

**American Sign Language in virtual space:
Interactions between deaf users of computer-mediated
video communication and the impact
of technology on language practices**

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ABSTRACT

According to some discussions concerning new information technologies and technologically enhanced communication, we are now in a revolution as profound as the printing press. The Internet is creating new kinds of meetingplaces and work areas and the possibilities of new types of relationships across time and space. This article reports on some ways that the Internet is shaping language practices in the Deaf community, with an interest in how new tools mediate and influence human behavior, including language and the organization of interaction. This includes the development and manipulation of a computer-mediated image of self and other, creativity and problem-solving in new communicative spaces, creating reciprocal perspectives, new participation frameworks, and specifics of language change. For the first time, deaf people can communicate using manual visual language, in many cases their native language, across space and time zones. This groundbreaking situation makes the Deaf community a particularly productive site for research into relationships between technological innovations and new communicative practices. (American Sign Language, computer-mediated communication, language and technology, Deaf.)*

INTRODUCTION

According to some discussions concerning new information technologies and technologically enhanced communication, we are now in a revolution as profound as that initiated by the printing press (Poster 1984). The Internet is creating new kinds of meetingplaces and work areas and the possibilities of new types of relationships across time and space. New socio-technical relations involve linking the local and the nonlocal in intimate, relational, and reciprocal connections, and offer new forms of access to others, with new space-transcending capacities and new techno-cultural visions (Robins & Webster 1999:221). Relationships can even involve a “tactile” dimension (Mitchell 1995). The new arenas for so-

cial interaction are described by some as liberating; to others, they have elements of the pathological or colonizing. The ability to enhance and expand capacities is celebrated, but the ability for increasing surveillance or voyeurism is deplored. Some describe the ability to return to direct and immediate face-to-face engagement (Levy 1997) in a way that transcends spatial domains, while others emphasize the ability to abandon the surrounding reality for another (Robins & Webster 1999:224). Increased access to knowledge is welcomed by some; others lament the devaluation and displacement of embodied and situated forms of knowledge. It seems clear that there are new forms of participation open to some of us, at least to members of what has been called a “new global virtual class” (Reich 1992). How practices develop around new technologies and the social impacts of technology are important questions for social scientists (Escobar 1994:214). What conventions do new technologies engender? How does participation in new technological environments shape language? And what aspects of social interactions are transformed?

In this article, we discuss some consequences for American Sign Language of the introduction of technologically enhanced communication in a particular community, the Deaf community. New tools mediate and influence human behavior (Vygotsky 1978, Leont’ev 1978, Wertsch 1991), and we are interested specifically in language and the organization of interaction. Members of human societies have a history of inventing cultural tools, both material and symbolic, which have influenced human societies in important ways (Tomasello 1999) – for example, in the organization of collective activity (Leont’ev 1978). We are interested in the symbolic properties of language as it is used together with new potential means of communication afforded by the computer, particularly computer-mediated signed language (visual language), as well as the re-creation of face-to-face communication in virtual space, or the invention of face-to-computer communication.

Studying language as social action (Austin 1962, Searle 1969, Gumperz & Hymes 1972) and examining specific ethnographic contexts has revealed ways that everyday talk enables social actors to accomplish goals and create mutual understanding. Conversation itself is a complex, highly structured activity requiring moment-by-moment cooperation among participants. Examining interactions can show how new knowledge of technologically mediated environments is shared, and how shared knowledge is managed through talk. Language does not simply symbolize events or objects; it makes possible the existence or the appearance of a situation or object, because language is a part of the mechanism whereby a situation or object is created (Mead 1934:78). Computer-mediated sign language communication involves new ways to manipulate language structure and performance, including experimentation with and invention of new language forms. This invention and experimentation is motivated by what Scribner 1997 has referred to as “interrelated goal-directed actions.” These are constrained

by convention, but they also involve transcending bounded knowledge domains and creating new knowledge and practices. Participants acquire the mental and manual skills needed to master particular knowledge and technology and apply these skills to accomplishing an old set of goals in a new way.

For the linguistic minority Deaf community, the Internet is increasing connections among Deaf members who are geographically dispersed throughout the majority hearing community. Internet use also is resulting in the development of new linguistic and sociolinguistic practices and increasing communication across the Deaf and hearing communities. For the first time, deaf people can communicate using manual visual language, which in many cases is their native language, across space and time zones. This groundbreaking situation makes the Deaf community a particularly productive site for research into relationships between technological innovations and new communicative practices. In situations where new technologies are introduced, we have a chance to study how participants innovate with new language forms and sociolinguistic practices – how they must, for example, negotiate reciprocity of perspectives, appropriate conduct, and production and interpretation of act sequences. Interactants use old tools (e.g. language) to configure new ones, and in the process they reconfigure the old tools (in the cases examined here, for example). The new communicative context of the computer for sign language communication entails the development and manipulation of a computer-mediated self and other, participation in joint communicative activity with a computer image, creativity and problem-solving in new communicative spaces, the creation of reciprocal perspectives for interpretation, new participation frameworks, and in this case, important alterations in language form itself.

