“If You Don’t Have It, You Can’t Find It.” A Close Look at Students’ Perceptions of Using Technology

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Rarely do adults ask students to reflect on their learning. This study looks closely at a sample of eighth-grade students’ perceptions about their experiences with technology, especially the use of the World Wide Web. Employing a phenomenological methodology of both examining a single student story and analyzing a collection of student voices, several themes and questions emerge. Students’ personal attributes of self confidence, resilience, and openness to learning about the new technologies, and their skills in reading the Web and managing information, may offer new questions for teachers and information professionals.

Accustomed to gathering and reporting data quantitatively and statistically to measure how much students learn, schools rarely listen to students’ talk and reflections on what they know or how they learned it. Kuhlthau, Turock, George, & Belvin, (1990) remind us that, “In the field of library and information studies, very little is known about what goes on inside the user” (p. 29). Thus, this qualitative study examines students’ perceptions of their experiences in using the Internet, especially the World Wide Web. As students continue to use electronic resources for their school work and their leisure interests, teachers, librarians, and information professionals need to know how young people make sense of their access to and retrieval of information. “When information seeking is viewed as a process of construction, the user’s experience becomes a critical component for analysis” (Kuhlthau, 1993a, p. 344). In order to get to know about some real-life experiences, I invited a number of eighth-grade students to reflect about their personal experiences with technology. My major purpose was to gather information from students about their own perceptions in using the new technologies. Specifically, I wanted to know what they mean when they say that they use the World Wide Web as a new resource for their studies and leisure. I wondered if they would disclose information about how they felt, that is, their levels of confidence, pleasure or frustration, and whether they would reveal unexpected or surprising insights about the skills needed to access information.

In order to express what they knew tacitly, students sometimes shaped a narrative to recount particular episodes in their experiences. Schank (1990) writes that “stories digest experiences” (p. 29). The students recalled ordinary moments in thinking about their use of the Web, and their stories and anecdotes supplied the data in which I, then, sought meaning. By analyzing their musings on encounters with this technology, we may gain some insight into how these students feel and what they think about their experiences. This kind of insight and understanding may inform us about student users’ construction of the relations between using the Web, the outcome of its use, and their own information problems (D. Raber, personal communication, October 17, 1997). If we believe that “people make it [the Net] work” (Janes & Rosenfeld, 1996, p. 714), we must see how students make the Internet work for school and personal interests. A supply of narratives may reveal some of the idiosyncratic and universal attitudes and skills which students acquire as they use new technologies. As I reflected on and engaged with the students’ words, my resulting text interprets the students’ thinking. The study, therefore, provides qualitative data for others to read first-person voices from the schools, and one professional’s response. Such a study may offer practitioners insight for listening to the users of the new technologies, for the “major purpose of library research must be focused on the question of how libraries can intervene usefully in individual sense-making processes” (Dervin, 1977, p. 29). Educators and policy makers may need to add student voices as an important element in thinking about users of this and other technologies. As recipients, users, and leaders in using electronic resources for learning, students’ ways of being with technology may inspire us to think in fresh ways.

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Background

Five years ago, the Tennessee State Department of Education's initiative in technology funded public schools for the purpose of purchasing hardware and software for individual classrooms. In 1992, Tennessee school districts received the first of their state funding from the Basic Education Plan (B.E.P.) to develop "twenty-first century classrooms" (Tennessee Code Annotated 493-351). The legislation supported the purchase of both hardware and software, with flexibility for local administrators and teachers to make selections. During their first year, the district of Maplewood (names of town, teachers, and students have been changed for purposes of this study) designated all fifth grades as "twenty-first century" classrooms. Each fifth-grade classroom in the district received five computers, including one for the teacher's use. Each year since then, the district designated the subsequent grade as recipient of the state "seed" money. As a result, in the school year 1996–1997, students in the original "twenty-first century" fifth-grade classroom, found themselves in the eighth grade, their fourth "twenty-first century" classroom.

In Maplewood, these technology classrooms included four student computers with CD-ROM drives, which were networked to a teacher computer; one networked printer, a laser-disc player, a videocassette recorder; Internet connectivity and, in some instances, scanners and a digital camera. Authoring and multimedia presentation software were included.

In the fall of 1996, many Maplewood district eighth graders entered their 4th year with technology in the classroom. For the most part, they encountered eighth-grade teachers receiving their 1st year of training in this technology. (The phenomenon of novice teachers and more expert students is not the focus of this study. Nevertheless, it raises interesting questions as students become more and more computer literate, and as adults continue to acquire their first skills in using technology. Certainly, questions of expertise connote issues of roles, power, and status. And indeed, some of these themes emerged in this study.) The purpose of this study was to reveal the students' own experience and their reflections on using the technology as a tool and resource.

Methodology

Regarding research methodologies, Mellon (1990) suggests that "methods of naturalistic inquiry should be selected where in-depth understanding of human actions is the primary focus" (p. 20). I wondered about students' experiences with technology, in general. I held no preconceived ideas, no hypothesis, but rather, came to students with an invitation to talk about their experiences using electronic resources, especially the Internet and the World Wide Web. This study is embedded in a constructivist perspective whereby the researcher asks participants to construct meaning of their own experience. Making meaning of one's experiences often conveys both cognitive and affective qualities. That is, as one wrestles with meaning, one cannot help but reveal how one feels about the issues, for, "Meanings are constructs that people hold of themselves and their worlds" (Belkin, 1990, p. 13). Affective information is not often offered explicitly. Bruner (1957) reminds us that a basic cognitive task is to "go beyond the information given" (p. 41). As a result, I engaged in the interpretive task of examining the students' words in order to construct my own knowledge of the cognitive and affective qualities of these particular student users of the Internet. Therefore, as listener, as practitioner, as researcher, I, too, engaged in constructing meaning of the students' meanings. Page (1997) suggests that "when we have comprehended an author's account, we are obligated to offer our response to it...[and] we acknowledge our role in making its meaning" (p. 146).

