

Computer-Mediated Literacy Development in Deaf and Second Language Populations

Beth O. Carlson

St. Petersburg Junior College
Clearwater, Florida

Introduction

I think there will be a world market for maybe five computers.

-- Thomas Watson, chairman of IBM, 1943

Computers in the future may weigh no more than 1.5 tons.

-- Popular Mechanics, forecasting the relentless march of science, 1949

640K ought to be enough for anybody.

-- Bill Gates, 1981

What *can* be predicted with reasonable certainty in terms of the uses of technology in the future? One fact is indisputable: computer-mediated instruction is emerging as a viable technological tool in a variety of educational contexts from preschool to college and university levels. Particularly promising is the potential for literacy development in an environment conducive to collaborative work, meaningful goals and real-time audiences. The contexts of literacy instruction are undergoing crucial transformations, to allow for concurrent changes in the nature of texts, of communication, and, more specifically, of language. This electronic link between social contexts and community (Duin & Hansen, 1994), leads educators away from traditional curricular notions and challenges beliefs, values, and pedagogy. One of the pedagogical theories implicit in an integrated writing environment is collaborative, or "interactive," learning (Batson, 1988). Collaborative learning techniques allow students to read what others have written as it is being composed as well as after it is complete; the students "comment on, contribute to, learn from, and share texts as they work together" (Bertrum & Rubin, 1993, p. 19).

To realize the potential of technology in literacy education, it is necessary to articulate the objectives of literacy development. Educators attempting to implement an innovation typically face the complex challenge of meshing new ideas with well-established beliefs and practices. Thus, a definition of literacy that includes technology is laden with political, economic, and educational agendas because technology, as much as literacy, is filled with ideological conflicts, shaped by forces of economics, history, and politics (LeBlanc, 1994).

The application of technology for literacy education through electronic conferences allows students to use the tools of literacy to examine the power structure of society; the goal, says Cooper and Selfe (1990), is to change those structures so that disenfranchised groups might participate in political arenas. Literacy is a social technology. That is, literate communities develop varied social, linguistic and cognitive practices with texts. As the definition and contexts of literacy development change to include

technologies such as electronic networks for literacy instruction, it requires understanding and acceptance of the evolving process.

The term *computer mediated communication* is used to encompass the merging of computers and telecommunications technologies to support teaching and learning (Collins, 1995). Typical functions and users include:

E-MAIL MESSAGES

E-mail messages can be composed directly in the telecommunications program (on-line) or first written on a word processor (off-line) and then uploaded. E-mail messages generally take a few minutes to arrive. Since the recipient does not have to be on-line, but can read the messages at anytime later, e-mail is considered asynchronous.

ASYNCHRONOUS CONFERENCING

Asynchronous conferencing allows messages to be sent from one person to many people. Two types are discussion lists, where one e-mail message can simultaneously be sent to thousands of e-mail addresses, and bulletin boards, where the same message is posted in a central place to be accessed and read by many people.

SYNCHRONOUS CONFERENCING

With synchronous conferencing, messages are sent instantly between one person and a group of people who are all on-line together. In educational settings, this often takes place in a classroom or laboratory with networked computers, and can be referred to as electronic networks for interaction (ENFI, a term copyrighted by Gallaudet University). Synchronous conferencing can also occur at a distance, taking advantage of telecommunications resources such as Internet Relay (IRC) or MOOS (virtual environments on the Internet for text-based discussion and simulation).

FILE SHARING

Both asynchronous and synchronous conferencing usually include some form of file sharing, which allows for paperless transfer of documents between individuals or within a group. This facilitates peer editing and collaborative writing (Warschaur, Turbee, & Roberts, 1994, p. 2).

Computer mediated communication (CMC) promotes self-discipline and requires students to take more responsibility for their learning. The nature of the text transfer and file sharing requires--if not demands --participation. In addition, an important aspect of CMC use in instruction is that it is text-based. Facility in writing is essential across the entire curriculum; one cannot communicate on a computer network without writing. Because CMC is, at present, primarily text-only, the consequent reduction in social cues leads to "protective ignorance" surrounding a person's social roles, rank, and status (Collins & Berge, 1995). For this reason, it is particularly suited to equality of voice in communicative activities.

If language learning is facilitated by interaction, i.e., the give and take of information about shared topics, negotiation for meaning, expansion of propositions, repetition, and clarifications that occur in any conversation (Batson & Peyton, 1986), then an environment rich in communicative practice, where students make and negotiate meaning through text writing, should foster linguistic proficiency and aid in the process of language acquisition for second language learners.

The medium of electronic communication breaks down barriers in ways that allow minority cultures, especially deaf populations, to participate fully in the discourse community. Computer-mediated

classrooms present enhanced opportunities for effective instruction in process writing, critical reading and analysis, and purposeful communication techniques, in addition to developing competency in the use of technology and writing across the curriculum (Bertram, Peyton & Batson, 1993). As the locus of communicative control in the classroom shifts from teacher-directed to student-directed, students become empowered. English, therefore, becomes alive and vital as it is used in meaningful and comprehensible ways to achieve shared goals.

