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thesis entitled

THE INITIATION AND ADMINISTRATION OF A
COMPUTER-BASED COMMUNICATION
ENHANCEMENT PILOT PROGRAM

presented by

Lucylee Neiswander

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Education

A handwritten signature in black ink, appearing to read "S. A. ...", written over a horizontal line.

Major professor

Date July 26, 1978

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1978

THE INITIATION AND ADMINISTRATION OF A
COMPUTER-BASED COMMUNICATION
ENHANCEMENT PILOT PROGRAM

By

Lucylee Neiswander

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ABSTRACT

THE INITIATION AND ADMINISTRATION OF A COMPUTER-BASED COMMUNICATION ENHANCEMENT PILOT PROGRAM

By

Lucylee Neiswander

Problem

This study was undertaken for the purpose of studying an administrative plan designed to serve as a guideline for administrators of an educational enterprise when they desire to identify, initiate, and implement a successful computer-based Communication Enhancement program for their communicatively handicapped students.

The dissertation was written as a descriptive study, in order to provide a historical-developmental orientation of a pioneering computer-based Communication Enhancement program designed specifically for the Communicatively Handicapped.

Methods, Techniques, and Data Used

A review of literature pertaining to the relevant aspects of the Communicatively Handicapped, literature on the transfer of technology to education, and a Management By Objectives administrative approach was conducted.

From the experiences, interviews, and documented information gathered from the direct involvement with the Jackson County

Intermediate School District, Jackson, Michigan, and the Artificial Language Laboratory, Michigan State University, East Lansing, Michigan, Computer-Based Communication Enhancement Pilot Program the historical-developmental descriptive study was detailed.

This was followed by a description of an administrative strategy for implementation of a Communication Enhancement program based on the Jackson County Intermediate School District/Michigan State University program.

The focus was toward implementation within an educational setting following assessment, design and development, and implementation components which spell out management strategies which meet the objectives of the computer-based Communication Enhancement program.

Major Findings

Administrators can put a team from various professional fields together and be able to:

1. Introduce them to new technology.
2. Introduce them to a new level of cooperation.
3. Use the computer as a central focal point for communication purposes and educational purposes.
4. Learn that resentment toward new technology is expected and can be overcome.

Although initially the cost seems prohibitive, there are many sources for finance that are available.

The administrator's role combined management skills along with the coordination of the new technology of Communication

Enhancement and educational program goals for the Communication Enhancement population.

The dissemination of information was an important obligation. The professional staff selected found it essential to function as a team. An active, interested participating family offered insights, direction, and support to the program. Community-wide cooperation and support aided in the professional as well as financial assistance.

The acquisition and use of the communication system allowed the student to participate more independently, to develop self-esteem, and to function with greater adaptability.

Conclusions

This Communication Enhancement team has been involved in a program where science and technology have been subordinate to human purposes.

Technology and education are two ingredients essential in providing appropriate surrogate devices and programs for Communicatively Handicapped individuals.

The Communicatively Handicapped can learn to communicate in a manner acceptable to society, using these alternate modes of communication.

It becomes the responsibility of the program administrator to develop effective ways to blend the varied philosophies and knowledge into an effective program.

Although finance will continue to be a major concern of program planners, it no longer need be a deterrent to program implementation.

Intermediate school districts or a consortium of school districts appear to be in the best position to initiate Communication Enhancement Programs in concert with their local university research centers.

Communication Enhancement is a young field functioning in many ways as an infant, but growing rapidly as a result of the interface of engineers, linguists, computer scientists, educators, lay people, and the Communicatively Handicapped themselves.

To Derek

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Any effort to recognize the many individuals who have made major contributions to this study is a task of insurmountable magnitude.

This study, like others of a similar nature, could only reach fruition through the cooperation of many individuals.

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CHAPTER I

THE PROBLEM

Statement of the Problem

How might one develop an administrative plan designed to serve as a guideline for administrators of an educational enterprise when they desire to identify, initiate, and implement a successful computer-based communication enhancement (C E) program for their communicatively handicapped (C H) students?

The author has chosen to use a descriptive method to provide a historical-developmental orientation of a pioneering computer-based C E program designed specifically for the C H.

Background Information

One segment of the handicapped population that has continued to be ignored and neglected by a large segment of society is the C H.

