

Cemeteries, Oak Trees, and Black and White Cows: Learning to Participate on the Internet

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Abstract: Designers of Internet applications and those helping others learn about the net need to understand the problems Internet newcomers face as they encounter the idiosyncratic structures that organize the networked world. As part of an ethnographic study of SeniorNet, an organization that helps seniors learn to use computers, we explore early encounters with the networked world by analyzing questions asked in introductory computer classes. These questions, grounded in newcomers' prior experience, show how the taken-for-granted assumptions and strategies underlying successful Internet use differ from those in other domains. The questions and analysis are grouped in the following categories: identity on the Internet; boundaries and scope of the Internet; boundaries and scope of the personal computer; and organizations and providers in the networked world.

Keywords: Community settings, conceptual change, informal settings, home computing, Internet learning

Introduction

The "networked world" is a social, technical, and cultural system with an idiosyncratic history, shaped by the unique perspectives and backgrounds of early net participants. Newcomers to the net find that the assumptions and strategies they have developed through experience with other communication and information technologies can be misleading or confusing when applied to the Internet. This paper explores learning encounters with the networked world, drawing on data from an ethnographic study of SeniorNet, an organization that supports senior citizens in gaining access to computing.

We analyze the questions seniors asked in SeniorNet's introductory computing courses and in a technical help area of one of SeniorNet's online communities. This study has implications for the design of both learning programs and applications that facilitate effective participation on the net.

In several recent studies (Bier et al 1997, Kraut et al 1996, 1998), researchers provided families with home computers and network access to investigate the use and impact of home-based access to online services. These studies look at patterns and implications of Internet use, but they do not address the processes through which people make sense of their new experiences. In contrast, we follow these processes by examining qualitative details of learning and community practices. As in most ethnographic studies, we have focused on detailed, nuanced observations and analyses of social practice in particular settings. The questions we discuss should not be regarded as a complete inventory of everything learners might ask about the Internet—other questions might arise in other learning situations. Our aim here is to listen deeply to these particular questions, to provide new insights about what is involved in learning to participate on the Internet.

Approaching the Internet is more complicated than learning individual software applications. Newcomers are confronted with broad questions of ontology, as well as questions about the customary procedures of this new domain. They must learn what the net is and how its pieces fit together, the roles of different service providers and organizations, and how an individual identity in cyberspace is formed and maintained. Like previous work on common-sense physics (di Sessa, 1993), we analyze the questions of learners to understand their developing sense of the objects and relations in this new domain. We exploit the geographic metaphor of the Internet by calling these learners "newcomers" and the people who have been around for awhile "locals." We avoid the terms "novice" and "expert," because they de-emphasize learners' intelligence and experience. The questions the students asked were reasonable and informed, not naive. No one comes to computing as a blank slate. The seniors we met in our study were mature people who had valuable experience with a variety of technologies at work and at home. Their questions are largely outside the frame of reference of locals of the networked world, so these questions illuminate the networked world as it currently appears to new Internet users in schools, libraries, senior centers, and homes. Because newcomers do not take the Internet and its workings for granted, they are in a privileged position to make visible the implicit assumptions that organize the net. Newcomers' questions provide us with material to reflect critically on the design of current networked applications and on the requirements of Internet classes or other learning programs.

Further, the learning problems posed by this domain are particularly interesting, since the Internet is changing so fast that even locals may sometimes find themselves surprised or confused by new developments. (Of course, physics is changing too, but not so rapidly as to change a high school teacher's practice from one day to the next.)

Locals of the Internet have developed a sense of what the important objects are (such as files, disks, applications, and windows), the meaningful relations between these objects, and the actions we can take with them. Computing ontologies are subject to change and

are not always logical and consistent from the point of view of new users, since they have developed from the historical trajectory of a specific group of designers quite different from today's Internet users. Part of local knowledge is recognizing the relative stability and prevalence of different features and conventions. One instructor of an online class directed students to the more durable features of the Internet by distinguishing between "cemeteries and oak trees", and "black and white cows".cows." In the early days of automobile driving, road maps were not readily available. Instead, guidebooks used permanent local landmarks as reference points. A guidebook might advise a left turn at a cemetery or a right turn at an old oak tree, but it would not refer to a herd of black and white cows. The instructor urged students to look for stable and pervasive landmarks in the networked world.