These processes involve trials and experimentation, and we will show representative instances of these. Interactants assimilate specific knowledge about the objects and symbols the setting affords, and the actions change novices to experts (Scribner 1997). For example, when using the web camera (webcam) for sign language communication, signers learn how to align themselves and how to figure out the best way to establish mutually coherent contexts for communication. They develop procedures for achieving successful computer-mediated sign language communication, including accommodating existing practices to the new communicative space. Interactants work together to understand and orient to the web camera's and computer's gaze parameters, and they adapt their language to video transmission. In face-to-face interactions, participants have reciprocal expectations and rely on mutually shared visions of the social world (Schutz 1962:54). The deaf users of webcam technology must collaboratively develop these shared visions through strategies such as those discussed below. They cannot immediately assume a shared perspective, since perspectives are technologically mediated.

The data presented here derive from a two-year study of four Deaf families in Austin, Texas (families with deaf parents and deaf children).¹

BACKGROUND

Signed language communities are unique language communities, with membership organized according to properties of an individual's perceptive system and not necessarily according to the speech community into which a person is born. The majority of deaf² people are born into hearing families who do not use sign language, and depending on the ideology of the particular local setting, deaf people may or may not learn a signed language during childhood. However, most Deaf individuals consider sign language to be a crucial aspect of their identity as members of the Deaf community, and many who do not acquire sign language from their parents develop signing skills later in life. Most deaf people are bilingual, using a signed language and a written form of some spoken language. Although deaf individuals cannot hear speech, many spend long hours acquiring the skill to produce it to some degree. In the American Deaf community, deafness is defined not only in physiological terms but also in cultural terms (Baker & Padden 1978:1), since this group includes hearing children of deaf parents, who are thus hearing native signers. Among signers, there is great variety in terms of hearing perception, language background, socialization to Deaf culture, native vs. late learning of sign language, style, and so on. What is also unique in Deaf communities is the daily reliance on interpreters, who can be informal makers of language policy.

Signed languages were only recently recognized as full-fledged languages as complex as spoken languages. Research is now growing, and there is great interest not only in the diversity of the world's signed languages (see e.g. Edmondson & Karlsson 1990) but also in comparisons between signed and spoken languages in order to contribute to understanding about universal properties of languages. *Ethnologue*,³ a well-known language data base, in 2002 listed 114 different signed languages throughout the world, and there are certainly more that have not been documented. Because of their linguistic minority status, deaf people have often been isolated not only from hearing people (and from the status and special privileges accorded by the state to hearing members of minority language communities) but also from other Deaf people.

A signed language is much more than a manual system. Signers communicate important grammatical, affective, and other information through facial expressions. Shape of the hands, orientation, location, and movement are all important components of sign language communication. American Sign Language (ASL) uses a system of classifier handshapes to refer to objects, surfaces, dimensions, and shape. There are important functions served by nonmanual expressions such as head movement, eye movement, and specific facial expressions. A question, for example, can be signaled by raised eyebrows, widened eyes, and a slight leaning forward of the head. Eyes are powerful turn-taking regulators. Fingerspelling is used for names or new terms, and also some borrowed terms, such as 'well' or 'cool', and sometimes for emphasis. Involvement can be shown through

affective displays, role playing, and direct quotation (Mather 1991:239). Signed languages can communicate several things simultaneously where spoken languages would do this sequentially. The majority of signs are made in the neck or head area (though this has changed over time).⁴

The facts that minority Deaf communities exist within larger hearing societies and that most Deaf people are bilingual create a language contact situation, and this supports forms of code-mixing. English-like or contact signing is characterized by such features as English word order, fingerspelled English words, and inclusion of articles or modals. Language contact and language policies created by hearing professionals teaching literacy skills in educational institutions have, in some countries, resulted in a kind of signed language that orders signs according to the syntactic rules of a spoken language. Examples of this kind of language include Signing Exact English or Signed Swedish. Such “languages” have been described as difficult for Deaf children to understand because they fail to take advantage of spatial resources (this point will be taken up further below), and the Swedish National Association of the Deaf (SDR) has stopped advocating the use of Signed Swedish (Bergman & Wallin 1990:202) and now advocates only Swedish Sign Language.