Current statistics reveal that of 750,000 individuals in the United States diagnosed as cerebral palsied, 20 percent are unable to communicate without artificial aids. There are 120,000 or more paraplegics and quadriplegics living in the United States today. There are nearly 8,000,000 handicapped school-age children in this nation. It is estimated that the population of physically handicapped school-aged is about 400,000 (Esposito, 1976, p. 2).

Of utmost importance is the fact that it has been estimated that 70 percent of the children with cerebral palsy manifest disturbances in their ability to communicate (Lehrhoff, 1958; Denhoff & Robinault, 1960; Cruickshank, 1966; Hagen, 1973).

The range is from mild dysarthria to the total inability to speak, while other C H are the result of multiple physical handicaps as well as cognitive, social, and emotional retardation. There are also children and adults who have lost communication ability due to progressive neurological diseases, traumatic brain injury, or stroke. This adds to the size of the group, making it more difficult to identify with precision in relation to other handicapping conditions.

Many of these C H individuals have been unable to talk throughout their lives. Often they have been labeled profoundly mentally retarded, placed in special schools, and shut off in institutions by a society that has been ignorant and fearful of those who are unable to communicate using traditional methods.

They were often viewed as noncontributors. A noncontributor was definitely a liability. Quite understandably, he was easily relegated to the "back room," a practice not yet absent from our social scene (Magary, 1960).

Although over the years these C H people learned through the receptive language process, their inability to speak and write created frustration for them, as well as for those close to them. With alert minds, their desire to communicate has been stifled by their inability to command their bodies, to articulate speech, or to control their body movements.

These individuals usually have carried on long, tedious, limited communication with those near to them, mainly their families. This communication system usually consists of a binary response, such as answering to a question by nodding the head, or moving the eyes, or a stare in a fixed direction. If the right questions are not asked, these individuals are unable to communicate and could sit for months with a pain or discomfort. They remain defenseless against misinterpretation and misguided assistance.

As a nonvocal cerebral palsied handicapper indicates, it has appeared as though they are being kept from society:

Language is to me a beautiful way certain groups of people have of sharing their feelings and thoughts with each other. If a person cannot speak the language of his society, people look at him as something other than a person, not belonging to the greater society (Renuk, 1976).

The real problem centers around the fact that society could not understand what these individuals were saying. As stated by an individual with a visual handicap:

Without communication, then existence is nothing. We exist in the world to communicate and if we cannot communicate with others or on a level with others, then we're lonely, we're lost (Jackson, 1976).

To date, for professionals in the field of rehabilitation and education for the handicapped, priorities have been in this order: (1) ambulation, (2) mobility, (3) independency in activities of daily living (ADL), and (4) communication (Ensign, 1976).

In the past, speech therapists have focused on developing the communicating ability of the nonvocal severely physically handicapped via naturally produced intelligible speech. Perhaps this

goal has been unreasonable for the nonvocal physically handicapped who cannot communicate because of severe neuromuscular involvement and the inability to phonate or to even control respiration.

Professionals working in the various arenas for the handicapped are just now beginning to reassess their priorities and procedures. Educating the C H is just one of many difficult tasks that society faces that is not well defined and understood. In addition to the responsibility of educating the severely handicapped, society has also had to face the economic and social burden created when many C H are required to live in restricted, undesirable environments at an enormous expense to society.

Yet our social order instills its confidence in our educational administrators to provide adequate direction and education for the severely handicapped. When financial resources and appropriate educational programs are nonexistent to resolve these dilemmas, parents, educators, and the handicappers become sufficiently perplexed. However, now with advancements in technology, researchers are working to develop artificial means of communication for the C H. We should soon begin to witness a marriage of technology and education to conquer this communication/education dilemma.

Consideration of man-machine systems designed to efficiently utilize a person's remaining motor capabilities available. Through use of these systems, many disabled persons will overcome their handicaps and become equal to and even exceed standards of performance usually established for nonhandicapping individuals. It is through an understanding of the handicapped person's human requirements, recognition of their remaining motor capabilities and application of the principles of cybernetics, that many of them can, when given the opportunity and appropriate feedback systems, supplement

their living systems with surrogates. It is through these insights that researchers engaged in studying systems to enhance man's communicative abilities can offer new hope (Kafafian, 1973, p. 258).

Such communication devices for the nonvocal severely physically handicapped were first developed mostly by engineers tailoring their work to individual C H clients. Perhaps due to time pressures or the lack of a dissemination format, their work remained essentially private. Funding came at times from hospitals, schools, or federal agencies. However, for the most part it remained a burden for the individual family of the client to bear.