The SeniorNet Project

The SeniorNet organization was founded in 1987 to help seniors gain access to computing technology (1). [9].SeniorNet supports robust network communities on the Web and on America On-Line (AOL). It sponsors over a hundred volunteer-staffed "Learning Centers" throughout the United States, which offer classes on such subjects as how to buy a computer, how to use financial software, and how to get online. Currently, there are about 25,000 SeniorNet members.

Our team conducted a year-long ethnographic study of SeniorNet, as a case of long-lived, successful computer access among a population stereotypically considered resistant to learning new technologies. We interviewed SeniorNet staff members, observed classes at three Learning Centers, observed online activity in discussion forums (newsgroups) both on the Web and AOL over a period of months, participated in chat regularly on the Web for a week, interviewed 30 members drawn from both network communities, interviewed 9 students from two of the classes we had observed (several months after their classes had ended), and interviewed one student after each of her class sessions. We also posted questions and research themes on an online forum, generating discussion among members about our project. Our findings address access issues, the nature of network communities, and online fieldwork practices, as well as learning to become a net participant. (Mynatt et al 1999, Mynatt et al 1999, Ito et al 1999)

Learning Center Observations

WeEach of the classes we observed three classes at three different Learning Centers, was situated within a community senior center. Two were introductions to computing (four and five weeks of two-hour sessions), and one was an introduction to online access (eight weeks of two-hour sessions). The classes were taught by volunteers and contained a total of 27 students.

These were "hands-on" classes, in which students worked in pairs on the classroom computers, and practiced both in class and at home, if they already owned their own computers. In addition, we observed the Newcomers' Forum, an online discussion group of the SeniorNet AOL community, for a period of one month. We found that the

questions posted online by newcomers were so similar to the questions asked by people in Learning Center classes that we have merged the two sets of questions.

Questions Analyzed

As we observed classes and analyzed students' questions, we were struck by the complex learning required for online access. For example:

If the file was saved, why is it still on the screen?

Does the person who sent you mail know whether you've opened it?

When are you supposed to double click?

Could I access SeniorNet on AOL through a different Internet service provider?

The questions covered six topical areas: (1) hardware (computer, mouse, modem, memory, printer, keyboard); (2) WIMP conventions and capabilities (dialog boxes, highlighting, scrolling, windows); (3) application features (changing margins or fonts, ccing someone on a mail message); (4) social conventions (courtesy, privacy, censorship); (5) computer ownership (upgrades, phone lines, online services, costs, technical support); and (6) networked world (the Web, downloading email, online access). We focus on the questions about the networked world (about 30 of the 125 questions), because such questions have not been studied and because they point to some of the more complex social, cultural and technical knowledge computer use requires. These questions cluster around four themes: 1. Participants' identities and the nature of participation on the Internet, 2. Boundaries and scope of the Internet, 3. Boundaries and scope of the personal computer, and 4. Identities and boundaries of organizations and providers in the networked world.

Participants' Identities On The Internet

People who enter the networked world begin to establish an identity there, just as they do in other settings where social exchanges take place. Using the Internet is similar in this way to other communication media, such as postal mail, telephones, and broadcast and cable television. Each of these media has its own conventions for establishing subscribers (names, addresses, and other information), which differ from Internet conventions. Newcomers' questions about Internet reveal unique features of Internet identity, particularly how it is persistent and public, constructed in part through the actions taken online.

Persistent Identity

How is it that you can get email even when you're not logged into AOL?

In some ways, the computer acts like a telephone. When you set up a connection via a modem, you can interact over the network. It would be reasonable to assume that this active connection gives you a presence on the Internet. This is like picking up a telephone call, with the computer rather than a telephone as a portal. But on the Internet, you can receive email even when you are not actively connected. To complicate the picture, if you are an AOL subscriber, you can download your email to your own computer and read it offline, an activity practiced in class. The question addresses the relationship between the mailbox and AOL. The general questions are: where does email live, and what is my role in managing its arrival? The learner seems to assume here that email is similar to the telephone, where both sender and receiver (or an answering machine) must be connected for an exchange to take place. However, Internet identity is different from either your active connection or your computer. Your service provider holds your identity for you, in the form of an email address. This identity is **persistent**, independent of your current connection.

Public Identity

I am getting junk mail on AOL. How did they get my name?

Does the person who sent you mail know whether you've opened it? Can it make junk mail worse to read it?

The general question behind the first junk mail question is, how is my identity made known to others in the networked world? The learner's assumption is that email works like postal mail—your own correspondents know your name and address. But on the Internet, the prevailing notion is that participation is a public act and gives you a public identity. However, in postal mail, mailing lists get sold, and postal addresses without names are available—you can get junk mail addressed to "Resident." The question asks how this works on the Internet.