The use of CMC to teach writing, thus, holds great promise for a number of reasons, according to Day and Batson (1995): writing is more easily demonstrated; writing tasks are more realistic; writing occurs for an established audience; writing practice is easily encouraged; collaborative opportunities are created; the lag time between classroom discussion and student writing is reduced; and conversations are not limited or unequal. Everyone has access to the "floor" at the same time which can lead to conflict or "flaming." However, as Gruber notes (1995) a classroom that provides students with a means for authentic thought will not suppress different opinions; instead, students' differences will be valued and their ideas will become a means for exploring issues important to a liberating classroom. When used critically, CMC can enhance that goal by providing a space for students to raise issues connected to class discussions. It can also provide insights into different backgrounds and look at the social, political, and economic implications connected to classroom approaches. These situations call for what Gruber (1995, p. 76) labels "discussion of the conflict solution" where "different personalities in the classroom; conflicting political viewpoints; varying racial, economic, and social background; and gender and differences in sexual preference are likely to cause tension that allows for open discussions and critical discourse."

The purpose of this research is to investigate the use of the Daedalus Integrated Writing Environment (DIWE) as an interactive instructional medium in deaf and second language classrooms in an effort to determine whether student-directed discussions of writing foster intellectual community. In addition, the students' relative knowledge and growth of certain problematic syntactical features will be explored as a possible predictor of increased English proficiency.

Two research questions are implicit at the outset:

1. What is the effect of "situated context," or a context where students write, interpret, and negotiate texts via computer networks, on the overall literacy development of post-secondary deaf students using Electronic Networks for Instruction (ENFI)? The areas of focus should include: social construction and interaction; situated literacy; distribution of power; and accessibility (Duin & Hansen, 1994).

2. What is the role of input and interaction on the acquisition of English syntactical structures in a networked-based classroom? The area of focus should include specific attention to how interlocutor interaction affects grammatical development during the process of negotiating text.

Rationale

The over-riding concern in deaf education has always, of necessity, been basic literacy: how to help students who have lost their hearing early in life, and therefore have had little exposure to English, to

acquire a level of written English proficiency that approximates that of their hearing peers (Batson & Peyton, 1986). As Batson and Peyton suggest, serious efforts to develop a naturalistic use of English have reflected multifarious communication approaches--speechreading, audio-loops, teletype (TDD) machines, overhead projectors, signed English, Signing Exact English, English fingerspelling (the Rochester method), Cued Speech, the Autocuer (eyeglasses with signaling mirrors), and Real-Time Captioning. However, the Commission on Education of the Deaf (established by the Education of the Deaf Act, 1986) concludes that some 175 years of research on the teaching of English literacy to deaf children have been, "remarkably unproductive: deaf students still are graduated from high schools coast to coast with third- or fourth-grade reading achievement scores" (Bowe, 1991, p. 13). Many communication methods have been tried over the years with little notable impact. The real problem that deaf students face is not a lack of hearing but rather a limited exposure to English.

Why are their reading levels at roughly the third or fourth grade? Predicting the language proficiency of deaf children is complicated. A number of factors such as home language, degree of hearing loss, age at onset of hearing loss, whether either or both parents are hearing or deaf, and educational background can make enormous differences in both American Sign Language (ASL) and English language proficiency. Bochner and Albertini (1988) note that only ten percent of 18 years olds read above the eighth grade level. In addition, on writing and grammar tests, deaf subjects manifest a variety of problems with English, including using shorter sentences with few conjoined and subordinate clauses; reiterating words and phrases within discourse; using more articles and nouns and fewer adverbs and conjunctions; and showing verb tense and agreement errors and the misuse of function words.

Another problem associated with predicting the language proficiency of deaf children is that it is often difficult to define "native" language for deaf individuals. According to Quigley and Paul (1984), many of the 75% of deaf American adults who use American Sign Language (ASL) regard ASL as their native language. Yet, as Quigley and Paul point out, since only 3 or 4% of deaf children are born to two deaf parents and fewer than 10% have one deaf parent, only a small percentage of deaf children really acquire ASL naturally in infancy and early childhood. "Therefore, the deaf individual's linguistic behavior can be understood in terms of delayed L1 development and in terms of a continual, less naturalistic L2 development. . ." (Berent, 1988, p. 134). Under these circumstances, as Berent postulates, we might be tempted to speak of this situation as "L1.5 acquisition."

While the reasons for this are extensively hypothesized, heavily debated, and unquestionably merit consideration, it is not within the scope of this current paper to go into such depth. It is sufficient to suggest that one line of thinking that might lead us closer to answering the perplexing and critical question is that the view of deafness and the challenges that deaf children, their parents, and their teachers face, requires reconceptualization (Erting, 1992).

While it is true that deaf children can't hear, it is more important to emphasize that they do see. It is through seeing that deaf people have created a visual language and a visual culture. Deaf children are

different, not deficient. Their access to the world and, thus language and education, is achieved primarily through vision. As Erting (1992) states:

While a deaf individual may choose whether or not to be an active participant in the Deaf community, that deaf person can not choose to hear -- no amount of practice, hard work, or desire will transform that person into an individual who uses hearing in a primary way as vision. It is our task as educators to create a linguistic and learning environment that is fully accessible to the child, rather than expect the child to communicate and learn in ways that are physiologically impossible. . . . we in the educational establishment have not yet created such environments for deaf children, and if we were to do so, we would begin to see significant improvement in literacy skills (p. 103).

Several researchers have established clear connections between an accessible learning environment and literacy. Vygotsky (1978) in particular has emphasized the role of social interaction in the individuals spoken and written language development. Vygotsky contends that written language is intimately related to spoken language, both being a socially-situated and developmentally continuous process. As Erting states, "We must make spoken language accessible. . . through print, but by relating it to their way of seeing and to their way of communicating" (1992, p. 99). The basic premise is that teachers and children need to converse. Research into the role of input and interaction and the negotiation of meaning in second language acquisition (Braid, 1995; Pica, 1994) offers rich insights for those attempting to understand literacy development in individuals who are deaf or second language learners. As Albertini (1993) asserts in relation to developing critical literacy:

Recalling and reflecting on past experiences establishes a basis for the student to read critically. Meaning is created by the reader in interacting with a text, by the writer in retrieving experience and committing a perspective to a paper. . . For the critical theorist, a role of the reading/writing teacher is to help the student uncover the relationship between knowledge and power in society (pp. 62-63).

