

The Interactive Use of Microcomputer for Distance Learning

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Abstract

For human beings, language is the most important means of communication. Bloom and Lahey see successful language development as an interaction between form, content, and use. Language knowledge is a social phenomenon produced in a socio-cultural environment through interaction.

Teachers have traditionally concentrated on the structure of their student's writing rather than on the message. If writing is to be seen as an interactive social process between humans, it is the content which is responded to.

Language acquisition could be a major problem for hearing-impaired children and their acquisition of written language is characteristically problematic.

This study is to search the use of microcomputers in written conversational methods, which enable the hearing-impaired student to hear their conversations in a visual form and which usefully extend their written language learning opportunities.

Keywords : microcomputer, distance teaching, interaction, hearing-impaired

1. Introduction

For most children with a moderately-severe or greater hearing loss, there is characteristically a serious breakdown in the acquisition process, in that they generally lack adequate reception of, and exposure to, language because of the severity of their hearing loss.

Language acquisition is a major problem for hearing-impaired children and their acquisition of written language is characteristically problematic.

The use of many technological devices has been explored in classrooms to enhance the opportunities for the naturalistic use of English by hearing-impaired students.

Microcomputers have recently been used in conjunction with a process writing approach re-

sulting in significant gains in written language by hearing-impaired students. The Interactive use of microcomputers to stimulate natural language development(Batson & Peyton, 1986) is the basis of the approach the ENFI(Electronic Networks for Interaction) programme developed at Gallaudet University. Microcomputers are used to send and receive written social conversations.

The use of microcomputers in a written conversational approach should allow the hearing-impaired student to "hear" their conversations in a visual form and should usefully extend their written language learning opportunities.

The present exploratory study is an initial examination of the usefulness of microcomputers as vehicles for written conversations over a distance using modems and telephones with hearing-impaired students. The effects of children's use of microcomputers for this purpose of their acquisition of language skills was explored.

2. Aspects of Language and Communication

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2.1 Difficulties of Language Acquisition

Acquisition of language requires meaningful communicative interaction between mature users and children. For most children this linguistic input is received through hearing.

However, for the hearing-impaired, even with manual communication, written language and amplification, this linguistic input is still incomplete (McAnally, 1987). The handicap for hearing-impaired students is their lack of exposure to language brought about by their loss of auditory functioning.

The Majority of hearing-impaired students enter school without the age-appropriate language skills of their hearing peers. Wood and Howarth (1986) found that the disruption to mother/child interactions because of the difficulties of communication brought about by deafness could lead to mutual frustration caused by the verbal control exerted by adults.

2.2 Teaching Language to Hearing-Impaired Children

Historically there have been two major approaches to the teaching of language to hearing-impaired children. Firstly, one is the natural approach which is concerned with helping children acquire idiomatic use of language. This approach has been referred to as the maternal reflective method, or conversation approach (Van Uden 1988).

Secondly, the other is the structured or analytical approach. This approach which deals with language analytically and prescriptively, dominated the teaching of language to hearing-impaired children in the United States during the 1940's. It proved the child with carefully constructed models of language often with use of metalinguistic symbols as guides.

Writing is a medium for social interaction primarily intended for communication. Hopman and Glynn (1988) described the close developmental relationship between the literacy skills which include listening, speaking, reading and writing,

as an interactive social process.

Written language as a form of communication is unlike face to face communication which uses external stimuli, such as facial expressions, gestures, variation in rate of delivery and vocal emphasis.

3. New Approaches to Communication

Teacher's role becomes one of an audience rather than evaluatory. Jerram (1988) showed increases in both the quality and quantity of children's writing when an interacting audience approach was used by teachers.

3.1 Use of Microcomputers in Written Language

Mander, Thomson (1987) investigated a "process writing" approach with hearing-impaired children using microcomputers. The process involved teacher-child interaction in daily writing periods with the child owning the topic and the composition. Results indicated improvements in sentence development, organization of compositions and vocabulary.