The second question is an advanced one—the student knows that her online actions may be known to others, though she is not sure about the particular action of reading mail. She is trying to ensure a certain level of privacy—to reduce, or at least not increase, the amount of junk email she is receiving. Some communication media (such as the telephone) do tell the sender when the receiver is listening, while others (such as postal mail) do not.

Locals understand that a net participant's identity is persistent and public, but not static. As you perform actions on the Internet (such as posting to a newsgroup or visiting a Web site), information about your activities can become available an unknown audience. Learning the limits on and strategies for privacy are complex, unending issues for all locals of the Internet. Persistent and public net identity is a design feature which maximizes connectivity and accessibility. This reflects the early days of the Internet, when uses were largely non-profit and confined to a comparatively small professional community. Currently, this value is being challenged by various "undesirables"—spammers, snoopers, and predators—and increasing value is placed on limiting and bounding net identity. Newcomers need to understand the limits of privacy, and strategies for ensuring privacy.

Design Implications

While systems designers have developed various technologies for protecting privacy, designers might further reconsider the value of "any time, anywhere" connectivity as a basic design premise.

Boundaries Andand Scope Ofof the Internet

When you visit a physical site, such as a national park or a historical landmark, you can usually tell when you are there. There are signs that mark the approach to the site, a border or threshold to cross, and significant features to recognize when you are there. Though the Internet is a desirable destination, it is not easy for newcomers to know when they have arrived there. Some of the deepest questions newcomers asked were those probing the boundaries and scope of the Internet. There are few clear markers that show where and what the Internet is.

Crossing Over to the Internet

An instructor noted that you need a certain modem speed to "surf the Web." A student asked, "What about the Internet?"

In a message on the Newcomers Forum, a SN member said that he just knew how to do email and he was now "trying to get Web or internet."

The general question here is, is: "Are we there yet?" People expect there to be a there there when they reach the Internet, but what features show where they are? Your computer is a physical object, but the Internet is not. Web pages are becoming a familiar concept, as they are referenced in news articles and product labels. But the relationship between Web pages and the Internet is fuzzy. It is easy for newcomers to assume that the Internet is the same as Web content.

For locals, the Internet is a space of possibilities for encountering different forms of information and communication. Although the Internet includes content, it is primarily defined by connectivity to a broad set of activities and audiences. The different genres of communication (email, the Web, chat rooms, news groups) are recognizably distinct, but they are part of the net as a whole—both defining and defined by their relation to the Internet.

Geography, Boundaries, and the Net

Is the whole country in this particular chat room?

If you want to send mail outside the country, do you have to use http?

The Internet is described in many ways: as a highway, a library, a hotline. Most frequently it is described as some kind of place, as in "visiting" a Web "site" or getting "into" a chat "room". Newcomers must learn the extent of this geographic metaphor, and

these questions explore the ways in which physical geography is salient in the networked world. The question of whether the "whole country" is in a chat room implies that geographic places correspond to virtual spaces. It is a question about scope—who can be here in this chat room, and does it have spatial limits? For the locals in the networked world, the salient limit on chat room participation is temporal, not spatial. In a chat room, people can only be together if they are there at the same time. Geography is not the relevant boundary.

The question about how to send mail outside the country assumes that geography is a significant boundary for addressing email messages, and that foreign addresses require a different protocol, as foreign postal mail requires different stamps. But for locals, the Internet's reach is independent of physical distance; it is just as complicated (or simple) to address a message to someone in a nearby town as to a nearby country. Some email address suffixes **do** explicitly refer to geographic entities, especially outside the United States, but an email address does not necessarily indicate where the person is located. This question exposes a seam where geographic regions and the networked world are explicitly related, though geographic borders are not among the cemeteries and oak trees for locals. Locals understand the net through space-based metaphors, but the space and its boundaries are organized by activity and connectivity, not physical geography.

Design Implications

Many important boundary crossings on the Internet are not marked in ways that newcomers can see. In the SeniorNet network communities, volunteer hosts help newcomers learn to navigate the social boundaries so that they can become accustomed to different online places. Designers of online communities and software can help newcomers by marking more clearly those borders that have functional and social significance.