Albertini suggests that teachers encourage writing as a tool to shape critical interpretation of experiences. For this to happen it is necessary to reexamine assumptions about writing and literacy that pervade educational practice and shift from complete emphasis on functional and cultural literacy to allow for critical literacy development. CMC use is based on a sound pedagogy that affords learners the opportunity to react critically with meaningful text in real-time audiences where they can explore their individualism in a rapidly expanding information age.

Tina, a deaf student in a postsecondary Developmental English class, aptly describes the difficulties deaf children experience in learning English:

Children who are born with hearing can that hear from their parents all the time. Children with hearing loss is that they couldn't get the language unless if their parents knew some signs for the hearing loss. Hearing impaired children without their parents knowing sign language that cause their education fall behind than hearing children. They used ASL because there is only one way they can communicate - through their hands. ASL is kind of mix language, not a follow the rule like English language. It use by the body and facial movement. This is why most deaf people use ASL instead English because English is very difficult language - primary language.

Deaf students seeking admission to postsecondary settings generally begin their studies with a significant educational handicap, and unfortunately, a high number of these students will drop out. Although there are a number of variables that mitigate their lack of integration into the social and academic systems of the institution (Nash, 1992), the most notable are their communication and academic achievement skills. Deaf students need to master the intricacies of standard academic English, and absorb information from English language materials that for many are still beyond their levels of syntactical knowledge (Berent, 1994). This is a most complicated task even under favorable conditions. At a very minimum, college students are expected by their instructors to use grammar, punctuation, and spelling correctly; to organize their text topics clearly; to present their arguments cogently; and to alter their style skillfully to meet the needs of their audiences. For many reasons, then, success in college is dependent on success in English (Anderson, 1993).

In a literate society, learning is the process of constructing necessary linguistic meaning from text. That deaf students have difficulty with English syntax and, therefore, reading is a well documented phenomena (Quigley & King, 1980). Because of their slow rate of syntactic development, many deaf students are not able to read the very material from which they are supposed to learn. As Lang and Lang (1992) state:

Content mastery of particular subjects, while important, is not the only consideration in current work. The interaction between the learner and the world is receiving increasing scrutiny; for such interaction is critical in the formation of identity. We can see a growing tension that exists between the self and the world, and between a student's self and others; achieving such understanding may be a primary task in the postsecondary years. While pursuing mastery of academic content and professional goals in postsecondary programs, the young deaf adult must simultaneously seek knowledge about power, people, and culture (pp. 67-69).

An additional concern noted by these authors is that at the postsecondary level, many deaf students are bilingual in sign and a written/spoken language. Lang and Lang (1992 p. 69) raise the questions: "How does that bilingualism shape and sort their world and others' being in the world with them? How do deaf students gain access to professional language, and participate visually in the language of 'the system' ?"

Innovation is necessary in order to usher in change in the way we provide instruction for deaf individuals in academic settings. In the area of writing, the view of computers as an empowering force has been especially strong since computers can be used to foster membership in a community. Deaf and second language learners must be seen as agents of change in the struggle for intellectual voice among marginalized learners. According to the Commission on Education of the Deaf (1988), "Perhaps the single most hopeful prospect for achieving quantum leaps in progress for persons who are deaf lies with technology, much of it computer based."

Computer-mediated communication (CMC) or interactive networks, though largely an untapped resource in classrooms for the deaf, hold great promise for the delivery of instruction in English and other

content areas (Stuckless & Carroll, 1994). Addressing the Educational Applications of Technology for Deaf Students symposium, Davila (1994) states that:

Because the availability of well-designed technology is so critical in the empowerment process, each of us needs to be sensitive to ways in which we contribute to, detract from, this process. Because we hold within our hands so valuable a component of the process, we must always keep at the forefront of our minds the true purpose for utilizing our skills: creating an environment in which deaf individuals can make informed decisions for themselves, communicate for themselves, project themselves, and relate effectively with others. Without innovative technology, these activities would be very difficult for some deaf individuals and impossible for many. But we must never forget that this process is a means to an end: the empowerment of deaf and hard of hearing people (p. 9).

This present study is motivated by the need to create accessible learning environments that will encourage unrestricted freedom of expression for students who will then be able to communicate in ways that are accepted and understood by everyone. When deaf students respond to education in positive ways that reflect a developing interaction with English, the acquisition process is enhanced.

A brief description follows of the Daedalus Integrated Writing Environment which is the interactive learning network used in the present study. This study focuses on postsecondary students who are deaf and learning English as a second language while using the Daedalus Integrated Writing Environment (DIWE).

THE INSTRUCTIONAL CONTEXT

What is DIWE?

Daedalus is a piece of software that defines the computer as a part of a network, a set of computers linked together in a Local Area Network, or LAN, so they can share information stored on a fileserver. DIWE defines the computer network itself as a medium for teaching and learning by means of (often interactive) written discourse.