The cognitive system for making meaning is basically narrative (Bruner, 1990). Therefore, phenomenological inquiry elicits story as content, and offers narrative analysis as methodology to make sense of a key question. It offers the researcher a process by which to reveal or uncover elements in students' thinking as they engage in the process of reflection through their stories. Because students sought to make meaning of their experiences, and I sought to make meaning of their narrative, I employ two uses of story in this research: First, the collection of students' experiences in the form of anecdote or story, and second, the rhetorical device for my writing as I come to some understanding of the students' stories. The study represents my reading of the students' transcribed interviews.

The Interview

With no predetermined hypothesis, I structured very few questions, listened carefully to the thread of the students' talk, and allowed myself to be open to the themes which they, themselves, raised. As in a reference interview, the questioning process can be "virtually content-free...and the respondent provides the content—the unique perceptions" (Dervin, Jacobson, & Nilan, 1982, p. 429). I offered one umbrella question, "What do you mean when you say you use technology?" I followed up with a second and third question when necessary, "Teachers tell me that your classroom has many computers. What does it mean to you to tell people that you use the computer?" And, "Tell me about using the Internet and the World Wide Web." I interjected additional questions only to probe, such as, "How did you know how to do that?" "How did you feel when that happened?" "Tell me more about what happened then." Students gave me permission to tape record their statements. I took very few notes in longhand and used none of my own notes as data.

The interviews took place in a small conference room in the school media center. Students recognized their sur-
roundings and seemed motivated to talk. They were not shy or reticent, and, although the interview represented our first meeting, we were able to establish rapport within a few minutes.

**Responding to the Interview Data**

Stories and anecdotes were embedded in much of the interview and conversation I had with each student. As I reviewed the transcripts, I sought a sense of narrative. That is, I selected excerpts that described moments really showing what a student did or thought about, rather than words which philosophized about their activities with the Internet generally. Therefore, from each transcribed interview, I located and shaped a key narrative. Often, a stunning excerpt represented the gist of the student's exchange with me. For example, many students echoed Alice's statement, "If you don't know what you're looking for, you're out of luck." And Polly captured it most succinctly by reminding us, "If you don't have it (the subject), you can't find it." The stories I selected to read and comment on caught my attention for their potential contribution to what we may want to know about students' sense and feeling about technology. In an attempt to interpret, to probe for the meaning of what was being said in stories, I read and analyzed each student's narrative content closely. Schank (1990) reminds us that "there is no one way to understand this story . . . when someone hears a story, he looks for beliefs that are being commented upon . . . and finds them by looking through the beliefs that he already has" (p. 72). Immersed in the students' brief text, I sought possible interpretations of their ideas and feelings about engaging with the new tools and resources of technology. The immersion in text and narrative analysis offered one technique for examining phenomena embedded within each student's words.

As an extended exercise, I analyzed the content across stories in order to encounter larger directions. From this content analysis, I derived two broad directions or categories which I labeled students' personal attributes and students' particular skills in using technology. These two categories serve as a way to organize my response to the students' responses. Others (Kuhlthau, 1993a) have acknowledged that searching for information involves actions, thoughts, and feelings, and indeed, students revealed both cognitive and affective attributes as they spoke of their experiences.

Each of the students' points, which I have considered significant enough for comment, I label as "questions." The notion of framing questions to be considered comes out of the phenomenological tradition, inviting continued inquiry from future readers. As Bruner (1994) recently remarked, "Great stories open us to new questions." That is, in phenomenological work, no definitive answers may be presumed, but rather, the researcher raises questions she considers fruitful for further and continued consideration. In illuminating the voices of student experience, I frame their attributes and skills as questions to invite readers' further thought. These questions may act as points for continued exploration. The students' stories and my subsequent close reading of their narratives represent a form of inquiry about which further inquiry can take place (Clandinin & Connelly, 1995). Note that several questions emerge from each of the larger directions or categories of attributes and skills. The first category which I address, students' personal attributes in relation to their use of technology, raises two questions: The question of self-confidence or voice of authority, and the question of understanding time. The second category, the students' particular skills in using technology, include the question of reading information, and a question of managing information.

The outcome of this study produces no theory or hypothesis because what students say about their experiences with technology, and especially the World Wide Web, varies with the purpose, context, or setting of technology use. However, transferability or identification may occur. As Connelly and Clandinin remind us (1990), the language of qualitative research presents a language of the whole. Therefore, a reader of this study might need to question, "How does this story connect with my own experiences as a learner, teacher, and user of technology, especially the Internet and World Wide Web?"
socioeconomic status. Nor did I inquire as to why they chose to participate in this study. And finally, I did not ask for, nor diagnose, the level of expertise in using the Internet and the World Wide Web. That is, I received no information from teachers about the students' actual experience or success with using the Internet as a tool and as a resource.

The students each selected an "alias" name and they and their teachers were given a first draft of my findings which they read for veracity. None offered criticism of the findings and all seemed to concur with my written statements. The following students’ stories appear in the directions which I label personal attributes: Vel, Elisha, J.R., Bryce, Lauralee, and Will. The direction labeled particular skills included stories and anecdotes from Bryce, Elisha, Alice, Vel, Polly, and J.R. I did not use the interview of one student. He spoke in generalities and wanted to philosophize. He found it difficult to remember moments or instances of his own use. He told me more about his brother’s experiences working at the Apple Corporation in California.

Limitations of the Study

The nine students represent a convenience sample due to their affiliation with a single school which might not represent the thinking or attitudes of other Tennessee students with "twenty-first century" classroom experience. Whether this represents an extreme sample from the state would be worthy of examination. Maplewood District is generally noted for its commitment to excellence in education. Average teacher salaries are higher in this district than any other in the state (Annual State Salary Review, 1997) and much of the annual budget comes from local property tax, unlike its neighboring school districts. Therefore, the average socioeconomic status of the community school might indicate that public school students in this town have benefited from family and community interest in strong educational programs. The variables of socioeconomic status or academic achievement are not addressed in this study.