Boundaries Of The Personal Computer

Just as people work to understand the boundaries and scope of the Internet, they also work to understand the boundaries and scope of their own personal computers. Where does my computer end and the network begin, and when does it matter? What makes one personal computer different from another, and when does it matter? Although the boundaries between computers and networks are increasingly blurred, these are important distinctions for newcomers to the net. The advent of network computers may change this picture (e.g., see [3]), Gentner et al (1997), but currently information and functionality straddle the network and the computer, with useful pieces on both sides. In the questions related to this theme, newcomers attempt to understand the nature of the personal computer. Sometimes it acts as one of many portals to the network, sometimes it acts as one of many machines that can handle a particular application (such as word processing or Web browsing), and sometimes it acts as a specific machine with its own local information.

Locality and Customization

Why doesn't Flashmail work for me at home, but it does in class?

The general question here is, what is the difference between different personal computers? Although this student's home computer was the same type as the classroom computer and he was using the same online service as the one used in class, he found that an express method of sending and receiving mail (Flashmail) did not work for him at home.

Identity in the networked world is not maintained on your local computer, but is maintained in its narrowest sense by your service provider. More broadly, identity is maintained through all of your public actions on the net, which often leave persistent records that comprise who you are. Flashmail should have worked, assumed the student, because his identity was independent of the particular computer he was using. He was the same person, using the same provider, and he should have been able to read his mail on either computer.

For locals, the networked world operates apart from the computers used for access, but these computers are not fully interchangeable. In a public library, you can browse the Web, but your personal list of bookmarked sites won't be available. Similarly, locals see a distinction between the persistent identity as maintained by the access provider (an email account) and the software used for the email application (Flashmail). The general operating logic is that content and identity are universal (cross-platform), but they must be translated and customized to be locally meaningful and accessible.

Design Implications

Customization is a highly valued feature of almost all current applications, but it is so pervasive that it is virtually invisible. It is often buried under a name like "Options" or "Settings"—nothing that suggests how crucial appropriate customization is. One design improvement would be to make it more obvious to newcomers that the email application at home had not yet been individually customized, to advertise the fact that there is a distinction between a default version of the email application and the user's own personal version. Customization is also a serious (and difficult) topic for learning programs to address.

Residence and Control of Content

Why don't we have to sign onto AOL to see the files we've downloaded?

This is an ambiguous question as it stands. The student who asked this question had just learned how to download files in class and had also practiced reading one of these files using a word processing program on the classroom computer. He might be assuming that the file is owned by AOL, is still located on AOL, or is in a format that only AOL can decode; in any case, the student sees AOL as the guardian of that file. The general issue here is the boundary between the local computer and the AOL online service. The student

assumes AOL should continue to be involved in accessing files, if that was the gateway through which the files were originally obtained.

I use my Favorite Places so much I'm afraid of losing it sometime. Is there a way of putting it on a floppy disk? I've gotten a lot of good links that I'd hate to lose in case of a 'crash'.

Is there any way to read this forum offline?

The general question is, to what extent can I manipulate network "stuff" on my local computer? In the Favorite Places question, the user is concerned about what can be done to protect against losing valuable information, but isn't sure where this information is and who takes care of it. This is complicated, because it requires understanding customization controlled remotely (by AOL). Both of these questions are attempting to discover how to use the local computer to gain more control over interactions in the networked world.

It is not clear to newcomers how objects are transported and transformed in the networked world. For example, a file in an AOL library or ftp directory can migrate in its current form. A Web page can be locally printed (one form of migration) or saved in its HTML source format (another form of migration), but if it is stored locally it loses its identity as an active Web page. The general local assumption is that most objects can migrate (through various translations), but then will then cease to be universal, networked content, and become personal, customized content. This transformation contradicts the basic physical assumption of object constancy.

Design Implications

Perhaps the most important distinctions newcomers need to learn in this area are when and why migration of a document is useful from a user's perspective, and whether a document can preserve its "essential" features when it migrates. Designers might consider ways to mark more explicitly when content is local and remote, and what kinds of translations would make it locally intelligible.

Organizing The Networked World

This final theme addresses the various organizations involved in the networked world, including content, service, and access providers, and their hybrids. How are the different functions of the net distributed across and managed by different organizational entities, and why does it matter? In the Learning Center classes, students are exposed to a variety of organizations as part of their entry into the networked world. Typically, these include America Online and SeniorNet, as well as particular content providers students may encounter on AOL or the Web, such as NASA or the **San Jose Mercury News**. Some students may be acquainted with other access and service providers. It is far from clear to newcomers what role each of these providers plays in the networked world.

Parts and Wholes

Is SeniorNet part of AOL?