A similar study by Vace (1987) with mildly mentally handicapped students showed an increase in time spent on writing and in the length of assignments composed on a microcomputer as compared to those handwritten.

A study by Geoffrion (1982) into the use of teletype (TTY) systems by hearing-impaired students discussed the differences of screen to screen "conversation" as against face to face conversation. Visual, prosodic and other non-linguistic cues were missing from screen to screen conversations with messages restricted to print.

This study found that in TTY conversations hearing-impaired students:

- (1)a. Never used the contactees name

- in greeting;
- b. rarely asked questions;
- c. rarely took an active role in maintaining conversations;
- d. often failed to provide adequate leave-taking sequences.

The use of networking or interactive microcomputers to stimulate natural language development with hearing-impaired children, with the students sharing their work and with the teacher able to review, comment or question, was reported by Batson and Peyton(1986). ENFI (Electronic Networks for Interaction) developed at Gallaudet University, used personal computers to send and receive social conversation in a written form where the emphasis was on the message rather than the language form.

- (2)a. English to be used in a non-threatening situation;
- b. Extensive exposure to meaningful English;
- c. Opportunities for the students to use language themselves;
- d. A move towards greater proficiency in the use of English.

Thomson(1987) described a study whereby a student used a microcomputer, modem and telephone to hold written conversations with a teacher using similar equipment. Analysis showed an increase in attempted language structures and student initiated comments and questions over time.

The computer could be seen as a freedom machine in that it provides a universal way of communicating. However, the hearing-impaired student may exhibit the same passive features as discussed by Geoffrion(1982).

The micro-computer provides the opportunity for the hearing-impaired student to use written conversational English in a "normal" situation. Hearing children listen to their own conversations as well as overhearing the conversations of others whereas hearing-impaired children are unable to do this because of the nature of their impairment.

The use of computers to facilitate social conversation in a written form provides hearing-impaired children with a visual record of conversations which can be referred to on the screen or at a later time as a print out. Unlike dialogue journals(Straton, 1985) this approach also provides immediate feedback to the "listener".

The present study is an attempt to investigate the use of personal computers to provide a method of communication in a conversational mode recognizing the limitations of print only communication as compared to face to face conversations with visual, prosodic and other non-linguistic cues present. This will be achieved by using personal computers, modems and telephones to hold distance conversations between a teacher of the deaf and hearing-impaired students. The study will seek to investigate whether regular "written conversations" will produce an improvement in the language skills of the students.

4. General Design

The present study was undertaken to examine the effectiveness of a distance teaching strategy using personal computers and modems for mainstreamed hearing-impaired students.

Four hearing-impaired students were involved in the study. The students were drawn from the roll of the Itinerant Teacher of the Deaf who was also the teacher in the experiment. Initially, a pool of students from the total roll was considered.

Descriptive data on the subject is presented in <Table 1>.

<Table 1> Data on Subjects

Child	Sex	Age(in years and months) at time of study May 1988	Degree of Deafness (Average over 4 Frequencies in DB)		
			L	R	
A	Male	11 years 3 months	79	82	Severe
B	Male	13 years 5 months	95	98	Profound
C	Female	12 years 9 months	89	89	Severe (Progressive loss)
D	Male	11 years 2 months	95	96	Profound

The estimate of hearing-loss was determined for each child by following the convention of averaging measured hearing thresholds in each ear over four pure tone frequencies of 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz. These measures were all made by Advisers on Deaf Children and were taken from the most recent audiogram available for each subject.