The deaf community and telephone communication: Historical context

Historically, telephone technology has excluded deaf people. Although Alexander Graham Bell was initially interested in creating technology that would help deaf people learn to speak, his invention of the telephone left deaf people out of one of the most important communication changes of the past century. The new communicative power of the Internet, however, has a strong visual component and relies primarily on the visual mode – both text and images rather than spoken sounds (many hearing people do not use the audio capabilities of their computers, for example).

The Deaf community did not have telephone technology until the 1960s, nearly 100 years after the hearing community. Before the teletypewriter (TTY) became available to them, Deaf people scheduled particular times to meet, or they got in the car and drove around to see their friends. Deaf people joke that since everyone was out driving around, no one was at home to visit with. Deaf people had to request that hearing neighbors relay calls and messages for them. In 1965, a deaf physicist in southern California, Robert Weitbrecht, developed an acoustic coupler that made telephonic communication possible for deaf people. This meant that a teletype machine could be connected to a telephone handset. Deaf people scrounged surplus teletype machines and adapted them, and new TTY communication practices developed. In the 1970s, a number of companies began marketing new electronic devices that functioned like teletype machines, the kind Deaf people mostly use today (see Figure 1). The TTY, however, relies on typed spoken language – for example, English (there is no agreed-upon orthographic representation for the visual elements of sign language), and it allows for trans-



FIGURE 1

mission only one-way at a time, which means that the interaction is unlike face-to-face communication or hearing telephone calls; no information about the recipient's response is available until the message has already been sent. TTY telephone calls studied by Mather 1991 often were characterized by multitopic turns, with as many as six topics in a single turn. Example (1) shows a TTY conversation between project members:

(1) A TTY "conversation"

- 01 G: HI GA
 02 E: HI THIS IS ELIZABETH, IS ALL FINE WITH GENE THER4 AND THE COMPUTER GA
 03 G: UV THIS IS GENE AND I JUST DOWNLOADED NETMEETING AND AM GETTING READY
 04 TO HAVE IT INSTALLED GA
 (...)

 05 G: SURE AND DI00 DID YOU FIND THE D CDS CD GA
 06 E: NO NOT YET IM STILL AT HOME GA
 07 G: K CATCH YOU LATER THANKS SK
 08 E: SK

Particular abbreviations are conventionalized in TTY interactions. Turn-taking mechanisms such as *GA* 'go ahead' and conversation-ending signals such as *SK* 'stop key', or signing off, are used.

The TTY changed communication habits and other social habits in the Deaf community. People no longer had to drive around to communicate face-to-face but could instead communicate visually through typed English messages. The socially transformative properties of communication technology are nothing new. Such transformations have been resisted successfully by some groups; for example, the Amish in Pennsylvania have banned telephones from their homes since

1909 (Umble 1992) because they consider telephones conduits for negative influences from outside the community that contribute to pride and individualism, and encourage informal women's information exchange networks or "gossip."

Some deaf people have been similarly worried about the intrusiveness of the new computer-mediated visual telephone technology. In Deaf town meetings in Austin in 1997 about the introduction of computer-mediated video interpreting service or video telephony, some deaf people said they preferred communicating via TTY without a video image because of privacy issues. Being visually available transforms aspects of what you do before you say "hello" or accept an incoming call. Now it may matter whether you had time to comb your hair. This has been a topic among deaf people in discussions characterizing the experience of the new video telephone technology. One videophone interactant said to another: "ALL DEAF USE THIS TECHNOLOGY SIGN WE CALL THREE-O'CLOCK MORNING HAIR-STICKING-UPCHAT"⁵ (his fingers are splayed upward from the top of his head). Disembodied language productions such as TTY texts used by Deaf people enable a certain freedom from a set of interpretable symbolic resources (e.g. age, appearance). As interactions are re-embodied through video connections, the videophone mediates in new ways between interactants, and between interactants and other objects and ideas, in a cultural environment.

TRANSFORMATIVE TECHNOLOGY

Using a small webcam (a simplified video camera for web interfaces) with a desktop computer and linking through the Internet, Deaf individuals can now communicate visually with one another over ordinary telephone lines. This is revolutionary because it means that they can use sign language to communicate across long distances.