DIWE itself is a collection of interacting components which allows instructors to post instructions and other messages to students in a file that they can view at any time. WRITE is a simple word processor. INVENT, an invention heuristic that students can use in choosing, exploring, and focusing topics for their essays, has its counterpart in RESPOND, which guides peer reviewers in critiquing draft essays. MAIL is an electronic mail system which can be used as a combination bulletin board, social invention aid, peer review system, and classroom management tool. INTERCHANGE allows the users to conduct intensive, far-ranging class discussions live or in "real time" over the network. All of these are available from a single menu. There are also a number of tools, available under a separate menu, which allow students and instructors to keep track of their work, and copy files to the right folders (The Daedalus Group, 1993).

Theory Behind DIWE

The Daedalus Integrated Writing Environment is based on the pedagogical theory of collaborative, or "interactive" learning and uses techniques that create a student-centered learning environment which

encourages and enhances language use through social interaction. Whichever program is used, the basic assumption of research on computer writing networks has been that students will benefit from collaborative writing (Bump, 1990).

Collaborative writing development espoused by Bruffee (1984) calls on individuals to view writing as an activity that can be enhanced by working in and with a group of other writers. It encourages, perhaps even demands, student engagement. Students become active creators and users of knowledge, rather than passive receivers. Collaborative learning allows for practicing of previously presented skills and concepts. It allows students to attempt to create personal knowledge through negotiation (language) during social interaction. In practice, however, learning to write with others is difficult. In the traditional writing classroom, time constraints and routines are counterproductive of collaboration (Hartman, et al. 1995).

According to Hartman, et al. (1995), the technology of computer mediated interaction is entirely devoted to letting people communicate with one another, and the characteristics that make it as such are uniquely suited to increasing interaction and to expediting collaboration. As Kern (1995, p. 459) states, "Thus the normal pattern of classroom discourse, consisting of a teacher-initiated topic, student reply, and teacher evaluation" is reduced in favor of student initiated control of the shared discourse.

Guidelines for Classroom Management

When accountability for learning is shifted from the instructor to the student, it is necessary for the instructor to redefine his or her role in order to create activities that will foster communal ethos. Intellectual and social frameworks within which the class's negotiation for understanding takes place must be well structured. The instructor must plan ahead for the purpose of the activity and consider which components of the Daedalus environment are well suited to the goals of the particular lesson. It will also be necessary to practice manipulating texts within the system, making use of the mechanics in relation to the writing task, which should be tackled in discrete tasks which build upon one another. Class assignments should be posted before each lesson begins. They should be structured in such a way as to allow students to proceed as soon as they log on and to work at their own pace.

Sample Lessons

Following are two sample screen lessons previously used in the DIWE classroom. The nature of the lessons allows students to proceed at their own pace.

Assignment October 7

1. Go to **ACTIVITY** and select **NEW WRITE WINDOW**. Type your dialogue journal response to the question, "If you were in the video [ASL - PAH!](#), what would you say about yourself?" When you have finished save it to your disk.

2. After you have completed number one, go to UTILITIES and select TURN IN A DOCUMENT. Turn in your composition.
3. Respond to MAIL.

Assignment October 14

1. If you have not already completed the assignment from October 7, do so now.
2. If you have completed the 10/7 assignment, go to ACTIVITY in the menu and select NEW WRITE WINDOW. Type five of your sentences from the homework (10/13). When you have finished, go to FILE, save your work on your disk and then print it.
3. When you have finished 1&2, read "Deaf parents are happy when their baby is born deaf" (see me for a copy). What do you think the author means by the statement that, "It's not, however, the hearing loss that puts people in the deaf culture; it is how they identify themselves." ? Go to INTERCHANGE under ACTIVITY and discuss your answers.
4. Respond to any MAIL.

Note: The theory behind the consistent use of dialogue journals as tools that can be used to promote sense of audience, as well as an awareness of turn-taking, questioning, answering, commenting, and initiating - skills which are more than basic "grammar" in successful communication (Bailes, C., et al. 1986; Cannon & Polio, 1989) is applied to the electronic mail and Interchange portions of DIWE. The transcripts from these portions should reflect similar patterns.

A particular problem that occurs in deaf classes is the use of "Telecommunication Devices for the Deaf (TDD) language", such as, "BEC" for because or "SK, SK" for signing off or "(smile)" and "u" for you. This is a natural outgrowth of the expression of keyed text for these individuals; it is perhaps possible that this could be considered parallel to the "medium specific" conventions such as smiles [:-)], frowns [)-(], or winks [;-)] used to compensate for the absence of prosodic and paralinguistic features found in face-to-face oral communication (Kern, 1995). It is generally requested that students keep this at a minimum in their expression of English text on the network. It must also be agreed upon prior to the outset that all language will be the student's approximation of written English and will be an attempt to conform to the shared goals. The following brief excerpt of an *Interchange* session demonstrates not only the dynamic student-to-student interaction, but also the potential for liberated discussion. In response to the prompt, "How do you feel that you have changed since leaving high school?", the discussion included:

Fara: *John try to think positive about your goal and life. You'll learning something a lot from school. Have a great weekend (smile).*

Robert: *Oh, hi Fara.*

Fara: *Robert Big Hello to u and have a great weekend and see u on Monday or whatever. Good-bye. Sksk*

Phillip: *I am feel same personality. I feel different some change my life what kind point change is no more dorm houseparent responsible for me and also time wake up and now I am responsible for wake time and bills and go to school for start time class that's life! .*

John: *I feel clumsy and I try my best if I can do it I can show you prove that I can do it and don't give up.*

John: *Now I am college student no more high school.*

Pedagogical considerations concerning the character of the networked interactions (Peyton & Horowitz 1988; Collins, 1988) such as side conversations, off-topic conversations, or missed conversations because the student is concentrating on typing a message, the tendency to make hasty conversations in order to keep up with the communications, "playing around," or use of "bad language" become less of a problem when students perceive the network to benefit their language growth and efforts to express themselves intellectually in relation to the group.