The students were introduced to the study at 4-weekly intervals with the teacher and the students subsequently holding daily 20-minute written conversations using personal microcomputers, modems and telephones. The students were in the programme for 4, 8, 12 and 16 weeks respectively in a multiple baseline design. Three conversations of each student, for each 4-week time block in the study were analysed for quantity and for sentence development to determine whether the use of the teaching strategy had led to any improvement in the students' use of language. Two types of measurements were gathered on the on conversation features, numbers of words used, numbers of sentences used and on the mean length of sentences in conversations. Secondly, the sentence development sequences of the Developmental Guide to English Syntax (Hsu, 1978) was used to classify each utterance and thus identify development over time in the level of complexity of syntactic structures used. The progress of the students was also assessed on the Test of Syntactic Abilities and on a Spelling Test (Peter s, 1970).

4.1 Equipment

Each school taking part in the study was supplied with an Apple 2E(128k) micro-computer; a 5 1/4" disk drive -to run the Full text pro 80 programme and to store conversations; an Image writer printer-to print copies of the conversations; and a Fountain MD 312 Modem permitting distance communication through the telephone system.

A copy of the Full Text pro 80 programme (by permission of Specific software) was also issued to each school. This word processor programme incorporated a spelling check, a mail merge and a communications package, and printed exactly the information shown on the screen.

The teacher based at K school for Deaf Children also had all of the above mentioned equipment but used a double disk drive to record all conversations on disk. This provision was necessary because there was limited space on the full text pro 80 programme to save all conversations. The equipment enable both student and teacher to print copies of conversations. For the students this provided a visual record which could be referred to at a later time while for the teacher a record of every student's conversation was available for analysis.

4.2 Research Design

4.2.1 Instruments

A multiple-baseline across subjects design was used, in which between and within subjects data were available for analysis.

The subjects were introduced to the study at four weekly intervals. The design of the study is shown diagrammatically in (Figure 1).

On entry to the experimental programme the student and teacher held pre-arranged daily (20 minute) written conversations using the computers, modems and telephones. An attempt was made to ensure that teacher and student were "equal partners" in the con-

Subjects	Time Blocks			
	Block 1 (Weeks 1-4)	Block 2 (Weeks 5-8)	Block 3 (Weeks 9-12)	Block 4 (Weeks 13-16)
Subjects 1	Treatment	Treatment	Treatment	Treatment
Subjects 2		Treatment	Treatment	Treatment
Subjects 3			Treatment	Treatment
Subjects 4				Treatment

(Figure 1) Time Blocks

versations with the emphasis placed on the conversational nature of the interaction, rather than on teaching or on the correction of syntactical structures.

The analysis involves the identification of the levels of syntactic structures which are present in the student's language by classifying each sentence used into one of five patterns and into one of seven levels of complexity.

4.2.2 Pre and Post Experimental Programme Measures

During the experimental phases three conversations, (per time block) on days 5, 12 and 19 were collected for analysis following the procedure outlined in (Figure 1).

A sample of 20 minutes of written language was gathered for each subject as they began the experimental stage and thereafter at the beginning of each time block they were in the programme.

Test of Syntactic Abilities The results of the screening test were used to measure shifts of attainment in the use of syntactic structures by the students over the time they were in the experimental programme. Scores obtained for the initial screening ranged from 67% to 97% correct.

Spelling Test This test was used to measure levels of spelling attainment before and after the experimental programme and to compare the students with age appropriate norms. Scores obtained for the initial test ranged from spelling ages of 8 years 2 months to 12 years 6 months.

4.2.3 Test of Syntactic Abilities(TSA)

This test was designed specifically for hearing-impaired students within the age range 10-18 years and provides information on the understanding and use of the following syntactic structures.

A method of classifying conversational features during a conversation. This taxonomy identifies three areas of a conversational opening, body and closing features, and is shown diagrammatically in (Figure 2).

OPENING : Establishing contact

Q/A	CONTENTS
HELLO	Participant uses "hello" in one of its many forms.
ID-SELF	Participant identifies him/herself in any form.
ID-OTHER	Participant identifies the other person by name.
ID-REQUEST	Participant asks the other person for identification.
R I T U A L QUESTIONS	Questions commonly included in the greeting ritual and not usually intended for information gathering("How are you?..")
R I T U A L ANSWERS	Answers to ritual questions which may or may not lead to a statement of information

BODY: Where meaningful discussion takes place.