Computer-mediated video telephone technology was first introduced into some areas of the American Deaf community in a pilot video interpreting service for deaf callers to hearing individuals (Video Relay Interpreting, or VRI). This service was first offered in Austin, Texas, by the Sprint company in 1996 (see Keating 2000). It has been highly successful. Subsequently, webcams and software products have become available for consumer use, so that deaf individuals now have access to a simultaneous, two-way telephone technology that is visual and supports visual communication. With video transmission over the phone line, a context more like face-to-face conversation can be achieved, and much more complex participation frameworks are possible. Figure 2 shows two deaf teenagers in a conversation with a friend. Notice the webcam on top of the CPU (to the right of the computer screen). With the new technology, interactants must arrange themselves in order to see and be seen (to be participants as both audience and communicator). Figure 3 shows the screen view of a different interaction.⁶ Each participant sees both the other and herself or himself.



FIGURE 2



FIGURE 3

Some aspects of the activity of communication (re-)mediated by the new technology we discuss include communicative space, use of the body, virtual images of self and other, production of signs, and interpretation of signs. Some important skills for a virtual or technologically mediated environment include: manipulation of desktop “real estate,” manipulation of language features, manipulation of image transmission and body relations, creation of a radically different sign space, alteration of signing speed, increased repetition, code-switching, and adjustment of deictic references.

Explanatory routines: Understanding constraints and possibilities of new artifacts

In (2) Ben⁷ and Ned actively work together to establish a coherent computer-mediated space for producing and interpreting signs. They negotiate the best techno-social environment for interaction over multiple trials by providing information to each other on reciprocal perspectives, and by precise descriptions of how to manipulate the on-screen image for maximal clarity of signs. This includes creating new metalinguistic terms and explanatory routines. Sign language communication is used to create a coherent space for sign language use and understanding. The focal range of the webcam restricts communicative space significantly compared to face-to-face signed communication; the camera's visual field is far more limited than an actual interactant's would be. Ben and Ned collaborate on describing what they each see – shaping the other's view and understanding of particular technological results of particular actions. Ben teaches Ned how to understand the consequences of particular actions and settings and how to internalize the eye of the camera as the operative "reciprocal field," a new virtual reciprocity of perspectives. They build a sense of the camera's visual field that is different from and supersedes their habitual face-to-face visual field in terms of its importance in virtual sign language communication. Using his arms and hands, Ben creates an abstracted view of the camera parameters and projects back the camera's relationship to Ned's body. Ben then tells Ned how to manipulate the on-screen production of his own image in a sequence of parts or moves. Not only the relation between hands and the signer's body is important, but also the relationship between signers and the camera.

- (2) Collaboratively building reciprocity of perspectives. Italics signify actions, capital letters signify ASL signs. Since there is no conventionalized orthography for sign language, we follow the convention of using English glosses in capital letters to represent ASL.

- 01 Ben: *(With his arms Ben represents the computer's desktop windows' horizontal parameters. What he shows is the relation of the viewing frame to his body, the body-to-camera relation is not optimal for communication. There is too much space above Ned's head and not enough of his torso is showing.) With his arms set in horizontal position, his dominant arm is above his head and across his face and his non-dominant arm is in front of his upper torso area.*
 02 *Ben moves both his arms downward.*
 03 CAMERA (classifier for 'camera', wrist move downward)
 04 A-LITTLE-BIT
 05 Ned: WHICH? YOURS OR MINE?
 06 *Ned leans toward the computer. Ned tilts the camera downward*
 07 Ben: ASK (? unclear fingerspelling)
 08 Ned: *Ned readjusts the camera position*
 09 Ben: OK FINE STAY

Ben is trying to tell Ned to move his camera because only his head is showing (see Fig. 4, top window) and sign space must include both head and torso. Ned, however, asks which camera must be moved: WHICH YOURS OR MINE?



FIGURE 4

(line 05), showing a confusion between action and result in terms of the new setting. Complex shifts between interpretive frames can occur within even the shortest utterances (Haviland 1996) in face-to-face interactions, and this can be further complicated through technology, especially in terms of deictic references, which depend heavily on the establishment of a shared context and understanding of perspective for interpretation.

Although the webcam has a more restricted gaze than a person, there are ways that the webcam's properties can enable understanding. In one instance, two interactants have trouble over the meaning of the word 'rollercoaster'. One is a deaf person from Germany who knows ASL but is not familiar with this particular ASL term. To solve the problem in understanding, his interlocutor first tries several variants of the term in ASL. When these are unsuccessful in communicating the concept, he thinks a moment, then asks his interlocutor to wait. He finds a picture of a rollercoaster on his computer, picks up the webcam, and moves it in front of the computer screen so that the picture of the rollercoaster is shown to the other. Then he puts the webcam back on top of the computer, and they continue the sign conversation.

Another way computer-mediated video enhances communication is in the way the webcam provides interlocutors with a unique resource – a two-dimensional image of themselves signing – which is available throughout the conversation. The sender of the message can simultaneously serve as an audience for the message, and the ability to take the perspective of the other is considerably enhanced. One has a good replica of what the other is receiving (only in terms of the body's relation to the camera, however, not in terms of speed). Interlocutors show that they utilize the "virtual" self when they modify their signing, although they seem to depend far more on feedback from their interlocutor.