A second limitation includes reliability of the students' perceptions. In soliciting students' comments, I had no way to check their experiences. My only source was the interview data. A follow up of this study might include two additional data sources: (1) Observation of students using the Internet and World Wide Web to evaluate search strategies, and (2) an analysis of work produced from using the Web as a resource. These two data sources would serve to check the affective area of confidence level, and the cognitive area of skill, in using the Internet as a tool and as a resource.

Discussion

Students' Personal Attributes: Questions of Confidence or Voice of Authority

Three stories illustrate the sense that students gain self-confidence and express authority with their understanding and use of technology for school work. In the following stories, Vel seems to allude to a comfort, a feeling of familiarity with electronic sources for both school work and recreation. Elisha's comments indicate a spirit of resilience in using the technology, and J.R. acknowledges learners' openness and vulnerability, which suggests a sense of confidence from these student users.

Vel: A question of familiarity: I use them at school and I go to the public library and use them . . . Ever since I was in the fifth grade, so that would be about 3 or 4 years now . . . I feel like I got it down pat. Or if I don't, I feel like I'm a very independent person so I don't like to ask for a lot of help. Like if I just don't understand it, I'll ask for help, but I'll try to figure it out. I just don't give up easy.

Vel offers us three reasons for his self-confidence which he asserts as "got it down pat." First, he feels used to working with "them" (computers) because he says that he has used computers since the fifth grade. Put another way, as an eighth grader (13-years-old), Vel has worked with computers in some capacity for approximately one third of his life. The familiarity which comes from his "3 to 4" years of experience suggests that using computers is not threatening or overwhelming. Second, Vel has access at school and at the public library. For him, accessibility may signify familiarity as well. Accessibility may suggest that one can stay current, that is, not endure long lapses of time between use, requiring brush-up sessions, or feeling out of date. Knowing that one has access and knowing how to access technology may suggest a kind of powerful knowing. In an emergent culture such as one which unfolds before us technologically, learners must feel assured that they can have access, belong to and stay close to the changing culture, rather than fearing its new iterations.

Third, Vel's personal and self-named attribute of independence suggests that he has a conscious sense of himself and some awareness of how he goes about solving problems. This meta awareness of his own problem-solving style is important in new learning. As Vel progresses in gaining new computer skills, he does not appear to be daunted by more complicated projects, but rather, will figure them out or, when pressed, will ask for help. Vel is not unusual in his claim for independence. Kuhlthau, Belvin, & George, (1989) examined library users' perception of the role of mediators. In their work, no mediator was identified by 70% of the participants (p. 164). Vel suggests that he "doesn't ask for a lot of help," but acting as a "very independent person" can offer Vel both strengths and weaknesses in his searches. Further probing of this affective stance might reveal that other issues keep him from requesting help from professionals, family, or friends.

In sum, Vel's stated self-confidence stems from a sense that he is in charge of the computer. Having something
“down pat” suggests that he is in charge and on top of his processes in using technology, in contrast to acting as a passive participant in his interaction. Experience, maintaining access, and personal attributes help shape this student’s confidence in using electronic tools and resources. In this portion of the interview, he is not specific about what he seeks nor his level of success in searching electronically for information. He simply wants to communicate the ease with which he approaches “them.” Perhaps if Vel lost a certain level of experience through his lack of access, he might lose a degree of self-confidence in using the electronic tools.

Elisha: A question of resilience: We’re doing . . . a paperless project. We look on the Internet for all different kinds of information on future energy sources . . . We do the whole report on a disc. We do all our charts and graphs on a disc. We transfer information on the Internet to our disc in the word processing. I think it’s pretty cool. It’s a lot better doing than having to write everything and it’s lots easier to keep up with. You pretty much just have to learn how to look up information on the Internet. Then you have to open the word processor and have the Internet open. Then you copy it and paste it onto your document in the word processor . . . There were some Web sites that my science teacher gave me to look up data for future energy sources and also, for projected usage and past usage . . . and you can go to the Net Search and type in future energy sources and it’ll give you a list of titles . . . sometimes you just have to look and see. I mean, some will have pretty much nothing that you really want. Others won’t look like they have it but they do. It’s pretty much trial and error, unless it has a really distinct title.

Elisha’s sense of confidence and voice of authority shows in her clear and concise synthesis of her latest assignment. We can infer from this narrative that she has not been perplexed by either the content of the assignment or the skills required to report her work in a paperless fashion. She speaks directly, offering the steps in sequence, and most notably, uses the language of a seasoned word processor. By employing the vocabulary of adult users of technology, Elisha shares the technological culture. In order to say “open the word processor and have the Internet open” suggests that she understands how to access both operations. Using phrases such as “copy it and paste it onto your document,” shows some word processing skills.

But the notable aspect of Elisha’s self-confidence comes from her mention of “trial and error” searches. Certainly debatable as a pedagogy, K–12 teaching methodologies rarely encourage students to engage in trial and error learning of new knowledge. When teachers of any field introduce new skills and concepts, they typically demonstrate, that is, they model specific steps and skills for students to practice before going on to more advanced steps (Tennessee Instructional Model, 1984). To suggest that she can tolerate the “trial and error” process, Elisha shows a resistance to the typically held school notion of producing one right answer. Trusting a trial and error search reveals a kind of forgiveness for coming up dry or being on the wrong track. Elisha mentions the variability in sites; undaunted, she resorts to a kind of inclusive thinking which suggests that she is willing to check out a number of sites and titles in order to come up with the information she seeks. She compares and contrasts. The flexible thinking, a tolerance for ambiguity—which resists rigid and linear thinking—reveal Elisha’s voice of authority in her resilience. She enters the world of many Web sites and evaluates them by titles and content. She follows tracks and gets off tracks, but she understands that this kind of work does not represent failure. On the contrary, her experience illustrates to her that this kind of thinking is required to connect with needed sources.