An additional necessity for the instructor is to have a back-up plan. All systems fail from time to time and frustration invariably accompanies the use of technology. It is best to have an alternative activity that can be quickly shifted to should Daedalus fail to operate properly - which it will.

METHOD

Subjects

Seventeen profoundly deaf individuals (90dB PTA +/- 10) in two separate classroom levels (ENC 0009/ENC 0019, Developmental English I/II; and ENC 1152, Communications II) participated in this study. Students were placed in these sections based on their performance on the Stanford Achievement Test for the Hearing Impaired (scores are transferred from their high schools), the Test of Adult Basic Education (TABE), which is an entrance requirement, and a writing sample. Actual cut-off scores vary with the population each session.

At the start of the session, students were instructed in the process of logging on/off and "pulling up" work from Daedalus. This was done using the file server and a large screen projection device to minimize visual disturbances that occur trying to instruct students in the lab. Approximately two 40 minute sessions of instruction occurred.

The students met in the computer lab one to two days per week during regular class time to work on the Daedalus Integrated Writing Environment (DIWE). When students were not in the lab, they received regular classroom instruction at their respective levels.

Instrumentation

Students first completed student information sheets to survey prior knowledge and establish demographic data (see Appendix A). This was an area suggested by O'Connor, et al. (1989) in a previous study that examined the effect of ENFI and non-ENFI environments on students' passing rate on the Writing sections of the *English Placement Test (EPT)* which is given at Gallaudet when a student enters the program and at the end of each semester thereafter. Subsequent work by Mary Fowles (1993) also

addressed this issue. Then, Developmental English students were pre-tested (and later post-tested) using the *RTAS, Revised Test of the Ability to Subordinate, form A* (Berent, 1988).

Berent (1988) revised the *Test of Ability to Subordinate* (Davidson, 1978) with permission from the author, by changing the sentence-combining task to a multiple choice version. He also created a second version (form B) which was used as a post-test for this research. In assessing the syntactic levels of college-level deaf students, Berent was interested in establishing orders of difficulty among nine *RTAS* English structures and explaining these orders within the framework of current linguistic theory. The *TAS* was designed to assess the ability of college-level intermediate and advanced ESL students to control the following nine embedded syntactic structures in English: 1) prenominal adjectives, 2) adverbs, 3) prepositional phrases, 4) infinitive phrases, 7) adverbial clauses, 8) relative clauses, and 9) noun clauses. It is a 45-item pencil-and-paper test containing five tokens of each of the nine target structures; it employs a sentence combining, fill-in-the-blank format.

In order to target students with reading difficulties in the Developmental English class, a general reading measure was obtained using the *Nelson Denny Reading Test* (comprehension portion), form G, Copyright 1993. Noting reading scores was relevant for the Developmental English level students as these students are required to comfortably perform a variety of reading tasks on the network. This has been identified as a potential problem with use of *Interchange* in "slow readers" (Hughes, 1994). The rapid pace of the text can place a considerable burden on students with additional reading problems. Students in the upper level courses were not targeted for potential reading difficulty during the course of this study; it was determined, based on their placement, that those students would demonstrate more advanced textual skills.

Data Collection and Analysis

Initial writing samples were reviewed and scored holistically by three professionals familiar with the writing of students who are deaf using the *Test of Written English (TWE) Scoring Guide* (see Appendix B), Copyright 1986, 1990 by Educational Testing Service.

In addition, a portfolio approach was adopted that reflected shared goals and experiences. Fowles (1993) includes an extensive discussion regarding assessment and the design of a portfolio program for ENFI environments in Network-Based Classrooms. Students selected a final writing to compare to their earlier submitted writing. Students were prompted to compare their writing on the basis of global and local occurrences in their writings and on the process of personal growth. Periodic reflections about the process were also informally monitored through the electronic mail portion of DIWE, and formally by way of an adapted questionnaire (Kern, 1995).

Students were pre-tested and post-tested using the *RTAS* which was then analyzed to determine if the findings were consistent with Berent's (1988) results. His testing revealed that, generally, the deaf college students were most successful on structures that exhibit subject-verb-object word order and in which those grammatical relations are explicitly represented.

In addition, transcripts were analyzed for grammatical trends in input language and interaction while looking specifically for patterns in social interaction that suggest increasing sophistication in usage. The overall quality of the student text was also noted.

Results and Discussion

In response to the survey on prior knowledge and demographic data (refer to Appendix A), the following breakdown was established:

Age: 17-19 = 24% 20-21 = 35% 22-30 = 29% 31-40 = 12%

Gender: Male = 59% Female = 41%

Ethnicity: White = 59% African American = 6%
Hispanic = 29% Asian American = 6%

Language spoken in the home:

English = 70% Spanish = 24% Thai = 6%

Language preferred:

English only = 12% ASL/English = 70%
Spanish/ASL = 12% ASL/Thai = 6%

Experienced with word processing:

Fairly well = 29% A little = 36% No = 35%

Experienced with DIWE:

First session = 35% Second session = 65%

It was expected that students with more experience using DIWE would be able to log on and get to the tasks more quickly. By the end of the session, however, most of the students were able to get to their assignments with relative ease.

