grade students, three of whom were strong readers and three of whom were struggling readers. Using New Literacy theory, the authors examined how social capital played out in these students' abilities to use computers for learning. The three strong readers were in an advanced class and the struggling readers were in a class where students generally read below grade level. Although all the students were familiar with computers, the struggling readers had far more difficulty completing a Web search to finish an assignment on Caribbean cultures for their cultural geography classes. Wilder and Dressman (2006) concluded that the theoretical literature on New Literacies that focused on access alone needed to be reexamined: "Assuming relatively equal access in their school careers to computer-based technologies at school, we would also expect that the students' technical abilities with the search process would show equivalent levels of sophistication" (p. 223). They concluded,

> This study suggests that one's capacity to use New Literacies in academic contexts remains contingent on one's level of proficiency in Old (print text-based) Literacy, while the development of technical practices sophisticated enough to take full advantage of Web-based sources' academic knowledge depends on more than the assumed provisions of access and opportunity at home. (p. 224)

A second study by Moje, Overby, Tysvaer, and Morris (2008) looked at the literacy practices of 716 seventh, ninth, and tenth graders in urban schools that were largely Latino/Latina. They found that only 28% of these students reported reading web sites outside school in the previous month and that lack of access was the major obstacle for many students. The researchers also challenged the notion that most adolescents are online and asked, "Does high use among middle- and upper-middle class youth mask the poor access of young people in high-poverty communities, whether urban or rural?" (2008, p. 127). Although no breakdown by grade level was reported on specific literacy practices, the aggregated findings suggest that these urban adolescents were reading outside school but perhaps not the kinds of texts that would support school performance. The researchers concluded that the Internet divide still exists for these students and, importantly, those students who were using the Internet were not using it in ways that were supportive of school performance.

Age differences in adolescence are also important influences on computer use. Large-scale studies like that of the Pew Internet and American Life Project— based on a telephone survey of 1,100 students aged 12 to 17 and one parent or guardian—reported on adolescents' uses of computer technologies, especially the Internet (Lenhart & Madden, 2005). This study found that instant messaging was the technology of choice for many adolescents with 75% of online teenagers and 65% of all teenagers reporting using IM. Older adolescents were more likely

to use IM and email than younger adolescents. Twelve-year-olds were least likely to use IM or email on a regular basis or at all. These findings and some of those cited above suggest that younger adolescents are on the cusp of more intense use of computer technologies, but that they become far more interested participants after their 14th year.

　　More recently, Scholastic and Yankelovich (2008), in a study of over 1000 students aged 5 to 17, reported that younger adolescents still preferred reading books to reading electronic texts. Overall, 62% of the interview respondents preferred reading books to reading electronic texts. They also found that students aged 9 through 17 began to extend their reading practices to include online texts. The study also showed a steep decline in reading from the upper elementary years to the high school years. Clearly, much is happening to literacy practices in the middle school years as young adolescents begin to broaden their social lives, gain more independence, and experiment with new technologies.

The Present Study

This study focused on some of the changes taking place in young adolescent readers and differences in their uses and conceptions of computers in this cusp period. We specifically investigated how sixth- and seventh-grade students in two suburban middle schools used computers as part of their everyday literacy practices, how sixth and seventh graders' conceptions of computer technologies differed, and how their conceptions and use differed across reading levels and grade levels. Our research questions included the following:

- How are sixth and seventh graders using computer technologies in and out of school, and how do those uses change from sixth to seventh grades?
- What conceptions of computer technologies do these sixth and seventh graders hold, and how do those conceptions change from sixth to seventh grade?
- How are these students' uses and conceptions of computer technologies related to their everyday literacy practices, specifically their reading practices?
- What social and contextual factors inform these students' uses and conceptions of computer technologies in and out of school?

Methods

This study included both qualitative and quantitative data on sixth- and seventh-grade participants in two suburban middle schools. Quantitative data from a Literacy Inventory administered to 189 sixth and seventh graders in the two middle schools provided an overview of the ways in which these students used computer technologies. Qualitative data from classroom observations and individual interviews

conducted with 24 students provided more detailed individual information on the degree to which these students used and conceptualized computer technologies in and out of school, their everyday lives, and their literacy practices. These data were collected by four researchers over a two-month period. All names used in this report are pseudonyms.

School Sites

We were interested in capturing baseline data on younger adolescents' changing literacies, especially changes in conceptions and uses of online technologies, through their perspectives. We selected the two middle schools—Oak Hill and Fisher—because they represented typical suburban schools. We wanted data on younger adolescents who had computer access at home and school to better understand their uses and conceptions before focusing in future studies on schools where access might be a large factor in students' uses and conceptions of computer technologies.

Both middle schools had comparable student populations. Oak Hill had 1675 students enrolled with 33 African American, seven Latino/Latina, and two Asian students. Only 17% qualified for a free and reduced lunch program, reflecting the largely middle-class demographics of the school population. Fisher Middle School had 1375 students enrolled with 38 African American, 16 Latino/Latina, and 48 Asian American students. Like Oak Hill, only 17% of the students qualified for a free and reduced lunch program.

Both schools were well funded and had at least one computer in every classroom and well-equipped computer labs. These schools provided typical samples of middle-class, suburban populations. According to an NCES study (Alt & Choy, 2000), most middle schools (grades 6-8) are located in larger school districts that have more resources than smaller districts.

Participants

We invited all the sixth- and seventh-grade language arts classes in each school to participate. A total of 189 students—68 sixth graders and 121 seventh graders—from four classes in each school agreed to participate. Participation was voluntary, and both the students and parents/guardians had to agree to participation. Mean ages ranged from 11-15, and the students represented a range of reading levels. All 189 students completed a Literacy Inventory (LI). From these students, we selected 24 students, 12 from each school, for two individual tasks—a reading recall task and an audiotaped interview. Student assent and parental consent were required for participation.

To select interview participants who represented a range of reading ability levels, we asked each teacher to supply names of students whose reading scores and performance in reading would indicate that they were advanced, proficient, or basic readers (categories established by the National Association for Educational Progress or NAEP). We asked teachers to select three names at each reading level.

We arbitrarily selected the second name in each level for interview participants.

We conducted a reading recall protocol (see description below) with interview participants that helped to confirm the selections of teacher-assessed reading levels.

Data Sources

One data source was a 73-item Literacy Inventory (LI) completed by 189 students. Their responses to items on technology uses are reported here. The LI was distributed during regular instructional time to all students who assented to participate (and whose parents also consented) in the participating sixth- and seventh-grade language arts classrooms at the two middle schools. The teachers arranged for non-participating students to do other work while participants were completing the LI. Students were able to complete the LI within a single 50-minute class. The researchers distributed and collected the LIs.