Q/A	CONTENTS
O P E N I N G QUESTION	Opening a new topic through use of a question. ("Did you see..."; "What's happening at school?")
O P E N I N G STATEMENT	Opening a new topic through use of a statement.
QUESTION	When a question is used within a topic.
STATEMENT	When a statement is used in the conversation.

CLOSING : Breaking off from conversation

Q/A	CONTENTS
R I C H C L O S I N G	Closing with both goodbye and a warning or excuse offered.
M I N I M A L C L O S I N G	Closing without warning, abruptly breaking off without elaboration

(Figure 2) Conversational Taxonomy

This method was used to measure qualitative changes within the students conversations during the time they were in the experimental programme.

5. Summary and Conclusion

For hearing-impaired students, the major educational handicap is that they generally lack adequate reception of, and exposure to spoken language bough about by the severity of their hearing loss. This inability to adequately hear their own conversations as well as overhearing other's conversations, characteristically limits and restricts the linguistic ability of hearing-impaired students.

Microcomputers have been found to be a useful supplement to written language programmes for hearing-impaired students with improvements being reported in sentence development, organization and vocabulary. In recent years the use of networking microcomputers to communicate in a semi-conversational mode for hearing-impaired students has been undertaken at Gallaudet University. The results of this approach are very promising and a move towards greater proficiency in the use of English was indicated in the students concerned. The present study was undertaken in an attempt to investigate the feasibility of using personal microcomputers as a vehicle for written conversations and to determine whether or not such use would produce improvements in the language skills of the hearing-impaired.

Generalization data were also collected. This consisted of 20-minute written language samples from each student as they entered the experimental programme and thereafter at the beginning of each subsequent time block while they were in the study. These samples were analysed for changes in number of words used, number of sentences used, mean length of sentences and for syntactic development sequences.

The analysis of the written conversations indicated that the interactive teaching strategy of holding written conversations at a distance using microcomputers, modems and telephones did appear to lead to improvements in the lan-

guage structures of the students. The analyses indicated that there were marked positive changes in the number of words used and in the initiation of conversational topics. The analyses of sentence development showed that the subjects utterances improved markedly in terms of the number of more complex sentence patterns used over the course of study. Positive shifts were also demonstrated by all subjects in spelling results over the period of the study.

References

- [1] Batson, T. Peyton. The computer as fifth sense: Networking with deaf students to simulate natural language acquisition. *Teaching English to Deaf and Second Language Students*. Vol 4. 1986
- [2] Daniele, V.A. and Aldersley. Implications of time-on-task research of teachers of the hearing-impaired. *American Annals of the Deaf* July. 1988.
- [3] Geoffrion, L.D. An analysis of teletype conversation. *American Annals of the Deaf*. October. 1982.
- [4] Hsu, J.R. A Developmental Guide to English Syntax. New York: St Joseph's School for the Deaf. 1978.
- [5] McAnally, P.L. Language Learning-Practice with Deaf Children. Boston: Little Brown and Company. 1987.
- [6] Peyton, J. K. Computer Networking: making connections between speech and writing. *ERIC/CLL News Bulletin*. vol 10. 1986.
- [7] Russell, W. K. Linguistic and Deaf Children. *Transformational Syntax and its applications*. Washington D.C. Alexander Graham Bell Association for the Deaf. 1977.
- [8] Streng, A. H. Language learning and Deafness - Theory, Application and Classroom Management. New York: Grune and stratton. 1978.
- [9] VandenBerg, M. *The Written Language of Deaf Children*. Wellington: NZCER. 1971.
- [10] Wilton, K. Use of microcomputers to facilitate the written language of deaf children. Paper presented at 12th National Conference. Melbourne. 1987.



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