Recent developments in computer technology and digital electronics have given rise to a new component of educational delivery for the C H child: The Computer-Based Communication Enhancement Program.

Through the use of minicomputers and microcomputers, adaptive input devices, voice synthesizers, and interactive graphic displays, persons who have been, until now, severely handicapped by the conventional learning environment can begin to have access to the educational experiences of their peers and can engage in social interactions on a level previously thought unattainable.

Until recently, federal funding has been unavailable because:

The target group's needs cut across many of the variables along which funding agencies' missions are defined: there are both children and adults; they require education, rehabilitation, vocational preparation, medical services; the work of the developers of communication aids includes service, training and research; the research is both basic and applied. No federal agency encompasses all of these activities (Dittman, 1976, p. 3).

Now that this technology has been developed the creation of these computerized communication enhancement aids is becoming a national priority.

Increasing demand for communication devices has brought prominent researchers, e.g., Maurice A. LaBlanc, Rehabilitation Engineering Center, Children's Hospital at Stanford, Palo Alto, California; John B. Eulenberg and Morteza A. Rahimi, Artificial Language Laboratory, Michigan State University, East Lansing, Michigan; Richard A. Foulds, Biomedical Engineering Center, Tufts-New England Medical Center, Boston, Massachusetts; Haig Kafafian, Cybernetics Research Institute, Washington, D.C.; Gregg C. Vanderheiden, Trace Research and Development Center, University of Wisconsin, Madison, Wisconsin; representatives from federal agencies, and Bureau of Education for the Handicapped (BEH) personnel together to confer at a nation-wide conference to initiate rational planning on these issues:

1. From the standpoint of service delivery, the prevalence and distribution of the client group, the relative merits of all-purpose centers, of regional specialization, the applicability of the models provided by Rehabilitation Centers, Deaf-Blind Centers, and others.
2. From the standpoint of research, the possibility of specialization, standardization and interchangeability of components, the usefulness of a technology assessment for the area, and the necessity for built-in evaluation for programs.
3. From the standpoint of the agencies, the need for inter-agency communication, the possibility for an interagency funding consortium to coordinate joint administration of support from a number of agencies for a number of projects (Dittman, 1976, pp. 3-4).

With the advent of Mandatory Special Education at the state level, in Michigan, in the early 1970's and at the federal level in 1975, an increasing number of C H have been identified and are required by law to attend some type of educational and/or special educational program throughout the nation's schools and institutions.

Significance of the Study

Researchers and educators have found it essential to bring about the necessary administrative structure to advance the education and well-being of these disabled individuals who possess a general inability to communicate effectively with their environment. These C H individuals should derive significant benefits from an efficient and effective educational computer-based Communication Enhancement (C E) Program administratively designed for implementation to assist them in reaching their utmost potential in the shortest time possible.

Researcher's Purposes in Conducting the Study

The descriptive study was presented as a framework describing an administrative approach to a computer-based C E pilot program.

The writer's primary purpose in conducting the study was to present a detailed description of a computer-based C E program. The administration of such a program and the reporting of the actual program process have until now never been afforded formal documentation.

A secondary purpose of the writer was to abstract from the primary purpose a general approach to the administration of a computer-based C E program.

A third purpose was for the document to communicate, to the educational field, knowledge of C E technology.

The writer's fourth purpose was to add other additional information to the document from the search of literature in the areas of educational administration and the computer field to make the documentation useful to further research.

The following needs are a result of the above purposes:

1. To expedite the administrator's search for information pertaining to this field. Being the first attempt of its kind in the field, there is no other previous research to which the administrator might turn.

2. To provide the administrator with a program outline that assists in meeting the implications of the state and federal laws which require that the severely physically handicapped be provided with an appropriate education.

3. To provide administrators and educators with a document that assists in meeting society's demands for greater accountability.

Questioners in the past were content to listen to accounts of resources allocated. This has changed. Today the questions focus on results obtained for resources. The questions are pointed, insistent and abrasive. The public school system is being held accountable for results (Lessinger, 1970, p. 217).

The placement of responsibility for the academic achievement of all students is now to a greater extent being placed on the school board, the superintendent, the principal, and the teacher.

4. To demonstrate to the administrator the need to place special administrative emphasis on the areas indicated below which are unique to the successful union of technological development and education, such as:

- a. The increased rate of information transfer may have psychological ramifications which may be detrimental to the success of the program and therefore requires careful attention on the part of psychologists and administrators.
- b. The new capabilities acquired by the student may make some learning skills irrelevant. This can affect the learning objectives set for the student by the school.
- c. The technology may disturb the results of performance measurements made by traditional means. Since such performance measures are essential to the proper management of an educational program, new interpretations of these results are required.