The results of the pre/post test on the *RTAS* yielded the following:

RTAS PRE/POST TESTS RESULTS

Table 1 Percentages of Correct Responses, Overall and by Group on the Nine Structures of the *Revised Test Of Ability to Subordinate*

Pre-Test

<i>Structure</i>	<i>Overall</i>	<i>Level I/II</i>	<i>Level III</i>
Prenominal adjectives	56%	46%	66%
Adverbs	49%	34%	63%
Prepositional phrases	61%	44%	77%
Infinitive phrases	34%	18%	49%
Participial phrases	24%	10%	37%
Gerund phrases	31%	8%	54%
Adverbial clauses	64%	56%	72%

Relative clauses		47%	5%	88%
Noun clauses	39%	20%	57%	

A comparison of the level I/II combined class and the level III class reveals that performance on most structures gradually improves as the level of proficiency rises. A difference between the two groups of 20% or more occurs on all structures on the pretest, except adverbial clauses. The largest difference (83%) occurs in relative clauses. If 80% is considered mastery, then level III appears to have mastered relative clauses on the pre-test at 88%.

Level I/II students had most success with adverbial clauses, prenominal adjectives, prepositional phrases, adverbs, and noun clauses, and the least success with relative clauses, gerund phrases, participial phrases, and infinitive phrases. Level III students had more success with relative clauses, prepositional phrases, adverbial clauses, prenominal adjectives, and adverbs, and the least success with participial phrases, infinitive phrases, gerund phrases, and noun clauses.

Post-test results yielded an overall increase on prenominal adjectives, adverbs, prepositional phrases, infinitive phrases, participial phrases, gerund phrases, and adverbial clauses of 9.14% while relative clauses and noun clauses decreased by 8.5%. According to Berent (1988) relative clauses violate basic NV(N) constituency and therefore interfere with the deaf learner's assignment of the basic grammatical relations of subject, verb, and object. He noted this structure as problematical on his initial testing with the *RTAS* as well. Accordingly each proficiency level handled relative clauses slightly differently.

In both classes, general writing samples were reviewed by two other professionals familiar with deaf student writing at the start of the session and scored using the *Test of Written Language* (1987) scoring guide (see appendix B). These were then included in the students' portfolios as were other writing samples which were scored holistically. A comparison of the average initial essay score and the final essay scores yielded gains in the ability to address the writing topic, organize and develop the supporting detail and approximate appropriate syntax and usage. Lexical gains were also observed.

Table 2 Percentages of Correct Responses, Overall and by Group on the Nine Structures of the *Revised Test of Ability to Subordinate*

Post-Test

<i>Structure</i>	<i>Overall</i>	<i>Level I/II</i>	<i>Level III</i>
Prenominal adjectives	57%	50%	83%
Adverbs	63%	38%	68%
Prepositional phrases	69%	47%	83%
Infinitive phrases	47%	28%	52%
Participial phrases	29%	12%	46%
Gerund phrases	45%	15%	51%
Adverbial clauses	73%	58%	83%
Relative clauses	36%	12%	60%

Noun clauses 33% 25% 52%

In response to the question students were asked regarding the process of learning English using DIWE, a number of responses were recorded. Two examples follow:

One student expressed a concern early in the session that is common with the students:

Well, I like to learn about this computer yes but I don't want to waste time. But I really interest in the computer.

Often students fear that they are using valuable class time for what seems like play. This feeling usually subsides once the students realize how much work they actually do in networked writing. Another student below seems to express some frustration in learning the system.

I'm doing okay... still learn with this computer stuff.

While yet another student has much praise for the method of learning.

Well, I like this because I learn how to improve my English language. I like to give people feedback. Bueno me gusta mejorar my lenguaje de ingles, escribir las palabras, me siento muy bien en usar la computadora por que me ayuda, en como mejorar. Espero que puedas entender. Te queremos mucho.

The above example was given by a student who felt more comfortable in her native language of Spanish to express her written feedback.

Responses to the student questionnaire are reported in Appendix C. Overall students felt the use of DIWE was a positive experience, they found the small group discussions helpful, they were comfortable with the way assignments were written, and they felt that the time was well spent. Most interesting was the realization that not only the best students talked the most (#9). While 54% strongly agreed or agreed, 36% were neutral or disagreed. In terms of anxiety over the use of English (#10), 45% disagreed or strongly disagreed that this was a problem for them on the network. This was one area of particular concern.

Sample dialogues from *Interchange* sessions were reviewed for examples of student effort to achieve comprehensibility of message meaning as they negotiated by working linguistically in order to achieve that needed comprehensibility. Pica (1994) suggests that instances where interlocutors engage in repeating a message verbatim, adjusting its syntax, changing its words, or modifying its form and meaning, are reflected in learner output and evolve in communicative settings. One particular *Interchange* session where students were asked to read a local newspaper article "Deaf Parents Are Happy When Their Baby Is Born Deaf" (St. Petersburg Times, 10/11/94) and discuss what the author meant by the statement that "It's not, however, the hearing loss that puts people in the deaf culture; it is how they identify themselves" demonstrated clear examples of these factors of negotiation:

Chris: *Most hard of hearing like to be in the hearing world that's why they not like to be involves deaf cultures because we learning slowing and behind the news happens. Hearing people became hearing loss and they trying to be learning*

sign language but all people who are hard of hearing and hearing loss not using sign language. They prefer to use voice with hearing aid.