The LI included three sections. The first section had two parts that addressed general literacy practices. Part A asked about the amount of time spent on specific activities. For example:

How much time do you spend each day playing computer games?
a. about half an hour
b. about 1 hour
c. about 2 hours
d. 3 hours or more
e. I usually don't play computer games

Part B included a series of yes/no questions about literacy practices and tools such as "Do you have high speed Internet in your home?" and "Do you have your own cell phone?" The second section of the survey included a short section with items on literacy practices such as "I look up information on the Internet" with choices of "Almost never," "Sometimes," "Often," "Most of the Time," or "Almost always." Another short section followed asking about preferences for different kinds of texts (e.g., "I like to read: science fiction/comic books/etc."). The third section focused specifically on how they perceived themselves as readers and what kinds of literacy experiences they had in school. For example:

I find going to the Internet to learn about the story or author…
a. Very useful.
b. Not very useful.
c. I don't remember doing this in my English class this year.

A second data source for this paper was an audiotaped interview with each of 24 selected students where questions about technology and other literacy practices were asked. We conducted the interviews during each student's regular language arts class period in private spaces provided by the schools (about 45-50 minutes).

The interview protocol included semi-structured, open-ended questions that allowed each researcher to use appropriate prompts. The questions focused on the student's history as a reader, on their perspectives on their reading practices, and on computer technologies with an emphasis on the contexts of these practices (e.g., home, school, interactions with friends). Each interview was audiotaped and transcribed.

Reading Recall Protocol

Before each interview took place, we conducted a short reading recall protocol with each student, as a third data source to confirm the teachers' assessments of the interview students' reading skills. A short story entitled, "Baby on the Beach" by Alix Kates Shulman was selected as the main text that was used in this part of the study. The story is three pages in length and focuses on the reactions of a woman who finds a small boy crying on a beach. Each student was asked to read the story as they normally would, and they were informed that their reading would be timed. After the reading task, participants were unexpectedly presented with the following set of instructions:

- Write down every bit of the story you have just read that you can remember.
- Try to use the same order and same words as in the story.
- If you cannot remember exactly, write as close to the actual story as possible.
- Let me know when you're finished.

Students were given an unlimited amount of time to recall the story. As noted above, this task was an incidental recall task, as participants were not informed, prior to the start of the study that they would be asked to perform a free recall task. Craik and Lockhart (1972) in their classic work on "levels of processing" indicated that this type of task provides for a purer measure of memory encoding, devoid of the strategic and elaborative types of processes that readers may engage in when they intentionally read information. That is, the current task more closely resembles the day-to-day types of reading tasks that students perform, as they acquire and encode new information.

Reading Recall Analysis

Three independent judges evaluated the story and counted the number of propositions or idea units present. An idea unit is the smallest unit of knowledge or information about which it makes sense to evaluate whether it is true or false (Anderson, 1983). As agreed upon by the judges, the total number of idea units within the story used here was 36 (see Appendix A). For each participant, reading time and number of idea units were recorded, and means and standard deviations across reading ability levels are included in Table 1. Additionally, ANOVAs (analysis of variance) and planned comparisons (e.g., *t* tests) were performed on the read-

ing time data, as well as the data describing memory for idea units. Results are reported within the results and discussion section below. Effect sizes (i.e., Cohen's *d*) are also included within the discussion of these data.

The overall ANOVA indicated that the advanced readers read the fastest, followed by the proficient readers, and then the basic readers (*M*'s = 316, 403, and 428, respectively) [*F* (2, 23) = 2.76, *p* = .09, Cohen's *d* = .48]. In addition, the advanced readers remembered the most idea units, followed by the proficient readers, and then the basic readers (*M*'s = .45, .36, .28, respectively) [*F* (2, 23) = 3.11, *p* = .06, Cohen's *d* = .52]. These results lend support to the notion that these groups represented separable groups of differing reading ability, as identified by their teachers.

tAble 1: **Means and Standard Deviations (SD) for Reading Times and Number of Idea Units Recalled in Sixth- and Seventh-Grade Participants across Reading Levels (reading times reported in seconds)**

reAding levels	numberof pArticipAnts	reAding time	sd
Reading Time			
Advanced	8	316	113
Proficient	8	403	74
Basic	8	428	107
Idea Units			
reAding levels	numberof pArticipAnts	ideA units	sd
Advanced	8	.45	.11
Proficient	8	.36	.14
Basic	8	.28	.05

Additionally, several significant findings emerged, as *t*-tests (Bonferroni correction applied) were used to examine the following four, planned comparisons. Reading times were significantly faster for advanced readers as compared to proficient readers, *t*(7) = 2.91, *p* < .05 (Cohen's *d* = 1.03). In addition, reading times were significantly faster for advanced readers than for basic readers, *t*(7) = 2.72, *p* < .05 (Cohen's *d* = .96). However, reading times did not differ significantly between proficient and basic readers (*p* > .05). Finally, advanced readers recalled a significantly greater number of idea units than did basic readers, *t*(7) = 3.17, *p* < .05 (Cohen's *d* = 1.12). It appears that on both measures, advanced readers seem to outperform readers in the other two reading levels with the most significant differences emerging in comparisons between those readers and basic readers—the two extreme groups.

Overall, it appears that the more adept a student is at reading, the faster they tend to read and the greater the number of idea units they tend to report. This is

especially true when comparing advanced readers to basic, or weak readers—the two most distinct types of readers, in the current study. Their ability to read and recall text influenced their overall literacy practices including how they used computer technologies as reported in the findings.

Analyses of Literacy Inventory

The statistical treatment of the LI data, analyses performed, and statistical tests that were applied to the data are noted below within each of the following sections, as appropriate. The survey data, after being scanned, were tabulated. Frequency counts were taken for each response by response category for all sixth- and seventh-grade participants. Frequencies were then converted into percentages, given the fact that the two groups had an unequal number of respondents—68 sixth graders vs. 126 seventh graders. Results for those questions pertaining to computer use and conceptions and perceptions related to the use of technology are included in Tables 1-7. Additionally, planned chi square analyses were performed for various cross-group comparisons as noted below.

Analyses of Interview Data

We used a grounded theory approach for the analyses of the interviews. Each researcher read all the interview transcripts for each of the 24 interviewed students. As a group, we met regularly over an eight-month period to code and analyze the interview data. We began developing initial or open codes (Charmaz, 2006; Strauss & Corbin, 1990). Initial or open coding, as Charmaz (2006) noted, "consists of this initial, shorthand defining and labeling" (p. 47). We used a process that involved moving back and forth between rereading data, making analytic memos, and finally refining codes and developing categories.