5. To provide the administrator with a means for integration of the C H individual into the least restrictive environment within the educational setting. In so doing:

- a. The handicapped individual gains independence and self-confidence by being able to work independently on projects and assignments. The handicapper is able to communicate on a more free and equal basis.
- b. An increased amount of learning takes place, both individually and with peers.
- c. The time involved in accomplishing various tasks is reduced.
- d. Job satisfaction is experienced by the staff.
- e. There is a reduction in cost. The school district saves in terms of the need for fewer professional and paraprofessional staff to provide individualized special education services to the individual. It may no longer be necessary for the handicapper to be transported over a long distance to special classes.

Through the use of this descriptive study, a significant and systematic approach to a complex educational challenge was presented.

Methodology

A review of the literature pertaining to the relevant aspects of the C H, literature on the transfer of technology to education, and on a Management By Objectives (MBO) administrative approach was conducted.

From the experiences, interviews, and documented information, e.g., daily logs, video tapes, gathered from the direct involvement with the Jackson County Intermediate School District (JCISD), Jackson, Michigan, and the Artificial Language Laboratory, Michigan State University (ALL-MSU), East Lansing, Michigan, Computer-Based Communication Enhancement Pilot Program, the historical-developmental descriptive study was detailed.

The writer also described the challenges of a C E program, including:

1. Introduction of new technology.
2. Interrelationship of the C E program with the medical profession.
3. Way special education is organized at the intermediate district level.
4. Attitudes toward such an innovation program.
 - a. Educators
 - b. Community

5. Administrative structural requirements used to solve the above challenges.

The writer then described an administrative strategy for implementation of a C E program based on the JCISD/MSU-ALL program. The focus was toward implementation within an educational setting following the basic skeletal outline, i.e., assessment, design and development, and implementation as diagrammed in the Basic Conceptual Design for Administration and Management of a Computer-Based C E Program, Appendix A.

The assessment, design and development, and implementation components sought to spell out management strategies that meet the objectives and needs of the computer-based C E program. Once having become operational, this process was able to be iterated until an effective management and administrative approach was achieved.

The project design, after review by the University Committee on Research Involving Human Subjects (UCRIHS), was cleared for research and development when it appeared that the rights of the handicapped individual were protected (Appendix B).

Limitations

The administrative strategy being described as a result of this research effort was designed for implementation by administrators providing special education programs to C H individuals encompassing ages defined by the respective state and federal mandatory special education laws.

The population of C H individuals to be served by an educational enterprise using these strategies appeared to be highly specialized and small in number, compared to the total physically handicapped population, e.g., supra, p. 1. Only recently has the BEH encouraged that a survey be conducted for the purpose of identifying a population that could be considered C H.

It was recognized that this was an initial attempt to provide a historical-developmental descriptive study. Since it was the first attempt of its kind, there was a limited amount of research data from which to draw.

The literature reviewed, further limited the study by the modicum amount directly related to the subject.

The number of school districts benefiting from the study is limited to those able to make the necessary financial and personnel commitment to such an innovative program.

Knowledgeable professional specialists and sophisticated futuristic equipment are required in the experimental research and prototype development of these computerized devices, designed especially to meet the individual needs of the C H. The costs could total a minimum of \$30,000 over a one- or two-year period (actual grant cost to the JCISD-ALL/MSU Communication Enhancement Program, July 1, 1976-December 31, 1977).

To the average taxpayer this might initially appear to be an exorbitant amount of money to be concentrating on one special education child compared to the amount being allocated by the school

district to general education and special education programs on a per pupil basis.

This is especially true when one views the program as serving only a few select C H individuals and the probability of these C H individuals ever becoming independent, self-sufficient, contributing adults in our society appears at this time to be small.

The author found it extremely difficult, if not impossible, to make an accurate comparison of the statewide average per pupil membership cost for any one year between general education and special education in the State of Michigan.

In looking at general education only, i.e., education of the normal child enrolled in a regular classroom program, a guaranteed actual amount of state support on a statewide average basis is quoted in Table 1. However, these amounts do not include the local dollars made available by approved local school millage elections. Local dollars vary extensively from district to district throughout the state.