FIGURE 5

In cases to be discussed below, conversationalists alter their production of signs in the new context, and not just the relationship among their bodies, the camera, and the computer environment.

Trials in modifying sign location and orientation

Meaning is a product of collaboration, and there is ongoing collaboration in the redistribution of linguistic knowledge and practice in this new environment. Conversationalists adapt to technical properties of computer-mediated image transmission, for example by adapting their signs for reproduction in two-dimensional space. This entails reorganizing sign space and modifying signs. The new communication tool influences language behavior. When Bob, for example, signs a particular name sign, he turns his head to the side to show from the side view how the hand position is performed in relation to the nose. Later, when he signs THREE, using his fingers, he repositions his hand so the thumb can be clearly seen. Before he turns his hand, the thumb is hidden and the sign looks like TWO. Another person signs MEXICO with an upward movement rather than a movement toward the camera in order that the movement or crucial change in spatial relationship can be clearly seen in two-dimensional space.

Other examples of signs being altered for computer-mediated communication are the sign 'baby' (usually produced slightly above or at waist level) now produced with the hands almost at chin level; the sign NOW, usually signed at chest level, signed at shoulder height; and the sign for VALENTINE moved upward to the shoulder from the chest area. The sign SON, usually signed with contact on the opposite hand at waist level, is signed with contact on the biceps and shoulder raised. Figure 5 shows the sign PROBLEM (usually signed at chest level directly in front of the speaker's body) being signed far outside the usual sign space, in

front of the webcam – in fact, in another person’s sign space – in order to position the sign for optimal transmission by the webcam.

Signers show multiple ways to adjust their sign production in order to maximize the communicative potential of the computer-mediated signing space. They experiment and learn that the parameters of the webcam can be manipulated in various ways. Some lean back to make a larger area of the body available, leaning away from the screen, for example, to sign SORRY and DIE, both made in the chest area. One of the study participants signed PAGER by standing up so that his waistline (where PAGER is signed) was visible, not his head and torso. Participants also utilize the properties of the technology to create larger and therefore clearer signs. They move their signing hands closer to the camera for emphasis. This means that, for example, in the case of a YES sign made near the camera, the YES is made much bigger and more forcefully, resulting in participants’ creating new ways to communicate affect or emphasis. Fingerspelling is frequently produced with the hand very close to the webcam. Three participants signed GOOD with the two-handed citation form (instead of one hand), which resulted in a larger sign. As in face-to-face sign conversation, conversationalists can engage in producing “continuers,” which are a conventional way to show interest and understanding in a conversation. There are many examples of this, such as using YES or OH-I-SEE.

Not all modifications work. In one case, a participant signed QUESTION using the first knuckle movement, but turned it 90° to the side (presumably to make the sign clear in two-dimensional space). However, the new orientation made the sign so different that his interlocutor did not understand his meaning. He then signed the larger, more iconic form (tracing a question mark path) and she understood.

Participants slow down their signs and are asked to slow down, and signs are distinct and fully articulated. Differences can be seen between the same signers’ off-camera signs and their productions for the webcam or “on-screen” signing. Off camera, each sign is less emphasized and is produced faster, and sign space is less restricted. On camera, signers sometimes hold their final signs and do not return their hands to resting position. This may be a result of uncertainty about whether the transmission has arrived to the interlocutor’s location undistorted.

There is frequent repetition of signs, phrases, and concepts. In (3), KNOW is repeated 14 times, and ME is repeated 11 times by a novice participant:

(3) Repetition

- 01 Terri: (to Frank) WOW GET BABY
 02 (looks at her mother) I SHOW BABY (beckoning gesture)
 03 Frank: (to webcam) (waves to get attention) YOU KNOW YOU KNOW YOU KNOW
 04 YOU KNOW YOU KNOW ME ME ME ME ME? KNOW KNOW KNOW
 KNOW ME ME?
 05 YOU KNOW KNOW KNOW KNOW KNOW ME ME ME ME?
 06 Terri: (to Frank) YOU FUNNY. SHE NOT KNOW YOU.
 07 SHE KNOW YOUR UNCLE J-R AND AUNT ‘J-on-palm’⁸

Repetition often involves reformulation. The same idea is repeated in different forms, or signs are enlarged. In one case, as she repeatedly asks her interlocutor to ‘move back’, with each repetition, a signer expands the space used for the sign. In (4), we see two participants repeat ‘who’s that?’ to their on-screen interlocutor in several different ways: WHO THERE? WHO OTHER PERSON WITH YOU QUESTION, WHO THAT?