Because we were interested in patterns of use in and out of school as well as conceptions, we started with two sets of coding tags at the axial coding stage (Charmaz, 2006; Strauss, 1987). Codes that reflected students' use of computer technologies had a general tag of TU with a number added to indicate the type of use. Codes that reflected students' conceptions on computer technologies were tagged with TC and a number to indicate the type of conception. (See Appendix B for codes and examples.)

We created categories based on "linkages" (Strauss, 1987, p. 33) with the codes. We began to construct the categories and themes that are used to present the findings from the 24 interviews that showed how these sixth and seventh graders' uses and conceptions of computer technologies differed. We found three categories of use (school related work, personal entertainment/knowledge, and social networking) and three categories of conceptions (personal relevance, trustworthiness, and difficulty of use) that represented themes in these students' responses. The findings from the interviews are presented below under discussions of the major themes and then illustrated in profiles of three students. The profiles offer a closer view

on how sixth- and seventh-grade students differed and how their conceptions of themselves as readers intersected with their conceptions and uses of computer technologies.

Limitations

As acknowledged above, the participants in this study represented a suburban middle school population because we were interested in collecting baseline data on students who had ample access to computers and the Internet at home and at school. Thus, the results are limited by that decision. We also depended on voluntary participation, as required by our Institutional Review Board (IRB), so students who participated self-selected themselves. However, we ended up with a group of participants who represented a wide range of reading ability levels, from special education students to very advanced students.

Results and Discussion

Computer Use as Reported on Literacy Inventory

Students answered a series of questions about their use of technology on the LI and questions on their everyday literacy practices. Of the 189 students, almost all of them reported they had at least one computer and high speed Internet access at home. When asked about Internet access at home, 100% of the sixth graders and 96.4% of the seventh graders reported they had access. Only one sixth grader and two seventh graders reported on the LI that they had no home computer. The high percentages of home computers and Internet access among the respondents reflected the overall demographics of these suburban middle schools. The findings reported in this section focus on the results of the analysis of the LI. We include tables that show the overall percentages of students' responses for each grade level and tables showing comparisons for students by grade level (see Tables 1-7).

Email Use

The LI revealed that email was not used by many of these students. Nearly 54% of the sixth graders and 60% of the seventh graders indicated they sent no email. Those who reported the heaviest use of email were represented in the seventh grade. The mean percentage of students sending 7 or more emails a day increased from 3.2% in sixth to 10.2% in seventh grade, $c^2 = 3.92, p < .05$. (see Table 2). However, there were some interesting differences across reading levels.

Analyses across reading levels showed that email use differed for each reading level group (see Table 3). Basic readers reported the least use of email. However, proficient seventh-grade readers showed significantly more email use than sixth-grade proficient readers who were sending 7 or more emails a day (6.7% vs. 16.7%, $c^2 = 2.85, p < .10$). In comparison, advanced seventh-grade readers showed a more modest increase for 7 or more emails a day as compared to sixth-grade readers

tAble 2: Overall Email Use by Grade (percentages)

6th Grade: Emails sent per day	n=68	7th Grade: Emails sent per day	n=121
a. None	53.8	a. None	59.9
b. 1-3	32.9	b. 1-3	26.7
c. 4-6	2.4	c. 4-6	3.3
d. 7 or more	3.2	d. 7 or more	10.2

NOTE: Values reflect the rounding of numbers, particularly in the rare cases in which a participant failed to respond to a given question within the inventory.

though this effect was not statistically reliable (2.9% vs. 9.8%, $c^2 = 2.64$, $p > .05$). These findings suggest that although the majority of these students did not use email, email use showed moderate overall increases, regardless of reading level, among seventh graders.

tAble 3: Email Use by Grade Level and Reading Ability (percentages)

Emails sent per day	Basic 6th	Basic 7th	Prof. 6th	Prof. 7th	Adv. 6th	Adv. 7th
a. None	54.5	56	51.1	66.7	55.9	56.9
b. 1-3	22.7	36	37.8	16.7	38.2	27.5
c. 4-6	0	4	4.4	0	2.9	5.9
d. 7 or more	0	4	6.7	16.7	2.9	9.8

Instant Messaging

Although many students did not use IM (see Table 4), there was a preference for this means of communication over email. About 37% of the sixth and seventh graders indicated they did not use IM. Comparisons across reading levels revealed some interesting differences (see Table 5). For example, although the trend was higher overall use in seventh grade, proficient readers showed a decrease in the use of IM from the sixth to the seventh grades, $c^2 = 20.56$, $p < .001$. However, among heavy users (two or more hours of IM a day), advanced readers showed a sharp increase. Only 5.9% of the sixth graders were using IM two or more hours a day, but over 29% of the seventh graders reported this level of use, $c^2 = 4.05$, $p < .05$. Overall, the means showed little change in the use of IM in seventh grade except among the advanced readers.

Computer Games and Searching

When asked on the LI about the amount of time they spent playing computer games, over 65% of the sixth graders reported not playing computer games at all (see Table 6). Among seventh graders, the numbers were reversed. About 41% of

тАЬle 4: **Overall IM Use (percentages)**

6th Grade: Time per day using IM	Total % n=68	7th Grade: Time per day using IM	Total % n=121
a. None	37	a. None	37.9
b. 30 min. or less	27.2	b. 30 min or less	18.6
c. About 1 hr.	23.3	c. About 1 hour	21.5
d. 2 or more hrs.	12.4	d. 2 or more	21.9

тАЬle 5: **Time Spent Using IM by Grade Level and Reading Ability (percentages)**

Time spent sending IMs per day	Basic 6th	Basic 7th	Prof. 6th	Prof. 7th	Adv. 6th	Adv.7th
a. None	45.5	32	15.6	58.3	50	23.5
b. 30 min. or less	22.7	20	35.6	8.3	23.5	27.5
c. About 1 hr.	13.6	20	35.6	25	20.6	19.6
d. 2 hrs. or more	18.2	28	13.3	8.3	5.9	29.4

тАЬle 6: **Overall Time Spent Playing Games (percentages)**

6th Grade: Time per day playing Computer games	n=68	7th Grade: Time per day playing Computer games	n=121
a. About 30 min.	13.7	a. About 30 min.	17.6
b. About 1 hr.	10.9	b. About 1 hr.	13.6
c. About 2 hrs.	6.4	c. About 2 hrs.	13.6
d. 3 hrs. or more	6.4	d. 3 hrs. or more	14.3
e. Don't play	65.2	e. Don't play	40.7

the seventh graders did not play while 59% did. Comparisons across reading levels (see Table 7) showed that heavy game playing (three hours or more) went from 2.2% of the sixth-grade proficient readers to 25% of the seventh-grade proficient readers, $c^2 = 14.86$, $p < .001$. Overall, there were modest increases in time spent playing computer games by the basic and advanced readers in comparisons between sixth and seventh grades.