Tom: *I think not. Most hard of hearing people like to be hearing world because I went to Gallaudet U. student, and I seen many hard of hearing people in my prep. group, and they love to joining deaf culture. Because they can feel their hard of hearing alike to be deaf and they knew that the deaf people are about same as hard of hearing people.*

Jean: *I am in the same story. It talk about hearing loss with hearing aid. They can talk by communication, but they don't get involved with deaf, but it harder for them use A.S.L. and socialized because raised with hearing family. I am in the both world. It better to deaf in own culture hard of hearing in the hearing world - they can talk.*

Chris: *I disagree this, but I am not discriminate your opinion. I always see hard of hearing like to be hearing so I always notice hearing people always desire to learn sign language when they meet deaf people.*

Phay: *Some hearing impaired people like to have hearing or deaf children as family. Most deaf people prefer to have deaf children like other hearing people have hearing children a family. I think why deaf people like to have deaf children as family is because they can communicate through sign language like other hearing family can communicate through voice. I understand why some hard of hearing don't identify with the deaf culture is because they never grew up in that kind of deaf culture, they grew up only in a hearing world. If I have some children, I don't care if they are deaf or hearing children, but I rather to have them to learn some sign so they can communicate with me.*

As Kern (1995) and Batson (1995) have also noted, examination of *Interchange* transcripts reveals a somewhat "chatty" nature of writing that students produce. Kern also suggested that while the discourse generate during the *Interchange* session obviously shares certain aspects of written discourse - for example, its graphic form (which allows for deliberation and editing before messages are posted) - the preference for certain syntactical structures, and greater lexical density is also noticed.

Much of the *Interchange* discussion of the deaf students tended to be "metalinguistic" in nature. This feature was also noted by Kern (1995, p. 459) who posed the question: "Might it be that the written form of *Interchange* discussion enhances students' awareness of the features of their collaborative discourse by distancing them from it and allowing them to review visually the discourse to find patterns and progressions?"

An additional feature of negotiation occurred in the mail portion of DIWE where students' engaged in asynchronous adjusting of textual meaning in response to peer feedback. Some examples of the feedback follow:

Tom: *Jessica, I agreed with you about Ethics class. That course made us interest. Umm. . . I noticed when you typed in first sentence, it talked about present, right? But after that you talked about past, so please try to thinking about reader reading in your paragraph. He or she will think which you were talking about past or present or future, got it?*

Thanks, Tom...

Jessica: *Tom, I'm not sure what your wanted to know. I don't understand what you mean by asking me if this was present or past?? I think I understand but to answer your question, I wrote this before. It was old. It's not about present. If you have any questions, pls ask me.*

Jessica

An interesting note on this particular discussion was that the student switched back to read her own writing three times in a nine minute period, which can be tracked on the *Mail* portion of DIWE. Afterward, she re-read Tom's feedback before she commented on his statements. She was obviously searching for evidence of his claims.

Conclusions

One goal of this research was to establish a positive link between the use of the computer mediated networked language program, specifically DIWE, and increasing levels of linguistic sophistication in deaf college students. Trends are emerging in the electronic writing environment, but the systematic application of a planned course of action should increase the effectiveness of the outcomes of the network. Designing input that will challenge students but serve to enhance their acquisition of problematical English structures has always been difficult.

A secondary goal was to create in the students a desire to be connected to the discourse community, whether through electronic mail, on-line classrooms, or through the development of materials specific to deafness that can be shared world wide. The electronic word is a powerful medium for individuals in the community of inquiry. Stigma associated with speech that is not normal may lead the student to shy away from dialogue. Only a receptive environment will solve this challenge.

The more deaf students participate and collaborate in the community of inquiry and develop self-direction, the sooner the stigma attached to the difference is lifted, self-confidence is nurtured, and the student's own goals and dreams are reached. One student's struggle to develop intellectual voice is reflected in an evaluative statement regarding her continuing process of acquiring English:

I think that teacher is good performance to work with student by the English class because we learn new many discover of the language, group debates, homework, and hear new things for the lecture. But we are very patient to fight on the concept of our life to speak in the language for the writing and procedure of the education. For me, as I had been difficult to catch the lecture that make me feel increase solution of work that would keep continue many methods of grammar for situations that keep me confuse sometime.

Access to higher education is possible for deaf and second language learners when the barriers to academic language and social constructions are minimized and students are no longer marginalized in the community of academic inquiry. Electronic networks provide one means of reorganizing classrooms to situate literacy within the control of writers.

It is evident from this research that "situated context" where students write, interpret, and negotiate texts via computer networks positively influences the language learning of students who are deaf. While it

is not a panacea for language acquisition, nor is it a substitute for normal classroom discussion, it *is* a viable means of creating social contexts and meaningful uses for language.

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Appendix A

Student Information Sheet for Beginning of Semester DIWE Students

Please provide the following information. All of this information will remain confidential and be used for group data only. No student will be singled out by name or ID number. Please use your name ONLY so you can be located at the end of the semester.