Elisha’s use of the vernacular, “it’s cool,” reveals that the assignment meets with little resistance from this adolescent. Yet another student uses the word “hip” in describing the project. The accolades suggest that, for now, either because it is new, fun, or because using technology suggests some authority or power which they have recently embraced, some students welcome what might have once seemed a dreaded research assignment. Elisha and Vel offer statements illustrating degrees of self-confidence and resilience, never alluding to developing or refining their own search strategies. For them, a level of success represents knowing how to access by performing trial and error searches.

J.R.: Questions of openness and vulnerability: We don’t ask for help in core subjects because we’ve been in these courses for all these years now and hey, they are things that we are expected to know. And you don’t want to feel like all your classmates are ahead of you and you’re asking a question and everyone’s like, “Man, I’ve known that since back in the sixth grade” . . . that doesn’t really apply for much in computers because most of the time everyone around you, including the teachers, are as clueless as you are. So, if you ask a question everyone’s like, “Yeah, what’s going on there?” because no one else really knows much . . . You know, it’s new to them. So it’s just like when you’re little, starting out in school, you know you could ask anything . . . everybody is so new to it so you’re not worried about what are people going to think if I ask this question . . . and the teachers here are very modest. They’re not putting themselves on a pedestal. The teachers here, with the exception of a few, have no problem with asking me, a student, for help with computers.

More than revealing that he has some expertise with computers and serves as a support to some teachers, J.R. points out that, because the general use of technology is still in its infancy, most students assume that fellow users share similar expertise and frustrations. Indeed, he alludes to the fact that student users are basically novices. Given that assumption, asking questions about and requesting
help for using technology are sanctioned as worthy ways to learn, as opposed to asking questions about basic or "core" subjects. From his point of view, making oneself vulnerable by showing ignorance and asking questions of teachers or classmates is sanctioned typically in one's early years of schooling when school is new to all. To carry out J.R.'s line of thinking, as long as technology remains in a continuing state of change and development, many users may long feel themselves "clueless" or "modest" about their expertise. If it is true that students in this generation feel more or less equal to each other in their technology skill levels, one might expect to see a new kind of classroom culture emerge, where peer support is more visible, where levels of expertise are more blurred than in "core subjects."

J.R. makes a reference to teachers suggesting that they may operate on a similar level of expertise as some of the students. As novices, he notices that teachers, too, may ask for help, even of students; yet they do not seem to mind the vulnerability of showing their lack of expertise. The exchange of roles between teacher and student occurs only infrequently in schools. For many reasons, school culture typically demands both formal and informal boundaries between student and teacher. And yet, with the emergent technologies, schools may find that teachers not only query the students but ask students to teach, inform, model, and answer problems which they cannot necessarily answer themselves.

J.R. illuminates an interesting contradiction. That is, in not knowing "what's going on there," students show a certain self-confidence by purposefully making themselves vulnerable in asking questions and seeking help. Logic presumes that students who lack self-confidence might not ask for help or know how to frame questions for assistance. Thus, in listening to Vel, Elisha, and J.R., one might return to them to probe for clues of justified self-confidence or mere bravado which hides frustration.

With these few interview segments, we hear students' construction of a user-friendly computer/Internet reality. Contrary to hearing "anxiety and uncertainty" (Kuhlthau, 1993a) expressed by these student users, the comments raise many questions. Is the confidence expressed by these students associated with using the technology as a tool, rather than as a resource? What constitutes each student's skill level in searching for information, generally, and on the World Wide Web, specifically? Have teachers or students evaluated final products of research and writing to assess levels of competence in searching and synthesizing ideas? Does such assessment improve the invitation to speak of their experiences. They did not share any uncertainty in revealing their stories of use.

Students may please themselves with their growing sense of self-confidence in using technology; adults may be surprised at young people's growing voice of authority. Nevertheless, the phenomenon of familiarity must be examined in light of continued and greater access for technology users. The phenomenon of resilience in learning—a willingness to engage in "trial and error" rather than systematic and prescribed approaches to accessing information—may offer educators and curriculum designers new ideas for pedagogy. Certainly, the notions of seeking information through "trial and error" methods may challenge the mode of producing "one right answer" for standardized tests. And finally, the blurring of traditional roles suggests that school culture may assume new dynamics, where teachers and students work together in more collegial ways, creating a true "learning organization" (Senge, 1990).

**Students' Personal Attributes: Questions of Understanding Time**

In talking with the eighth-grade students about their uses and experiences with technology, I found that they revealed three mature notions of the concept of time. Bryce suggests that expediency is in order and that users of technology must be mindful of how they spend their time, for several reasons. Lauralee talks about the pleasure of having time for browsing, as she discovers the pursuit of ideas. And finally, Will discusses the need for patience as an attribute for accessing information.

**Bryce: A question of expediency:** Time is a very precious commodity . . . [And] on the Internet this can be a financial issue . . . but if you don't have to worry about time constraints or where you have to be in 15 minutes or how much you're going to have to pay, the Internet can be specific, up-to-date, and quick. So really, when we are looking for something on the Internet, to find something quickly is always to our advantage but sometimes, we don't find the most specific thing or the best information we can. . . . It depends on how easy it is to find that information. If you're doing something very, very specific, like my project on triboluminescence, it could take a long time, say maybe 30 minutes or more to find information. But something very widespread like the legalization of marijuana or trade embargoes around the world, some current event topic, it's pretty easy to find information on something such as that.