- (4) Two teenagers in Austin are talking to a friend in Indiana, and are asking who is with her (the bracket between lines 05 and 06 indicates talk produced at the same time).
- 01 Jeff: WHO WHO WHO WHO THERE WHO WHO WHO THERE?
 02 Karen: WHO OTHER PERSON WITH YOU QUESTION?
 03 Jeff: WHO THAT?
 04 Karen: QUESTION?
 05 Karen: WHO WHO WHO THERE?
 (here ‘who’ is made with a variant sign for ‘who’)
 [
 06 Jeff: WHO WHO WHO THERE?

Trials with sequence-based rather than spatially based meaning-making

Making oneself understood through a new computer-mediated environment involves not only repetition and alteration of sign space relationships; in the families we studied, it also involves the use of different varieties of language. As mentioned previously, there is a wide range of language styles and forms in the American Deaf community. Members of the Deaf community are used to adjusting their language to a wide range of interlocutors, from those whose signing is very English-like in structure to those whose signing is very ASL-like. Although we found the families in our study adjusting their sign language to more English-like grammatical features, this was not because they were conversing with those whose language skills were English-like, since all the study participants were fluent ASL signers (one of the authors of this paper, Mirus, is deaf, has Deaf parents, and is a native signer of ASL). We attribute an unexpectedly high use of English-like sign in the computer-mediated interactions in our study to strategies of adjustment to properties of the new communication technology, including problems with the clarity of transmission of images and altered aspects of space.

English-like or contact signing is characterized by such features as English word order, fingerspelled English words, and inclusion of articles or modals (see ex. 5). In (5), Rose signs to her friend Teri (a person who highly favors ASL) a question containing a fingerspelled English modal (‘did’) and the signed form of the English preposition ‘to’ in her formulation of a question, D-I-D YOU GO TO P-T-A¹⁰ (line 02). In fingerspelling D-I-D, Rose puts her hand close to the webcam. Teri is busy with her infant (Rose says ‘I

didn't know you were nursing the baby'), and Rose repeats her question about the PTA meeting, this time using a more ASL-like construction: YOU GO P-T-A (with eyebrow grammar to signal a yes/no question), line 03. This shows the range of linguistic competence and also the flexibility of study participants in experimenting with language forms and structure for optimal communication.

(5) Italics indicate English-like grammatical constructions.

01 Rose: SORRY INTERRUPT YOU. I NOT-KNOW *THAT* YOU NURSE BABY D-
 02 (*laughs*) YES. *D-I-D* YOU GO *TO* P-T-A. UNDERSTAND ME?
 03 YOU GO P-T-A? *D-* NOT YET?

Lucas & Valli 1992 were surprised to see the use of English-like sign in conversations between ASL signers in an experimental interview they conducted (1992:63), and they attributed this to an association in the Deaf community between English-like signing and formality¹¹ and accommodation (in our case, we suggest that the accommodation is not to another speaker but to another medium). Choice of language features regularly constructs differences in context, just as context can shape the choice of language features (Duranti & Goodwin 1992). Using a more English-like sign is a common way to signal a register or context shift in the ASL community (see e.g. Stokoe 1969), and this is a resource for all Deaf signers, even those who commonly use only ASL (see also Mather 1991:138).

In Signed English, signs are ordered according to the syntactic rules of a spoken language, and signed English fails to take advantage of spatial resources in the same way as ASL, where movement is "highly productive," conveying many aspects of meaning, including speed and quantity (Valli & Lucas 1998:86) as well as subject-object agreement. In ASL, facial grammar and head position also convey important grammatical information, such as topic or object of a sentence, type of question, and negation. Non-manual signals such as facial expression and head position organize sentences into different types. However, forward head tilt can be difficult to perceive in two-dimensional space, and eyebrow raises, lip position, or squinting can be difficult to perceive if images are slightly distorted or not clear. Certain types of movement can disrupt the quality of an image transmission in computer-mediated communication, particularly over regular household telephone lines.

New adjustments and trials can be understood as preliminary attempts to formulate agreed-upon practices for communication in the new medium. These are based on conventional strategies of sign language communication, including altering communication means in order to signal a specific purpose or context. Social activities shape local understandings and conceptions about space (see e.g. Hanks 1990, Choi & Bowerman 1991, Brown & Levinson 1993, Duranti 1994, Senft 1997).