Looking Up Information

Students in both sixth and seventh grades used the computer to look up information for school and for topics of personal interest (see Table 7). They were asked if they looked up information "Almost never," "Sometimes," "Often," "Most of the time," or "Almost always." The findings suggest that students in both grades used the computer for informational purposes. Overall, there appear to be no significant

tAble 7: Time Spent Playing Games by Grade Level and Reading Ability (percentages)

Time spent playing games per day	Basic 6th	Basic 7th	Prof. 6th	Prof. 7th	Adv. 6th	Adv.7th
a. About 30 min.	18.2	16	11.1	16.7	11.8	20
b. About 1 hr.	9.1	20	8.9	16.7	14.7	4
c. About 2 hrs.	0	12	13.3	16.7	5.9	12
d. 3 hrs. or more	9.1	8	2.2	25	0	10
e. Don't play	63.6	44	64.4	24	67.6	54

differences in the frequency of computer use specifically for the acquisition of information from the sixth to the seventh grades, within each reading level (p's > .05). However, there appears to be a trend toward more usage for advanced readers than for proficient and basic readers across grade levels (i.e., among respondents who selected "Almost Always" as a response). Thus, while increasing their social uses of the computer, as mentioned previously and described in greater detail below, participants were also using computers regularly for informational purposes particularly at advanced reading levels.

Computer Use and Conceptions among the Interviewed Sixth and Seventh Graders

We interviewed 24 students who were selected from the 189 students who completed the LI (see descriptions of selection process in Methods). The interview lasted about 45-50 minutes. These interviewed students represented a range of reading abilities, socio-economic situations, and racial/ethnic identities. All 24 interview students, with the exception of the one student with no home computer, had home computers (and some had more than one) with high speed Internet connections. The focus of the interview was on who they were as readers, their conceptions of themselves as readers, and their use of and conceptions of computers and the Internet. We begin this section with profiles of three students and then present our findings, organized by major themes, across the interviews with sixth and seventh graders.

Profiles of Amy, Rachel, and Chris

We present three profiles—of a sixth grader, Amy, a seventh grader, Rachel, and another seventh grader, Chris—to illustrate in more depth some of the key differences between sixth and seventh graders and how students with different abilities and preferences defined *themselves* as readers, what they thought about computer technologies, and what role these technologies had in their lives in and out of school.

Amy: "I Guess I'm Pretty Good." Amy, a sixth grader, identified herself as a "pretty good" reader, although she was not sure what makes a good reader. Her teacher identified her as a proficient reader, and her reading protocol performance con-

firmed that assessment. Amy was also a social reader. Her friends were part of her reading life, and she was at the center of a social network in which book swapping played a major role.

Amy described her recent reading as wide ranging, from Anne Frank to popular young adult fiction. However, she found school reading more challenging. She had a strong preference for novels, but identified expository text as problematic: "Um, I don't really like scientific books. Like books on machines and mechanical stuff. I don't really like those." She preferred to pick her own texts and found that what she was required to read in school did not pique her interest, making it harder to focus and remember: "I don't like really boring stuff. I just lose interest in it really quickly." When asked what she considered boring, she said, "I don't know. Like a lot of really short chapters. Our Language Arts book gets pretty boring sometimes." She was not engaged by or interested in what she was required to read in school.

Amy had her own laptop and shared a desktop with siblings at home. Although she had high speed Internet and ample access, she was not interested in spending much time online. She said, "I go on Instant Message like 15 minutes a day, and I look up information for projects." She indicated that she used Instant Messaging, but it was not important to her: "Uh, well, I have a lot of people on it, so, I like it but I don't do it that often." When asked if her parents limited her use, she said they did not. Her response was emphatic, "Fifteen minutes and I get bored so I log off."

She did find the Internet occasionally useful for information for school projects: "Like I just go to Google, or if somebody says a web site or something." Asked if she played computer games, she said, "Not usually. If I'm really bored I'll play like solitaire, or spider solitaire or something." Like many of the sixth-grade students, she did not use email and did not seem interested at this point in her life in spending time on a computer.

In school, she indicated she used the computer only during computer class, a required course for all sixth graders. She gave a short answer when asked about the content of the class—"Internet stuff."

When asked whether she preferred to read online or with book in hand, Amy preferred not to read online: "Well, on the computer it's always more difficult to concentrate than when you're reading a book because there's all these things popping up at you and when you're reading a book you just can sit down and go in a quiet place." She also found pop-ups and IMing to be an intrusion: "Yeah, and like they're always coming up and people who are IMing me and things like that."

Rachel: "I'm not like terrible, but I'm not the world's best [reader]." Rachel, identified as an average reader by her seventh-grade English teacher, said she read extensively at home and recalled many experiences with reading as a child, both in the early grades of school and with her family at home. She recalled that her parents read to her before going to bed each night. Rachel described her family as always

having "tons of books" and recalled asking for someone to read to her as a common childhood practice. Her family read the Bible together after dinner every day.

In spite of books at home and encouragement to read at home, Rachel struggled with reading in school. She said:

> If I don't concentrate when I'm reading, like if I'm just reading the words but not understanding it, then I don't remember much. I tell myself that I have to concentrate so that way I can answer questions if we're asked. Sometimes if I'm just reading the words, I have to read it again and that way I'll know that I really get it. . . . But sometimes I go back and read parts that I didn't get. . . . I like to read, but I don't like to read books that have really small print because I get headaches. If the print is a little bigger, then I don't really care about the length of the book. Really small words give me headaches and when I get headaches, I'm not interested in the book.

Rachel liked to read at home, but chose to read on her own time, and viewed herself as "a fairly good reader." She especially enjoyed reading series books. Many of the texts she read outside school were below her grade level. She named *Mary Kate and Ashley, So Little Time, Sweet Sixteen, American Doll,* and *Lily* as favorites.

Rachel used the public library frequently for checking out books, using the computer, and participating in library programs. In contrast, she rarely used the school library. The only time she could go to the school library was during flex time, and she preferred to use that time to get homework done.

Rachel used her computer at home primarily for entertainment. She said, "I use my computer at home a lot for email, and I like to play games." She described a game that she said was fun and helped her with her reading:

> On my computer, there's a program that helps you to read faster. An object like a basketball or a cookie comes up and then it moves to different parts of the page. You have to follow it and then it moves faster and you have to follow it. Then it starts with words that pop up and disappear. If you're really good, they give you paragraphs that pop up and they go really fast and you have to read the paragraphs. It's to help you read faster and it's a learning process to help you to read faster.