As a user of the Internet, Bryce reveals his understanding of both the financial and the existential issues of time. He honors the element of expediency because he is aware of the value of time in life, generally, and because he knows that some users pay for their Internet connection. Bryce is intrigued with the efficiency the Internet can
provide. He states that even if users have no time constraints on their browsing, the Internet can provide current information quickly. In his statement, Bryce tries to compare the efficiency of searches between “widespread” and “very specific” topics. He claims that searching a “current event” topic will offer easier access than esoteric, little-known areas. Nevertheless, “subject knowledge may contribute to retrieval success” (Sugar, 1995) and what Bryce neglects to reference is the quality of the information which is accessed. His “30 minutes” may represent a careful search around a familiar topic in which he knows his questions and parameters. Searches by others for “widespread” topics may represent more superficial looks at information where quantity and diversity may, indeed, surface more quickly.

Nevertheless, Bryce appreciates that time is precious, and in this light, for him, a key value in using the Internet remains the expediency. He values subject currency and specificity as well.

Lauralee: Questions of the pleasures of browsing: I don’t think you need time. I think people like a lot of time to browse. But you don’t really need a lot of time to go where you want to go if you know your question. . . . Sometimes you’ll go to somewhere completely different than where you wanted to go. Because if you look up something like the moon, there must be tons of matches. You could be looking for information on the colonization of the moon, and you would get a poem. So a lot of the matches don’t give good explanation of what they are. So you really have to click in to them to see what they are sometimes . . . and sometimes when you are just bored, you just want to get on and just go somewhere. And you don’t know what you want to find out. And sometimes an idea will just pop up into your head and you’ll think, “well, I want to learn more about that.” So you’ll go to something. You really just go wherever you want and there’s really no destination. You’re just kind of floating around I guess . . . like walking in an unfamiliar place. You don’t know where you are going, but you are not afraid of getting lost.

Lauralee shows delight about the browsing process using the World Wide Web. She appreciates the idea that one browses sites slowly when one doesn’t know the question. But, according to her experience, when one knows what one seeks, there is no need for using a lot of time. She understands that the “matches” may not be one’s own “match,” which often happens when the browser doesn’t know his question. She understands that even if she is pretty clear and specific about the topic she researches, she may have to “click in to them to see what they are” to make sure of the match. This does not seem to bother her. Finding a poem rather than the scientific information she seeks does not discourage her from continuing to seek information. She knows you have to check out the “match” to see what it really contains. Here, Lauralee alludes to the content of the search rather than to the search process itself. She does not mention specific strategies for seeking information, but rather, discusses and evaluates the content in light of whether it simply matches the original question of subject matter.

But Lauralee is most exuberant when she talks about the delight of finding information when she has randomly determined the starting point of the search. Not knowing “what you want to find out” describes browsing at its finest: With no time limits, for the sheer joy of connecting with an unplanned topic, and digging as deeply into a question as one pleases. She describes her pleasure as “floating around”—a metaphor suggesting weightlessness, sensuousness, or a lack of accountability. As a student, she has begun to encounter the joys of knowing, seeking information, and playing around with ideas for their own sake rather than for an end product or grade.

Lauralee distinguishes between needing time and liking to have the time to browse. Rather than feeling the press of time, she perceives the element of time as positive, as the necessary and pleasurable currency for the recreation of exploring ideas. She implies a distinction between browsing “if you know your question,” which might not require a lot of time, and browsing when “an idea will just pop up into your head” and you have “no destination”—interesting distinctions which serve to remind us of different functions of information searches.

Will: Questions of patience: The good news about computers is that they’ve got what you’re looking for, it’s got a lot of information; the bad news is that there’s too much of it, and sometimes you can’t find it. . . . You try and find a specific thing, right, and then it says there’s like 900,000 or 9,000 files found on it. Like you have to find one out of 9,000. . . . Virtually anything you want is on the Internet. . . . You have to be real patient.

Will shows awareness of the magnitude of this new world of information. Now that the Internet is more accessible to young students such as Will, he is impressed with the size of this information source yet seems to question his capacity to tap into it. He likes the grandness of the Internet, perhaps experiencing a feeling of having the world at his fingertips. Yet, at the same time, he has named his coping strategy for handling so much information: Patience.

Will feels positively about seeking information and seems to be undaunted by the scope of his tasks. By mentioning that “you have to find one out of 9,000,” Will suggests a mystery, a hunt, some suspense or competition which characterizes his relationship to the act of finding what he seeks. He plays this game carefully, with patience, believing that what he needs exists on the Internet.

These student voices raise questions of time for browsing and searching, and for accessing and reading information on the Internet, specifically the World Wide Web. All three of these narratives around using technology and understanding time offer insight about how some students
perceive their “precious” time, their sense of browsing, and their patience in searching. And by noting the two broad directions of personal attributes—having self-confidence and understanding time in using technology—we sense that students may require different conditions for seeking information from those presently structured in the schools. Questions of making time to explore on the Internet offer many challenges to policy-shapers and curriculum developers for schools. Under what conditions would schools and libraries offer time for students to “float” around on the Internet with no predetermined topic for research? As students grow in their competence with technology and explore intellectual issues on their own on the Internet, management of what students learn and how students learn may look radically different from what we see currently in the schools. Indeed, questions of how students engage with the Internet and how that may influence their reading skills, for example, raise challenges for teachers.

**Students’ Particular Skills: A Question of Reading**

Within the question of reading, three areas arise. Bryce discusses the role which audio and graphics play in reading. His talk is labeled, *questions of reading with many senses*. Bryce made several references to “skimming” as a strategy for reading. The second excerpt is labeled, “questions of skimming as a reading strategy.” And Elisha sheds light about differences between reading for pleasure in books, and reading for information on the Internet. Her narrative is named, “questions of reading as ‘treasure’ and ‘resource.’”