Non-shared space: Trials with referential pointing

An important area where the new computer technology influences language practice is the use of deictics. The term “deixis” is borrowed from the Greek word for ‘pointing’ or ‘indicating’ because these linguistic items “call upon the hearer to use his powers of observation, and establish a real connection between his mind and the object” (Peirce 1940:110). Common types of deictics are person markers such as ‘I’ and ‘you’, place markers such as ‘here’ and ‘there’, and time indicators such as ‘now’ and ‘then’; they have no meaning apart from the context in which they are uttered, since ‘I’ or ‘you’ can refer to different people at different points in a stretch of talk. The meanings of ‘here’ or ‘there’ or ‘now’ must be ascertained from contextual cues – the physical position in space of the speaker or the time of the utterance. The interpretation of these forms is “intrinsically bound up with the cultural distinctions and practices,” and the rules of use and interpretation become reflected in the structure of linguistic code (Hanks 1996:228). In ASL, person deixis is indicated by pointing, for example to the self or others. One of the most interesting aspects of computer-mediated video sign language is how signers must renegotiate conventions of deictic use. In computer-mediated sign language communication among the participants in this study, rules of referential pointing are changing. In the new two-dimensional space, interlocutors orient to a modified deictic field, redefining the deictic relationships not in terms of their actual position vis-à-vis their interlocutor on the screen, but in terms of the position of the webcam and how their sign relative to what they are pointing at will be *reproduced on the screen*. For example, one participant raises her thumb and begins to point directly behind her (at her husband), but then turns her hand so that her thumb is pointing directly to the side, where her husband is in the *two-dimensional* world of the screen. In the computer-mediated image in the video window, she is pointing at her husband, when actually he is at least two feet behind her. In other examples, signers point directly at the webcam when signing YOU rather than pointing at the image of their interlocutor on the screen. Signers look at the screen, but then point at the webcam, and sometimes they both look at and point to the webcam. One of the participants tested pointings in space by placing her thumbs in different positions as she repeated her message.

In Figure 6, two interactants simultaneously produce two different versions of THERE, one pointing to her right with her thumb, and the other pointing straight ahead with his forefinger. In lines 05 and 06 of (6), both Karen and Jeff are asking the identity of someone in their interlocutor’s image window. Each renders the term ‘there’ differently (see Fig. 6, where Jeff, in the foreground, points ahead, while Karen points her thumb to her right). Previously, each has tried two different ways to ask the identity. The importance of lines 05 and 06 lies in the way Jeff and Karen show that they are experimenting with new ways of representing the question ‘who’s there with you’.



FIGURE 6

(6) Experiments with 'there'

- 03 Jeff: WHO THAT?
 04 Karen: QUESTION?
 05 Karen: WHO WHO WHO THERE?
 (here 'who' is made with a variant sign for 'who')
 [
 06 Jeff: WHO WHO WHO THERE?

Signers such as these are in the process of developing new ways to signify meanings through the symbolic forms of language. With the "mirror image" or representation of their own sign production available through computer-mediated communication, they can judge the effect of certain relationships in mediated, two-dimensional space and experiment with the efficacy of new forms of hand position and orientation in order to produce signed communication.

Learning communicative competence: Shaping the next generation

Members of language communities learn appropriate language use across contexts from everyday interactions. Young children are socialized into the use of new technologies and can expand the creative potentials of the technology for communication across borders of space, time, and language understanding. Some examples of the explicit socialization of young children in our study include orienting them to the computer screen in the environment, teaching how to identify oneself and others, establishing social relationships, modeling openings and closings ('hello' and 'goodbye'), and identifying images on the screen as people co-present and available for interaction.

In Figures 7 to 10 (video stills), Teri kneels on the floor to bring her image into camera range. Her son is in the chair in the "coparticipant position" for computer-mediated sign language interaction as she kneels on the floor beside him. She



FIGURE 7



FIGURE 8

models looking toward the screen, and she points to orient her child. She supports her child's arm as he mimics her point. She models smiling. She stands and "explains" what her child is seeing: 'a boy'. The moving image is a person to be greeted, and Teri waves at the screen. She observes her son's communicative production by looking straight at him, not at the image he is producing on the screen. The grandmother looks on from the periphery. They make sense of the environment in which they live and orient themselves to one another and to ob-



FIGURE 9



FIGURE 10

jects. With new communicative technologies, frameworks for communication can increase in complexity, and interactants must develop new skills and introduce these skills to novice users.

Novice users can also learn through Gallaudet University's website, which contains a set of recommendations for sign language communication via the Internet: "slow down a bit on fingerspelling or unusual signs, set up your location for chatting so that there is good light on you, if possible, have a plain wall as background, avoid having anyone walk behind you while you are chatting as this



FIGURE 11

will slow down the video, avoid Internet ‘rush hours’ such as 2–4 p.m., 7–10 p.m. weekdays.”