Rachel used her home computer regularly, "about an hour or two hours on the computer a day." She said, "Sometimes I do reports on the computer, like my homework." However, she spent most of her time playing games, especially with what she called "educational games:" "They have these games called *Jumpstart* for all different grades. I do the games for seventh grade. You have to answer questions about social studies or math."

Rachel also used her computer to communicate with her friends, but had some parental restrictions: "I email my friends also, but I don't have IM. My mom doesn't want me to have it because she says that I'd be on it forever." Her use of

email rather than IMing was atypical; the survey findings revealed that those who were using the computer to communicate with friends used IM instead of email.

Her use of computers in school was minimal. Like other seventh graders, when asked about using computers in school, she indicated little work that required a computer: "I don't usually use computers in school. I did once when we did reports for health. Last year in language arts, we had to look up information on any topic, and I did amusement parks. I used Google to find a bunch of sites."

Like most of the other interviewed students, Rachel disliked reading on a computer screen. She complained: "Reading a book is easier. Computers have really bright screens that hurt your eyes, so you can't read it too well. When I do read it, the words mush together. Reading is easier in books and magazines. You can change the brightness on the computer, but even the lowest is too bright." This complaint about brightness, even when she knew how to adjust for it, was a common problem for these younger adolescents.

Chris: "I'd describe myself as a good reader." Chris was identified as a good reader by his seventh grade English teacher, and his performance on the reading recall protocol confirmed that assessment. He also viewed himself as a capable reader, explaining that, "I'd describe myself as a good reader. I really enjoy reading and I read a lot and I read well." He reported that he had "stepped away" from reading novels due to his preference for reading non-fiction. In Chris' home, news issues were a frequent topic of dinner conversation.

Chris' reading practices and preferences demonstrated a level of sophistication that surpassed his age and grade. He read widely to support his interest in politics and national and world news. He regularly read *Time* magazine, the *Times Union*, and the *New York Times* to stay informed. He described his news reading in the following way:

> I'm into politics. . . . I read some of the front page stories and some of the sports stories because I'm a big Yankee fan. I read the *New York Times*. I like how that paper is written, the word choice. You can tell that those people know what they are doing.

Chris identified three books that he had read in school this year: *The Spy at Ticonderoga, My Brother Sam is Dead,* and *Sounder*. He found all three books unchallenging. He said of *Sounder*: "It was too easy to read; it was obvious what was going to happen next, and there wasn't much that happened in it." There was a clear mismatch between what he preferred to read outside of school and what he was required to read at school.

Chris used his computer at home primarily for communicating with his friends and downloading music to his IPOD. He described the importance of this communication:

I go on the computer for a half hour to an hour and a half when I get home from school. We don't get time to talk to our friends in school, so I use IM to talk to them. On the weekends, it will be two hours and I'll be sitting there talking to five people in separate IM boxes, or I'll be in a chat room. We talk about stuff that happened in school, things that people said, things that we're doing over the weekend.

When asked about his computer use in school, Chris said, "I don't use the computer much." The only school assignment he recalled was one in his health class: "We used the computer for drug reports. We had to have four sources, two from the computer. One had to be from an online periodical and another from a website." The previous year, he said he took the computer class required of sixth graders, which primarily consisted of learning keyboarding, word processing, and using PowerPoint.

He preferred reading from books, magazines, and newspapers as opposed to reading from a computer screen. He found it hard to concentrate while reading on the computer:

On a computer screen, it's harder to concentrate because there's a lot of other stuff on the screen other than what you're reading. Plus the screen is bright, you scroll with the mouse, and things pop up. I don't really enjoy it. I'd never get an ebook and read it online. I prefer reading from books or magazines. But I definitely prefer doing searches for information online because it's so much easier.

Like most of these middle school students, Chris found a computer screen difficult to read, but he acknowledged the practical aspects of being able to search for information on the Web.

Profile Summary. Amy, Rachel, and Chris represented some of the typical responses for the sixth and seventh graders among the interviewed students. Specifically, their responses illustrate some of the grade level and reading level differences we found in the data as well as some similar conceptions across grade levels. All three had access to computers and high speed Internet at home and at school, yet their conceptions and uses of computer technologies as part of their everyday practices varied in important ways. Like other sixth graders, Amy had little interest in spending time on her laptop, but Rachel and Chris, as seventh graders, had begun to explore many of the resources available to them through computer technologies, though in very different ways. We will discuss these issues in terms of the findings from the interview data below.

Computer Use and Conceptions of the Interviewed Sixth and Seventh Graders

The profiles above echo the overall findings from the 24 interviews we conducted. Those findings are presented below.

Sixth Graders' Computer Use

Of the 12 sixth graders interviewed, only two reported regular use of a computer. The other sixth graders said they used a computer only for school projects, and these assignments were infrequent. The sixth graders who reported more use of computers were using them primarily for entertainment and social interactions. Overall, most of these sixth graders had only limited interest in using computers.

Amy, an advanced sixth grade reader said she had her own laptop and computer, but commented: "I go on Instant Message like 15 minutes a day, and I look up information for projects. . . like I just go to Google." When asked more about her use of IM, Amy said, "I have a lot of people on it; I like it but I don't do it that much." Eileen, another advanced sixth grader had a home computer, but expressed little interest in it: "I don't use a computer outside of school unless I want to write up something or check my email, which is not most of the time. In school, I only use it sometimes if I have to do a project or type something up."

Proficient and basic sixth-grade readers used computers primarily for school tasks and occasionally to play games or to IM. Lindsey, a basic sixth-grade reader, said, "I have one [a computer], but I'm never on it unless related to school . . . maybe once a month or once every other month." Victor, another basic student, saw the computer as a last resort for entertainment: "Most of the time, I don't use it. But sometimes, if I have nothing to do, I put a game on it." Kay, a proficient reader said, "I go on the Internet and look things up . . . and I use the encyclopedia . . . and the dictionary like when I'm writing up essays and stuff or when I just want to play around." The comments of these sixth graders echo those of others who were interviewed. Many of them were not using computer technologies like email, IM, or games, but those who did used them infrequently for play or for occasional school-related tasks.

Seventh Graders' Computer Use

In seventh grade, the students we interviewed reported much more use of IM, games, music downloads, and school-related research regardless of ability level. Some of the basic seventh-grade readers we interviewed had begun to discover on their own the possibilities for using computer technologies to find help for school tasks.

Frank, a basic reader, had found the computer helpful for completing school assignments:

> I use it a lot. I use it to do my homework. I use it for my vocabulary. You just type in the word, and the computer defines it. There's a calculator on there, so you can use it for math. I use it to write essays because I don't have the neatest handwriting. I look up information for reports.