**Bryce: Questions of reading with many senses:** The Internet has more pictures and sound and other media than a book. Like books don’t have animated things like Java. So you’ll look at pictures and hypertext links rather than reading words just straight out of a book. So a lot of times you’ll read less thoroughly on the Internet. . . . Java allows color picture animations even with sound. So when you’re on the Internet you could hear a real time audio clip, watch a video as it loads, watch Java animation. It adds a lot to the experience of browsing that you don’t get from a book . . . your imagination is used differently than reading a book. It can be stimulated by the intriguing animations. In fiction writing, you create the storyline in your head. That’s all good but for nonfiction or factual information, pictures definitely add a lot.

**Alice:** You can see the pictures on the screen. It’s not like you are imagining them by yourself. . . . You have to read the book to find it, but on the computer you just click on an icon and you can see it . . . on the screen.

She knows the difference between engaging the imagination in reading text from books and seeing the picture which expands and enhances the text’s message. Yet another student, Vel, perceives the pictures and graphics as a motivator for his reading.

**Vel:** They might have a picture of the new car and then they might have a paragraph beside it and I might read it . . . and they’ve got the writing printed a certain way and I might like it and I might read it.

Here, Vel comments on both pictures and the typography; each intrigues him to read the text for information.

**Bryce offers yet another key insight when he suggests that “you’ll read less thoroughly on the Internet.”** The word “thoroughly” suggests a kind of attending to. Both in speaking and decoding text, listeners and readers attend to different kinds of information about words, including: Phonology, or how to pronounce; the syntax of the text, which asks readers if it “sounds right” grammatically; semantics, which projects meaning; and the pragmatic, which checks context, i.e., is this fantasy, is this slang or offensive text? (Dewdney & Mitchell, 1996, p. 522). Bryce may be thinking that the audio clip, graphics, or typography, in their “intriguing animations,” offer more accessible cues for information about words than what readers find in close, deep, or “thorough” readings of stand-alone text. In decoding and comprehending print, readers must construct many levels of meaning and information on their own. For Bryce, “thorough” reading on the screen is not as necessary when multisensory cues such as he describes are provided. And finally, perhaps, the two kinds of reading—from print and from screen—are simply different, providing qualitatively different comprehension experiences.

Many of the students commented that graphics, as well as the text, serve as powerful points for their information gathering. Alice says nearly the same as Bryce, when she claims,

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has the power to imagine what the topic might look like, sound like, smell like. Words offer cues to the imagination. In employing multisensory cues to help decode text, the interpretation of the information will offer more of the authors’ and programmers’ nuances of understanding. In these instances, a reader’s imagination and comprehension are challenged in ways different from what reading text alone may do. The lure of visually exciting screens does not offer a substitute for exercising one’s imagination from reading stand-alone text, whereby one employs comprehension skills far superior to simple decoding or taking information from the screen. Bryce points out the important distinction between reading fiction and nonfiction; he notes an appropriate function of graphics for reading nonfiction and information, and suggests they may inspire new reading strategies.

Bryce: Questions of skimming as a reading strategy: If you have something to do (on the Internet) you can’t read it as thoroughly as if you had unlimited time. You don’t pay by the hour with a book. And (with the Internet), sometimes you’ll find yourself just skimming because the Internet has more pictures and sound and other media than a book.

Bryce is not apologetic about skimming for information. He is aware of the cost of Internet service for some. We know from a previous story that he values time, is expedient, and can assume that he uses the reading strategy of skimming in order to cover as much material as possible. His reference to reading less thoroughly on the Internet is not a negative one because he notes that both graphics (which can be decoded quickly) as well as words (which are decoded at a slower rate) can offer needed information. In a classic textbook on teaching reading, Huey (1977) suggests that

We have never canvassed the possibilities of improving the total word-form, for particular words. . . . If by using capitals or by changing the shape, size, or even color of constituent letters we bring into prominence the total word-form and characterize it better, total form will thus come to play a still larger part than at present in mediating the recognition of what is read. Such recognition in larger units favors speed in reading and lessens the strain on eye and mind. (p. 423)

But skimming as a single reading strategy raises many questions. Well known are the courses which teach “speed” reading or strategies of skimming. They endeavor to liberate word-by-word and line-by-line readers in order to accelerate reading speed and to influence greater comprehension of large quantities of information. Such courses make “reading and studying into a conscious activity, in which students are aware of which passages they choose to read and at what level of detail” (Lambert, 1997, p. 67). Given the nature of browsing or surfing on the Internet, will students learn also to employ thoughtful, critical reading strategies, such as close reading to appreciate authors’ intentions or to “search out implicit structure of a text” (Lambert, 1997, p. 68)? Should we be concerned if students learn to read or only choose to read electronically by “surfing,” or “gliding and tapping into what you want”? As a complex act, reading offers many levels of challenge and pleasure. Certainly, skimming empowers readers. And, ironically, skimming as a reading strategy is often difficult to teach to novice readers who lack the confidence to free themselves from word-by-word and line-by-line decoding. As educators, however, we must understand the differences among the various strategies and purposes of reading. Elisha notes differences between different kinds of reading.

Elisha: Questions of reading as “treasure” and “resource”: Books are always going to be a treasure to me. . . . I can really get into a fantasy in a book rather than surfing on the net. I find wanting to have an adventure more in reading a book than going on the Internet. . . . The computer for me is more of an information resource. I find I am more interested when it’s on the computer because it seems more in depth and up-to-date. I find it more appealing to go into the computer and have such a choice instead of one book, maybe . . . and it’s easier to read. You kind of just sit there and you scroll down. It keeps my attention better, because of its brightness and being right there, I guess.

Elisha’s insight offers a sense of balance. A reader, she helps look at key differences in being with a book compared to being on the computer. As metaphors, both “treasure” and “resource” share meaning of value and potential support. “Treasure” refers to an elusive, yet emotional dimension not necessarily seen in the notion of “resource,” a more neutral support. “Getting into a fantasy” suggests getting lost, immersing oneself in a pleasurable experience. Saying it “keeps my attention better,” Elisha paints an active picture of physically and cognitively interacting with the Internet. She chooses material from various sources, initiates when to “scroll down,” and cannot escape its bright presence, a far different experience from curling up with a piece of fiction for pleasure or adventure reading which may only happen in her head.