1. Date _____
2. Name _____
3. Student ID _____
4. Class (e.g. ENC 009/0019, ENC 1151, ENC 1152, etc.) _____
5. Age (optional)
_____ 17 - 19 _____ 20 - 21 _____ 22 - 30 _____ 31 - 40 _____ 41 -
6. Gender
_____ Male _____ Female
7. Ethnicity
_____ White _____ Black _____ Native American
_____ Hispanic _____ Asian American
8. Language spoken in the home _____ (please specify)
9. Language you feel most comfortable with _____ (please specify)
10. Please indicate your experiences with DIWE (using a computer network to communicate with the teacher and with other students)
_____ This is my first session in a DIWE class
_____ This is my second session in a DIWE class
_____ I have had two DIWE classes before
_____ I have had three or more DIWE classes before
11. Do you know how to use a word processor?
_____ yes, fairly well
_____ yes, a little
_____ no
12. Do you use a word processor for your writing classes?
_____ always
_____ sometimes
_____ never
13. When writing for your classes, do you compose with a pencil and paper before entering your text into the word processor?
_____ always
_____ sometimes
_____ never
14. When writing for your classes, do you compose your essays directly at the word processor?
_____ always
_____ sometimes
_____ never
15. How would you rate your overall typing ability?
_____ I do not type at all
_____ minimal (under 30 wpm)
_____ average (30-60 wpm)
_____ proficient (60 wpm)

Appendix B

Test of Written English (TWE) Scoring Guide

Readers will assign scores based on the following scoring guide. Though examinees are asked to write on a specific topic, parts of the topic may be treated by implication. Readers should focus on what the examinee does well.

Scores

6 **Demonstrates clear competence in writing on both the rhetorical and syntactic levels, though it may have occasional errors.**

A paper in this category

- effectively addresses the writing task
- is well organized and well developed
- uses clearly appropriate details to support a thesis or illustrate ideas
- displays consistent facility in the use of language
- demonstrates syntactic variety and appropriate word choice

5 **Demonstrates competence in writing on both the rhetorical and syntactic levels, though it probably will have occasional errors.**

A paper in this category

- may address some parts of the task more effectively than others
- is generally well organized and developed
- uses details to support a thesis or illustrate an idea
- displays facility in the use of language
- demonstrates some syntactic variety and range of vocabulary

4 **Demonstrates minimal competence in writing on both the rhetorical and syntactic levels.**

A paper in this category

- addresses the writing topic adequately but may slight parts of the task
- is adequately organized and developed
- uses some details to support a thesis or illustrate an idea
- demonstrates adequate but possibly inconsistent facility with syntax and usage
- may contain some errors that occasionally obscure meaning

3 **Demonstrates some developing competence in writing, but it remains flawed on either the rhetorical or syntactic level, or both.**

A paper in this category may reveal one or more of the following weaknesses:

- inadequate organization or development
- inappropriate or insufficient details to support or illustrate generalizations
- a noticeably inappropriate choice of words or word forms
- an accumulation of errors in sentence structure and/or usage

2 **Suggests incompetence in writing.**

A paper in this category is seriously flawed by one or more of the following weaknesses:

- serious disorganization or underdevelopment
- little or no detail, or irrelevant specifics
- serious and frequent errors in sentence structure or usage
- serious problems with focus

1 **Demonstrates incompetence in writing**

A paper in this category

- may be incoherent
- may be undeveloped
- may contain severe and persistent writing errors

Papers that reject the assignment or fail to address the question must be given to the table Leader. Papers that exhibit absolutely no response at all must also be given to the Table Leader.

Appendix C

Student Questionnaire on DIWE

Please answer the following questions honestly. You do not need to write your name on this questionnaire.

Answer with one of the following:

(a) Strongly agree

(b) Agree

(c) Neutral/No opinion

(d) Disagree

(e) Strongly disagree

1. DIWE was a positive addition to this class.
a. 36% b. 55% c. .9% d. 0% e. 9%
2. The *Interchange* sessions were too short.
a. 0% b. 36% c. 46% d. 9% e. 0%
3. Small group discussions on *Interchange* were the most helpful.
a. 27% b. 55% c. 9% d. 9% e. 0%
4. The discussion topics were interesting.
a. 18% b. 55% c. 27% d. 0% e. 0%
5. The way the assignments were written helped me to feel more comfortable in participating.
a. 46% b. 55% c. 0% d. 0% e. 0%
6. The time we spent using *Interchange* would have been better spent in the classroom.
a. 18% b. 9% c. 46% d. 18% e. 27%
7. The *Interchange* sessions changed the class discussion in a positive way.
a. 18% b. 64% c. 18% d. 0% e. 0%
8. Most of the discussions were unimportant.
a. 9% b. 0% c. 46% d. 18% e. 27%
9. Good computer skills were needed to participate in the discussions.
a. 36% b. 18% c. 9% d. 0% e. 0%
10. Worry about writing in English kept me from participating.
a. 0% b. 9% c. 46% d. 36% e. 9%
11. The instructor did not give enough feedback.
a. 9% b. 18% c. 55% d. 9% e. 9%
12. Students were more honest on *Interchange* than they would be in regular class sessions.
a. 18% b. 46% c. 18% d. 18% e. 0%
13. The *best* students talked the most on *Interchange* sessions.
a. 36% b. 18% c. 18% d. 18% e. 0%
14. Knowing the *Interchange* program made it easier for me to participate.
a. 18% b. 55% c. 18% d. 9% e. 0%

15. It was difficult to read everything that everyone wrote.
a. 18% b. 18% c. 27% d. 18% e. 9%
16. The instructor should have given more guidance in the *Interchange* sessions.
a. 18% b. 64% c. 9% d. 0% e. 0%
17. DIWE was a welcome change from the usual class routine.
a. 27% b. 64% c. 9% d. 0% e. 0%
18. DIWE improved my ability to write in English.
a. 46% b. 46% c. 9% d. 0% e. 0%
19. DIWE improved my ability to read English.
a. 27% b. 64% c. 9% d. 0% e. 0%
20. DIWE improved my ability to discuss ideas in English.
a. 36% b. 36% c. 27% d. 0% e. 0%