Karen, another basic reader, reported that she used her home computer for help with school tasks: "I like, always research school topics on there." As with

the other seventh graders, these students were discovering on their own that the computer had relevance to their daily lives and that they could use it to get help with school assignments.

Changing Conceptions of Computers in the Sixth and Seventh Grades
Differing conceptions of computer technologies also emerged in the interviews. As these sixth and seventh graders talked about when and how they used computer technologies, their conceptions of these technologies in relation to their lives showed a significant shift between the sixth and seventh grades.

The Sixth Graders
Most of the sixth graders we interviewed revealed a conception of *limited relevance* of computers for home and school use. This conception of computer technologies being irrelevant to their school learning became apparent when they described computer activities as "boring" and their use of only basic functions—word processing for school reports and "googling" or looking up information for school assignments—as uninteresting.

This limited relevance conception seemed to be reinforced by the ways that teachers were asking students to use school computers. For example, Chuck, when asked about how he used computers in school, said, "If it's in the class then we do what she [the teacher] wants us to do, like type sometimes." Laura said, "I use it in school but not so often, but I type reports and find research and books in the library." Amy echoed this generic approach: "Our teacher just teaches us about computers and stuff and the best way to do things and things like that."

Although one of the sixth graders was "playing around" with PowerPoint and graphics, the rest indicated little interest in the computer. A second conception that the sixth graders shared was that the computer was irrelevant to their social lives, even though some of them were using IM and email on a limited basis. Victor, a struggling reader, said, "Most of the time I don't use it. But sometimes if I have nothing to do, I put a game on it. Like Real Arcade, where you know, I have to find a new game to play." For the sixth-grade students we interviewed, the computer was not their preferred source of entertainment.

The Seventh Graders
The seventh-grade students' conceptions differed in important ways. They had begun in most instances to see computer technologies as more relevant to their daily lives, especially at home. Adriana said, "I use my computer about two days a week .... I sometimes IM, or I might play games like pinball." She also talked about going to the public library with her grandmother: "We go on the computer and find books and check them out." She, like the other interviewed seventh graders, had begun to conceptualize the computer as a tool for enhancing her social life, for finding information, and for entertainment.

Sixth and Seventh Graders' Conceptions of Print Texts versus Screen Texts
One of the strongest conceptions to emerge from the interviews with the sixth and seventh graders was that reading on a computer screen was difficult and uncomfortable. All the sixth graders preferred reading a book or magazine to reading on a computer. In the interviews, both sixth- and seventh-grade students cited lack of mobility, brightness of the screen, pop-ups, unreliable information, and font size as problems with computer reading. They preferred books or magazines because they were more portable, interesting, and easier to read. One seventh grader talked about how the continuity and reliability of textual material in books was important to her:

> Reading a book is easier than reading on a computer screen because it's easier to read when it's in front of you. With a book you can go back. Sometimes you can't remember where you got the reading from a computer and you can't go back and finish reading the article on the computer, but with a book you can. Sometimes the people who own the web site that the article is on will close the web site, and you can't get back to it. Also, a book has been edited, and it's been punctuated right and words are spelled right. Sometimes on a web, they don't check it.

These comments suggest that having a stable, reader-controlled text is important to these middle school students for ease of comprehension. The student above, like other interviewed students, viewed computer texts as less credible than books and magazines. Reliability and trustworthiness were strong positive factors for books. These views were echoed consistently by other students.

Social Factors
Social activities were among the factors that influenced the degree to which these young adolescents used and thought about computers. In the interviews, both sixth and seventh graders said they preferred being outdoors, involved in sports, and being with friends rather than being in front of a computer screen.

Chad, a seventh grader, said his use of the computer was structured around his sports participation: "I use it maybe one or two hours a day. I usually have a soccer game or something." The lure of the outdoors even contributed to a pattern of seasonal use. Natalie, another seventh grader, when asked how much she used her computer at home, said, "Probably like an hour, hour and a half. Because . . . in the winter I did it a lot, but in summer I don't do it a lot."

In the interviews, sixth graders had little to say about factors affecting their computer use, because most said they were using their computers at home very little. They were more interested in being with family and friends or in reading books or magazines. However, if they were using a computer, they were engaging in IM and email in limited ways or completing school assignments.

The seventh graders we interviewed indicated increased interest in the Internet

and computer technologies, especially IM. Students began to conceptualize their home computers as social venues and sources of entertainment. Chad indicated that his Internet use now included playing games with friends: "I play computer games. My friend likes to use my computer because it's so fast, and he plays a lot. [laughs] I like computer games." Christina, an advanced reader, said she did not like reading but liked "talking to my friends on IM": "I don't like to read that much. I'd rather be outside playing, or be with friends, or be on the computer." So, for Christina, using the computer for instant messaging is now as relevant as her other social activities. Jerry, a seventh-grade basic reader, was a heavy user of his home computer. When asked how much he used his computer, he said, "A lot. On the weekends, probably two to three hours a day. During school, probably one to two hours. I IM with my friends, and I go on the Internet and look stuff up. I look up remote control stuff." Like other students, he had discovered that he could go online to satisfy his need to know about topics that were of interest to him. These seventh-grade students' conceptions and uses of their home computers might have reflected a growing desire for autonomy as well as a desire to enhance their social lives in a virtual as well as a face-to-face context.

Contextual Factors

Contexts affected how computers were used and conceptualized. Computer use at home was affected by other family members. Although we expected that parents would have some role in shaping use and conceptions, no sixth graders mentioned parental controls. (We did not ask about parental control, to avoid collecting third party data from non-participants.) Only one seventh grader mentioned parental control.

Others reported that siblings limited their home computer use. Mary, a special education seventh grader who was identified as a basic reader, explained that she had to share the family computer with her two brothers and her sister. She commented that she could not do a lot of IM because of her older brother: "Like I do it for probably like an hour, and then my brother has to get on [laughs]. He's on for a really long time." In spite of some of the limitations on using their home computers, most of the seventh graders we interviewed indicated that they spent more time on home computers than did sixth graders.

These students' increasing use of computer technologies and the Internet outside of school paralleled their increasing use of other technologies outside of school. Data from the LI showed that about 31% of the sixth graders had a cell phone; over 61% of the seventh graders had one. By seventh grade, many of these students were learning to use an array of technologies as part of their literate lives. However, for almost all these suburban middle school students, their developing uses and conceptions of computers and other digital technologies were being shaped outside school.

Computer Use in School

The context of school, in spite of well-equipped computer labs in each of these middle schools, shaped the students' conceptions of the computer as a tool for learning in minimal ways. All of the 24 interviewed students in both sixth and seventh grades reported that they used computers very little in school. Twenty-two of these students characterized school computer use as uninteresting.