Paying attention to balance challenges educators to orchestrate the materials and resources for their curriculum development and delivery. Balancing reading assignments of fiction and nonfiction and requiring both curling up with books and logging onto the Internet require thoughtful pedagogy and pacing. As two very distinct and qualitatively different reading activities, students’ intellectual lives should be charged with engaging in reading for pleasure and for information. They must not only read, but know the difference among various kinds of reading.

Of all the themes which these student interviews raised, educators must raise the questions of reading as essential
to their pedagogy. How critically or deeply do students read when they work with hypertext or read on the Internet as compared to reading print in books? What kinds of new reading strategies should teachers account for as students switch reading activities between paper and screen? Given the lure of electronic resources, will we create blocks of time in which students not only are allowed to browse on the World Wide Web but spend time getting lost in a book? What cognitive skills diminish as graphics and audio stimuli offer ready-made interpretations? Which reading skills expand? Essential questions of reading might shape new ways in which teachers conceive of using electronic sources in their teaching.

Students’ Particular Skills: A Question of Managing Information

Throughout the interviews, students raised questions about quality in technological resources and wondered how to handle great quantities of information. Several students discussed how much information appeared before them—at an instant—and how much of it appeared irrelevant or useless. Alice and others suggest, first, that one needs to know one’s question. I have labeled the first skill area, questions of knowing what you want to know. As a second step, students have to learn strategies to conduct searches on the Internet. J.R. shares his thinking in the section labeled questions of search strategies.

Alice: Questions of knowing what you want to know: Browsing is just flipping through things, seeing what all is there. It’s kind of like flipping through the channels on TV, typing different things in to see what pops up on the screen. And you know, if you don’t like it you can flip to another thing. If you don’t know what you’re looking for, you’re out of luck. . . . For looking up “solar energy,” I didn’t even know what I was supposed to do and so I just typed in “solar energy” and I kept getting these other things like “solar energy, the book.” I’m like, “no, solar energy.” Then there was a person named “Solar Energy.” And it was like all kinds of things, so I just clicked “solar energy: science.” Basically I had to find it out on my own. It took like 3 days to figure it out. . . . There are so many things out there. On the computer you don’t really know what all is in there. But you can find anything that you want. You just have to find a way to do it.

In this story, Alice offers a picture of familiarity with the initial browsing process, making the analogy with selecting television programs. But it would appear, for her, that her analogy stops there when she says that, “If you don’t know what you’re looking for, you’re out of luck.” Television browsers often act passively, checking to see whether or not they can be intrigued by a presentation to remain with a channel. But the Internet search feels different, more active, as the students refer to initiating a search and evaluating a match. Vel echoes this as he suggests, “When you first get on the Internet you have to have a subject to get on there.” And Polly states it most directly, “If you don’t have it, you can’t find it.” These students show that in order to make use of the Internet, one needs a focus, a question. And more productively, Belkin (1982) reminds us that “it is more suitable to attempt to describe that anomalous state of knowledge (ASK), than to ask the user to specify her/his need as a request” (p. 62) for information. Students must know what they want to know, beyond suggesting a discrete but ambiguous subject.

Shaping the research question seems to challenge the students. Alice spent 3 days trying to figure out specifically what she wanted to know. The broad topic of “solar energy” offered too many possibilities to search, and by not figuring out what it was about solar energy she wanted to know, she found irrelevant connections. Polly adds to this frustrating picture when she tells us,

Polly: So sometimes it seems like you end up with things with no connection whatsoever, or so far out there in connection that it might as well not be. It’s annoying when you end up with those things and you only have so much time to do it in, and you can’t find anything.

Seekers of information must learn to frame or shape their initial question. Polly feels impatient with lost search time. Although it took Alice 3 days to learn that she had to undergo a process of refining her search, she became more clear that she had to figure out, “on her own,” what she wanted to know. Even within the subset of “solar energy: science,” Alice then went on to find additional subsets for past and projected uses of solar energy. Knowing what one wants to know represents one key to success in searches. Shaping questions for Internet searches differs little from searching print materials. Feeling confused about how to go about the process of finding information often maps back to the initial question which many students have not considered thoroughly enough. A second key to search success might include assistance. The students interviewed for this project do not mention seeking help from a mediator—a teacher or media specialist—but rather, mention figuring out search strategies “on their own.”

Nahl and Tenopir (1996) suggest that users “need information about searching itself” (p. 281). Teachers and librarians can train students to search on their own by first teaching them to ask themselves such questions as, “What is it about ‘solar energy’ that you want to know?” And further, “And what about that is it that you care to learn,” thus helping to establish the topic even further by identifying the user’s true information need. Teaching students overtly how to go about the business of seeking and writing up information offers students a model of digging mindfully into subject matter, rather than encouraging superficial searching and scanty thinking. The “trial and error” searches, the 3-day searches,
represent fairly low cognitive efforts. If students care to research topics with serious effort, they must pay attention to their cognitive need to know, and practice strategies which connect the seeker to the sought material.

Thus, once the research question is established, searchers must employ explicit strategies to seek information. J.R. offers insight into the delight of finding so much information, and discusses his strategies for coping.

J.R.: Questions of search strategies: There's just much more selection on the Internet. . . . Sometimes it's good that it has so much, because it is very broad. It has a lot of information from a lot of different places and even from different times. I was looking for something and it had like 12,000 matching topics. You narrow it down by giving it specifics . . . what words to use . . . . But in narrowing and scrolling down, looking for what you need, you'll find something [else] interesting. You get side tracked on it. But that also can be a pitfall because when you get to something like that, you have to know how to find that one thing out of the 12,000 that you are looking for.