New participation frameworks: Organization of communicative activities

With new communicative technologies, aspects of participation can increase in complexity. For example, signers using computer-mediated communication can have more than one participation framework active; they can keep their signs out of camera range if they want to take part in a “side” conversation with participants in real space, excluding those in virtual space. There are thus “front” and “back” zones (Goffman 1974). A formerly dyadic long-distance conversation by TTY can now be much more complex, involving three people (see Fig. 11) and multiple generations. New participation frameworks can involve images of people as well as text messages. In some cases, two co-present interlocutors can converse through the onscreen image, as when a woman signs with both her husband and their friend on the computer screen, although her husband is actually behind her, a position that would usually exclude him from participation as either producer or receptor. Since only two video signing spaces are currently available (one-to-one pictures), others can and do participate via text messaging at the same time. As on-line instructions from Gallaudet University indicate, this is a popular new form of group chat: “The video chat itself is limited to one to one [one dyad], not a group, however, you can have group text chat using ‘line by line’ chat within NetMeeting.” “One-to-one” really means “one location to one location,” as you can see in figure 11; and as many of our interactions show, multiple members of Deaf families can participate in the one camera frame “window” that is available.

The children in one of the families involved in the research project have integrated the video telephone into their lives and everyday communicative practices

in transformative ways. Instead of watching TV so much in the evening, the children have apportioned among themselves designated times to chat with friends via sign language and the computer. They switch between languages and modalities, between sign language via video and English via typed “instant messaging.” It is not the case that the computer-mediated video phone has completely replaced the TTY or text messaging or e-mail, however; often the introduction of new technologies does not mean the total abandonment of other tools but entails a process of incorporation, involving and influencing collaborative and complex forms of human achievement embedded within dynamic and changing cultural systems.

CONCLUSION

The Internet and other forms of computer-mediated communication are profoundly shaping aspects of communicative practice. In this article we have addressed the question of how participation in new technological environments shapes language, and some ways that aspects of social interactions are transformed. We have shown how computer tools can influence language, as well as how people utilize language to mediate the introduction and incorporation of new communicative tools into their environment. Signers alter communication practices by limiting sign space, changing how signs are produced, reducing signing speed, and increasing repetition by producing several variants of the same message. They exploit new possibilities for communicating messages, creating new forms such as the technological transformation of the size of the hand (moving it nearer the camera) for emphasis and clarity. They reorient deictic references to the technological alteration of relationships among multiple participants in space – for example, transforming the communication of the concept ‘behind’ to ‘beside’. Technology generates new boundaries, and these are explored through trials and through joint problem-solving. Interactants explore and share new strategies, including new relations between form and meaning and new repertoires. The structure of talk itself becomes a site for innovation in order to accomplish goals and understanding. Using webcams and computers for signed language, a language that depends on interpreting visual relationships between hands and the body (including facial movements) involves learning about and adjusting to how virtual space is crucially different from “real” space. The interactants we studied are engaged in a process of reorganizing the production and interpretation of key spatial relationships in sign, reorienting the body toward the technological eye of the camera, adjusting to newly available feedback through a visual image of the self, and experimenting with language forms, registers, and modalities. Properties of the webcam not only influence conventional strategies but also permit innovations in participant frameworks and the transmission of particular types of visual information across locales. Socializing young members into interpreting an image on a computer monitor as an active conversational partner and in inter-

acting with this partner is also important in the incorporation of webcam technology into the communicative practices of the Deaf community.

NOTES

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¹ The research team consisted of Elizabeth Keating, Gene Mirus, and Chris Moreland (research assistant). Keating is hearing, and Mirus and Moreland are deaf.

² It is customary to capitalize "deaf" when referring to Deaf culture, whose members may include those who are hearing (e.g. hearing children of deaf parents), while lower case indicates any individual with hearing loss.

³ <http://www.ethnologue.com/>

⁴ For more on sign language see Valli & Lucas 1998, Klima & Bellugi 1979.

⁵ It is conventional to reproduce ASL by using capitalized English glosses.

⁶ The pictured system in Frame 3 is from a previous study by the authors, but it shows the two image windows as they are available to interactants in the study being discussed.

⁷ All names used are pseudonyms.

⁸ This is a name sign, a special sign to refer uniquely to a person.

⁹ "wh" with a line indicates the facial grammar for a *wh*-question.

¹⁰ "PTA" is an acronym for Parent Teachers Association, one way U.S. elementary schools organize parent participation.

¹¹ English and English-like signing can be associated with formal and educational contexts by some members of the Deaf community.

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