Larry, a proficient sixth-grade reader, explained the divergence between his home and school use: "I usually use the computer at home almost every day, but at school, I only go to it when the teacher tells me to." His comment was echoed by many others. Christina, an advanced seventh-grade reader who used her home computer for a variety of purposes, said, "I don't use a computer very often in school. You can if you want to in tutorial. If you need to, you can come up to the computer center, or you can use one in the classroom." Others also indicated that computers were available in school for them to use, but it was usually not part of the regular curriculum.

For the most part, if students used computers in school, it was for a class project. Frank, a seventh-grade basic reader, described a couple of instances when he had used the school computer for class assignments: "I don't use the computer much in school. I go down to the computer lab during flex [a study period] to look stuff up. Sometimes we go during class to do reports. In science, we used the computer to do a little showing about rocks." This discrepancy between home and school seemed to be intensified by the infrequent and mundane tasks students reported doing on school computers. Adriana, who said she used her computer at home regularly, described school use as limited: "In social studies, we did [use the computer] one time, but normally we don't. When we had to do our book talk, I wrote it out on the computer. In math, we don't use it; in science, we used the computer to look up online magazines." Other students' echoed Adriana's comments. Although use of computer technologies and the Internet was increasing at home as the students moved from the sixth to the seventh grade, their use at school remained limited in terms of time and types of activities.

Although these large, suburban middle schools provided access to computers, computer technologies were not integrated into the curriculum in either school. Teachers seldom assigned computer-related tasks, and these tasks were usually related to finding information for a project. These assignments, as all the interviewed students indicated, often required little in the way of developing any conceptions of the computer as a useful tool for learning in academic subjects.

General Discussion

The findings on frequency of use among younger adolescents confirmed those of other studies (Facer & Furlong, 2001; Lenhart & Madden, 2005; Yan, 2005, 2006).

Younger adolescents tend to use computers less than their older peers. We found that the sixth and seventh graders in our study were more focused on their families, social lives, and school work than on computers. A gradual shift began in the seventh grade when they began to see the Internet as a way of expanding their social lives and as a tool for investigating topics of personal interest to them. They mentioned using search tools like Google to complete school research projects, but school computer use required minimal knowledge or use of computers or the Internet. Although we did not report on these students' teachers for the present paper, interviews with the teachers confirmed minimal use of computers as part of the curriculum even though the teachers acknowledged that their students were using computers regularly at home and that they, too, used their home computers for many functions.

One surprising finding was that all the interviewed students' conceptions of computers and the Internet were influenced by both physical factors and credibility factors. These students indicated that they found using a computer physically uncomfortable and distracting as a tool for reading and learning. All of the sixth graders and all but one of the seventh graders reported problems with the brightness of the screen, distractions of pop-up advertisements, changing font sizes, discontinuity of textual material, and unreliable information. They cited the discomfort of sitting for long periods of time in front of a screen. These distractions, physically uncomfortable aspects of use, and the lack of control over many of these factors might have contributed to their general disinterest in computers and their preference for books and magazines for reading material over electronic texts. Their expressed desires for physical activity and social interactions made long periods in front of a computer screen an unattractive option for most of them. They preferred the stability of a traditional text to electronic texts on a computer screen. As Kress (2003) noted, the traditional page offers a clear, well-organized path, a factor that may be important to younger readers.

Social development begins to become paramount as students move into adolescence. Although the sixth graders were largely uninterested in using computers, by seventh grade, more students were beginning to use computers to further social interactions and to find information for personal use and for school tasks, but there were some significant differences depending on grade level and reading skills. Social use of computers was particularly strong for a subset of advanced readers. Advanced readers who used IM for more than 2 hours a day showed a sharp, significant increase in seventh grade compared to sixth grade, as reported earlier. A subset of proficient readers, those who played video games more than 3 hours a day, also showed a reliable increase in seventh grade compared to sixth grade, as reported earlier. These findings suggest that these advanced readers are enhancing their social lives with IM, a fast-paced written communication that requires strong language skills and the ability to manage multiple correspondents.

In contrast, the proficient readers were finding gaming with its colorful visual images and participatory action more compelling.

Some basic readers reported that the computer was a useful tool for help with school-related tasks and with developing their personal interests, but their use of the computer for informational purposes, according to the LI results, remained about the same in seventh grade as it was in sixth grade. Because computer technologies were not integrated into instruction in school, these basic readers, who potentially might have been helped the most by learning how to use the computer for informational purposes, were not getting that help.

Contexts affected both use and conceptions. If students were using a computer, they were using it at home, and the seventh graders indicated that they were using their home computers for a variety of purposes. In contrast, their computer use in school contexts was infrequent and uninteresting to them. They reported that in school computer classes, they were taught to use computer software like Microsoft Word or PowerPoint, but reported no regular use of computers in core subjects. On the few occasions they used the school computer lab, they went to look up information for a report or to use a word processing program. Three interviewed students used school computers for other purposes such as downloading music during flex time in school.

The contrast between home and school use of computer technologies showed how disconnected these students' non-school literacy practices and learning were from their school literacy practices in terms of gaining technological expertise that would support their school learning. This disconnection was creating conceptions of computer technologies as primarily for entertainment and social purposes outside school rather than as tools for extending knowledge or academic skills.

Conclusions and Implications

These young adolescents were on the cusp of more intense uses of multimodal literacies. Their practices and conceptions showed some marked changes between the sixth and seventh grades. As Barton and Hamilton (2000) noted, such practices are "associated with particular aspects of cultural life" (p. 11) and play out on macro- and micro-levels. On a macro-level, the larger culture casts all adolescents as competent computer users, but on a micro-level much was changing for these students, particularly in their social domains. The findings showed an important shift between sixth- and seventh grade students' literacy practices, especially in terms of their uses and conceptions of computer technologies and the Internet.

However, this shift occurred in different ways among students at different reading levels. Perhaps some of the overall changes in uses and conceptions could be attributed to changing social and developmental needs, but a finer grained analysis across reading levels suggested that a variety of factors—literacy skills and contexts of use—strongly influenced these students in important ways. These findings can

be linked to Kress' (2003) contention that reading on a "screen path" is far more demanding. We found that students who were skilled readers of traditional texts were more likely by the seventh grade to engage in IMing and to conduct searches on a variety of topics, many of personal interest. Students who were less skilled readers of traditional texts tended to prefer games and visual interactions. Our findings indicate that literacy practices, especially skill levels in reading, have a strong influence on students' conceptions of and uses of computer technologies. Although Wilder and Dressman (2006) were focusing on high school students and social capital, they found that reading skills were important indicators of overall skills with Internet searching and reading online texts. So, although access to computers is important, access alone cannot guarantee proficiencies with the kinds of computer skills that would be useful in an academic environment. This is an important point given the capital investments that school districts require to buy and maintain computers in classrooms and labs.