J.R. appreciates the breadth and depth of the information so readily accessible from his Internet searches. But he is very aware that it can overwhelm. "Narrowing" represents his key search strategy and he understands how to use specific words to direct the search. Nevertheless, in simultaneously "narrowing" and "scrolling down," he notes the temptation of getting sidetracked into more possibilities. For him, this can be both good and bad news. At no point did J.R. mention employing "broadening" as a search strategy. Although he suggests that "you have to know how to find that one thing," he does not divulge how one might recognize it. More startlingly, his statement suggests that, just as a needle in a haystack, you must know exactly what you seek and then, must recognize it. His allusion to "specifics" or words to use does not employ the more sophisticated language of "terms." One senses that J.R. has learned by trial and error, that he has had some moderate success in his searches, but that the awe of so much response to his query continues to impress.

Students must employ basic search skills to access the Internet productively. These skills may include general research concepts such as defining the topic, negotiating parameters of both the topic and the search sources, learning to use search terms, and skimming for information. As for all research, both print and electronic, students must learn to evaluate their sources. And finally, student searchers must know how to synthesize their information and write their findings in their own words, citing the sources in appropriate ways.

Some students will teach themselves these skills from home and recreational browsing. Some students will learn these skills in school from peers or teachers. Research must address issues of initial learning of how to use the Internet for searches. How much can novices gain both from the playfulness in undirected browsing balanced with the structure of learning direct search strategies? Do trial and error searches enhance or impede the initial learning of tried and true search strategies for information retrieval? What best methodologies support the initial learning of retrieving information from Internet sites? These student voices help raise questions for additional research.

Conclusion

In reviewing the students' perceptions, we gain insight into how they, themselves, have begun to construct a working understanding of the relations among the information problem that they bring to the search, the Internet as tool and resource, and the outcome of their search. If the adults who work with student users understand students' constructs, perhaps they can gauge what users have in common and what is idiosyncratic in electronic searching. The study raises questions for professionals engaged in teaching students how to seek and retrieve information. The questions suggest areas for professional development for teachers and media center directors as they begin to embrace electronic and print resources for student research. The areas include assessing students' levels of self-confidence in using the Internet both as a tool and as a resource, knowing how to structure both overt and open-ended lessons in search strategies, and appreciating and employing different kinds of reading strategies.

First, the positive attitudes and self-confidence exhibited by these nine research participants provide interesting dimensions of youthful users, but may not indicate success in their information retrieval overall. Professionals who research stages of adolescent development may offer insight into notions of justified self-confidence or the veneer of bravado which students exhibit as they talk about their expertise with technology. Were these students novices or could their 4 years of familiarity with "twenty-first century" classrooms label them as seasoned users? Understanding better students' sources of self-confidence with technology would offer information for meeting individual needs. This research suggests a level of student confidence only with using the Internet as a mechanism, a tool. None of the stories alluded to evaluating the Web sites for content excellence. Few mentioned accuracy and adequacy of the information retrieved from their searches. Information professionals must be clear about the differences among comfort level with the technology and depth of appreciation and critical assessment of content which students encounter.

Because of their "guinea pig" status as "twenty-first century" classroom students, many of these students learned on their own, as peers of their teachers who were learning as well. We may continue to see this collegial setting for a number of years ahead as schools seek to change their pedagogies to accommodate the use of the Internet as a resource. These early years of developing
curricula and teaching strategies which integrate print and electronic resources may offer an informal approach by learning in a collegial atmosphere. The informality of a developing technological school culture offers issues to notice. Different from the print-alone culture, students may know more about how to use the technology than the adults. How can we harness the real self-confidence and use this affective variable in assisting students' learning overall? Our continued understanding of students' cognitive and affective development (Kuhlthau, 1993b) may offer a beginning framework for learning how to introduce, how to pace, and how to measure students' capabilities with using the Internet.

Second, questions of continued technology training and professional development will begin to drive the quality of use in the schools. Research into how best to assist teachers and school media professionals in learning how to facilitate students' learning on the Internet is needed. Throughout the narratives, students made very few references to intermediaries such as teachers and media specialists. Only Vel, when pressed by my question, "How did you learn to find Web sites?" responded, "The [public] reference librarian!" Certainly, schools need to engage in creative and developmentally appropriate ways to introduce students of all ages to the notions of vastness and currency of the Internet's content, as well as to elegant and efficient strategies for accessing the information. Schools may have to entertain questions of time and schedules to enable students to complete both leisurely browsing and efficient searches. And further, if research and search strategies are overtly taught, then how do schools schedule time to perform the searches, which are, by nature, unpredictable? Typically, students do research outside of school time. If professionals want to assist students, coach them in their newly learned search skills, do computer labs and school media professionals assume new roles during traditional class time?

Third, threaded throughout their narratives, students made references to the process of reading. As we introduce technology into the schools and set expectations for using the Internet as a resource, we must be mindful of the different kinds of reading employed in gathering ideas. Educators and students must understand that we both skim and perform close readings on text, depending on the task of seeking knowledge. Therefore, questions of how to select a suitable process of reading depending on the purpose must be made more explicit for students. As they enter an Internet world with multisensory cues for decoding which invite them to skim, students must not forget the processes of reading deeply for meaning and evaluating, as traditionally expected with print. The goal of learning how to access information and then, comprehending it at many levels, does not change because one can skim so much more easily on the Internet. Continued research might offer us ideas about how to recognize and practice the differences in how to read and comprehend print text and Internet text.

The students who shared their stories and insights about their use of technology illuminate key issues for educators. Eager to share, these students offer memorable stories of encountering the Internet. If we listen to their voices, we hear their confidence and their openness in using technology. If we listen carefully, we gain insight into rethinking how we teach such core subjects such as reading, research skills, and writing. As we consider students' perceptions, we gain insight into how to assess and utilize their own construction of what it means to use technology such as the Internet's World Wide Web.

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References