If you are on AOL, are you automatically on the Internet?

What is the difference between SeniorNet and AOL?

The general question is, what are the relationships among content providers, service providers, access providers, and the Internet? And who is what? Learners often assume a model of parts and wholes to understand the structure of net organizations. For example, is SeniorNet in a part/whole relation to AOL? Is AOL in a part/whole relation to the Internet? Given that the different organizations that comprise the networked world appear to have different scales, this is a reasonable assumption to make. Newcomers to the networked world assume the existence of supersets and subsets that bear some logical and accountable relation to one another.

By contrast, locals have resigned themselves to the chaotic, ad hoc nature of net organizations. Service, access, and content providers jockey for position and voice while forming fragile, temporary alliances, and any proposed hierarchy is always contested. Calling this chimera "the Internet" provides an illusion of organizational stability. The networked world is further complicated when online services such as AOL provide content that is separate from the Internet at large, available only to subscribers, a boundary whose nature is quite unclear. The networked world is an assembly of different kinds of parts, and they don't constitute a single whole.

Implications of Organizational Arrangements

Could I access SeniorNet on AOL through a different Internet service provider??

[Searching cake recipes with different search engines] What is the role of AOL in all this?

Is SeniorNet on the Web the same as SeniorNet on AOL?

The general question is, how do all these providers affect what I want to do? Newcomers soon realize that these organizational affiliations matter, that it is not simply a matter of branding. Rather, organizational structure governs, in complicated ways, not only the brand and content, but also the form, functionality, and general informational access. These questions reveal the complexity of these organizational arrangements.

Many of the student questions, especially those using a part/whole model, assume that the medium and content are provided as a piece, and that they are integrated at the point of access. This is an entirely reasonable assumption based on the models provided by other media technologies, utilities, or even destinations. For example, while a newspaper involves various organizations and individuals in its production and distribution, at the point of access, the product is a single integration of content and physical structure.

The underlying newcomer assumption is that content and organizations must be related. The first question asks if an online service other than AOL could provide access to SeniorNet content, since access and content are separable. But in this case, SeniorNet and AOL are organizationally linked, and the SN/AOL network community is not accessible through a third party provider. The second question probes the relation of search engines and access providers, which can be either closely linked or completely decoupled.

The relation of content and organization is one of the most rapidly changing aspects of the networked world. Newcomers assume that the economic exchange with the access provider must shape content in some logical way—this is one way of understanding what one is paying for. But locals are increasingly coming to see the value of organizational affiliation less in terms of access to content, and more in terms of how that content is presented and grouped (witness the growing importance of portal sites such as Yahoo).

Design Implications

There is value in the open exchange of information on the one hand, and a great need to limit and organize this information on the other. Designers are having to pay more and more attention to the operative metaphors of gateways, portals, and services, rather than collections of objects. Thus AOL provides value by (de)limiting access to certain content, as when it sponsors a relatively manageable community such as SeniorNet within its borders. For new users in particular, it may be helpful to provide content that is "local" to the particular access provider, and which is explicitly flagged as such.

Conclusion

Many of the seniors in our study became enthusiastic and successful users of the net—it does not take long for newcomers to become locals themselves. But by listening carefully to the questions of these newcomers in their early encounters, we catch glimpses of how the networked world might appear to inquisitive and puzzled visitors from afar. We begin to see the complex relations, historical features, and odd ontologies that organize the networked world. These aspects of the networked world have become invisible to more experienced users through tradition and habit, but they can be challenging to newcomers. Our findings can be useful in two ways. First, they point to the metaphors, explanations, and basic assumptions that are embedded in the user interfaces of network applications which require clarification to support easier access for newcomers as well as locals. Additionally, they indicate useful areas of focus for the design of learning programs for newcomers.

Acknowledgements

This research was funded by the National Science Foundation under Grant #SBR-9712414. We are grateful to the SeniorNet staff who supported us in this project, especially Marcie Schwartz, Ann Wrixon, and Richard Adler, and to Willie Riemersma and all of the other SeniorNet members who generously shared their network communities and classes with us. We appreciate the contributions of our Advisory Board members, Claude Fischer, Malcolm McCullough, Sim Sitkin, and Terry Winograd, and

our colleagues Paul Dourish, James Greeno and Steve Harrison. And we thank Luna Ito-Fisher, who joined our project at its midpoint, for her cooperation and charm during our meetings.

Notes

1. SeniorNet Web site: <http://www.seniornet.org/>

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