The most interesting finding across these two middle schools where computers and access were not generally an issue was that these sixth and seventh graders were learning about computer technologies primarily on their own. Except for a sixth-grade class that focused on using basic programs such as Microsoft Word and PowerPoint, the majority of students did not use computers in school, nor did they have assignments, except in one seventh-grade health class where they were required to use the Internet for finding information. Their language arts teachers said they did not take students to the school computer labs or integrate computer technologies into their instruction. Consequently, these students' conceptions and uses of computer technology and the Internet rarely included academic work or learning.

These sixth and seventh graders' conceptions and their burgeoning uses of computer technologies reflected a clear disjunction between home and school literacies, a finding that paralleled other studies showing disjunctions in home and school computer use (e.g., Alvermann, 2002; DeVoss, Hawisher, Jackson, Johansen, Moraski, & Selfe, 2004; Hull & Schultz, 2002; Vasudevan, 2007). These students' conceptions of computer technologies emerged almost solely from their experiences with them outside of school, both as part of their expanding social lives and their growing interest in finding information on topics of personal interest. For most of the sixth graders, computer technologies were not important to their lives, but our data showed the seventh graders manifesting an increased interest in gaming, IMing, and finding information on personal interests. These same trends were evident in their choices of reading materials, with seventh graders expressing preferences for popular and specialty magazines for pleasure reading.

Because these students were not using computer technologies in their schools, most of them had limited conceptions of computers as tools for learning in their core academic subjects. Their emergent conceptions of computer technologies

were shaped by their family and peers as they began to explore the Internet to expand their social networks and to find information on topics like sports figures, wrestling, and movie stars, all far removed from academic topics.

Our findings also indicated that these younger adolescents had some specific problems with computer use, both conceptual and physical. The sixth and seventh graders we interviewed reported that they found the brightness of the screen, pop-ups, and sitting in front of a screen to be uncomfortable. The sixth graders, in particular, preferred interacting with family and friends. Many of the sixth- and seventh-grade students viewed computer texts as less reliable than traditional texts and cited poor editing as well as unreliable information as negative aspects. When taking these factors into account, their conceptions and their physical discomfort worked against their using computer technologies for academic purposes.

As a result of these findings, we believe that more attention should be given to the ways in which computer technologies may be problematic for younger adolescents in terms of cognitive, social, and physical needs. If important technological tools are conceptualized as physically uncomfortable or as untrustworthy by younger adolescents, their concerns need to be addressed. Certainly, further research is merited in this area.

A key finding in this study is that sixth and seventh graders exhibited important differences in their literacies, especially in terms of conceptions and uses of computer technologies. We suspect that these differences reflected not just developmental trends but social, cultural, and pedagogical aspects of their lives.

New Literacy scholarship has emphasized the intimate connections between learning and sociocultural influences, and these connections are important to pedagogies in the 21st century. Bruce (2002) proposed, "If we are to make sense of changes in literacy, we need to develop better ways of conceptualizing technologies in relation to epistemological and social processes" (p. 12). We agree with this idea but would add that the changes in literacy are already here and that students, even younger adolescents, have already developed practices and conceptions that may not fit popular perspectives of adolescents as users of computer technologies. Moje et al. (2008) suggested that such conceptions masked issues surrounding access. We believe that these same popular views may mask the kinds of differences in development, literacy skills, and interests that we found with these sixth and seventh graders.

Yet, these findings and those of other researchers (Moje et al., 2008; Wilder & Dressman, 2006) suggest that it may be too easy to suggest that professional development on integrating technology into the curriculum is the only answer. The problem is more complex. These sixth and seventh graders were clearly quite different in key areas: their everyday literacy practices, their reading skills, and their uses and conceptions of computer technologies. Such findings suggest that literacy instruction for these early adolescents needs to address these important

differences and to find ways of providing developmentally appropriate instruction that facilitates learning in a multimodal world.

Although this study was limited to 189 students in two suburban middle schools with computers in classrooms and computer labs, the students represented a range of reading skills. We believe these findings are important as baseline information on younger adolescents who are on the cusp of using computer technologies and beginning to conceptualize how or if these tools might play a role in their everyday lives. We hope our findings will inspire further research on this important period in adolescence when middle school students' literacy practices and their uses and conceptions of computer technologies are not only changing rapidly but also positioning them to participate in an increasingly technological world.

ACknowlEdGMEnTs

REfEREnCEs

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Appendix A: EnumerAted IdeA Units for the Story, "bAby on the beAch"

1. baby heard crying
2. stopped doing work in cabin
3. went on porch to listen
4. sees child on beach
5. where were parents?
6. baby aged 2 or 3
7. runs to child
8. embraces/picks up child
9. child falls asleep
10. child has black hair
11. child has red face
12. subject asks child where his mom is
13. baby points to path
14. subject says "show me"
15. subject carries baby even though they didn't want to
16. walk toward the path
17. two people approach them

18. the two people are a woman and little girl
19. woman is not the baby's mom
20. woman is pretty
21. woman has tan arms and legs
22. woman has red hair
23. baby's name is Tony
24. little girl wondered if they were giving Tony away
25. woman is his mom's friend
26. woman doesn't look at Tony
27. subject does not feel right about the situation
28. woman's idea to leave him on the beach because he was crying / wanted to see how long he would carry on
29. Tony couldn't see his mom or her friend but they could see him
30. subject upset at this explanation
31. woman never stopped smiling
32. subject gives Tony to the woman and girl
33. Tony knew the woman
34. Tony told to say "bye" but doesn't look back
35. subject goes back to cabin
36. gulls heard crying at end

Appendix b: Coding And exAmples for interview dAtA on Computer Use And Conceptions

TU1	In-school use of computers
	"In school, I only use it to do a project or something." (6th)
TU2	Personal interests/entertainment purposes for computer use
	"I just go on to play games." (7th)
TU3	Use of computers for social purposes
	"When I'm on the computer, I am talking to my friends on IM." (7th)
TU4	School tasks done on computer outside school
	"Sometimes I do reports on the computer, like my homework." (7th)
TU5	Accessibility factors
	"I do it for an hour; then my brother has to get on." (7th)
TC1	Relevance of computer technologies to personal lives
	"I have one, but I'm never on it unless it's related to school." (6th)
TC2	Difficulties/Discomfort with computer
	"On the computer, it's always more difficult to concentrate because there are all these things popping up at you." (6th)
TC3	Trustworthiness/reliability of texts and information on the Internet
	"Sometimes the people who own the web site will close the web site, and you can't go back to it." (7th)