Table 1.--General education: Guaranteed actual amount per pupil on a statewide average basis (Hodson, 1978).

1975-76 (Actual)	1976-77 (Actual)	1977-78 (Estimated)	1978-79 (Estimated)
\$1,113.95	\$1,193.81	\$1,307.00	\$1,427.00

At the present time there are no guaranteed actual cost statistics available on a per pupil statewide average basis for special education.

Special education actual cost averages are extremely difficult to obtain because of the many service and program options that are available to each special education child. These options are necessary in terms of providing appropriately for the many individualized special educational needs caused by the various handicapping conditions of these individuals.

Estimated amounts on a statewide per pupil average basis, reflecting state financial support, are provided in Table 2 for all combined basic classroom programs (i.e., visually impaired, hearing impaired, POHI, learning disabilities, trainable mentally impaired) and support services, including all teacher consultants, homebound/hospitalized, and speech and language therapists.

Table 2.--Special education: Estimated actual amount per pupil on a statewide average basis (Hodson, 1978).

	Basic Classroom Programs	Support Services
1976-77	\$3,276.00	\$626.00
1977-78	\$3,540.00	\$671.00
1978-79	\$3,758.00	\$704.00

These amounts can be extremely misleading because of the following factors:

1. Basic classroom programs are generally not the only costs to that child's education. Usually these children are also receiving some type of support services and/or services from other special education personnel, i.e., special education supervisors. The individual special education program may vary from the basic classroom to a multiplicity of supportive services, making the range in costs for any one student extremely great.

2. The type of special education classroom varies also; i.e., in 1978-79 the highest classroom per pupil cost is estimated to be \$6,125.00 for the visually impaired, with the lowest being \$3,150.00 for the trainable mentally impaired classroom. All other categories varied in cost within that range.

3. The cost for support services varies to an even greater degree within a wide range. In 1978-79 the projected estimated cost ranges from a high of \$5,147.00 per pupil for homebound/hospitalized to a low of \$451 per pupil for speech and language. Again, all other support services range in cost somewhere between these two figures.

The amounts do indicate, however, that the costs per pupil for the special education child are considerably greater than for the general education child.

Parents of normal children attending regular classes in general education are actively displaying an increased awareness and concern over what they perceive as an inequality of expenditures being allocated for their child's education as compared to the amount being accounted for by special education.

To argue that "equal protection" and equal education are based on equal spending would be folly. To argue for an "appropriate" education for all children is ideal. . . . Most recently parents of the non-handicapped have followed the direction set by parents of the handicapped and have questioned the quality of education of normal high school graduates who lack appropriate reading skills at the time of graduation. Recent actions in California and in Long Island, New York may be a harbinger of due process activities by parents of non-handicapped children (Wawrzaszek, 1977, pp. 15, 30).

Because of the unique needs of individual special education children, the administrator has found it increasingly necessary to be responsible for assisting the public in gaining an understanding that this C E program is designed as a research effort that will in the very near future be benefiting the C H and society as a whole, both directly and universally, at a greatly reduced cost.

In the next decade, computer-based systems will become a dominant factor in the lives of a large segment of the handicapped community. . . . Time shared computer networks . . . brings down the hourly cost to individuals. . . . A second force in getting computer costs down is mass production of increasingly efficient mini-computers and micro-computers. . . . (Miller, 1976, p. 25).

Although this study was based on the research and authoritative opinion presented in Chapter III, the selection and interpretation of the evidence were designated and evaluated by the writer.

Delimitations

The study incorporated library research to include ERIC and Dissertation Abstracts information searches. Further delimitations included a review of the literature pertaining to the relevant aspects of the C H literature on the transfer of technology to education and an administrative MBO approach. Appropriate information

was gathered from the leading research and educational centers throughout the country, now piloting research projects for the C H.

The writer directed the efforts of the study toward only one C E program, the JCISD/MSU-ALL pilot program. The study describes the service delivery program that was formally initiated July 1, 1976, and continues to be in operation within the JCISD at the present time.

The author had the opportunity to be an active participant-observer in the daily program activities, and had access to all program information within the JCISD and the ALL-MSU pertaining to computer-based C E programs.

Description of Terms

The following major terms were used throughout the study and were defined to insure clarity and continuity for the reader.

Artificial Language--Refers to definable linguistic structures and included computer programming languages especially constructed for scientific discourse and models of natural human language (Artificial Language Laboratory, 1977).

Cerebral Palsy--Refers to a condition caused by damage to the human brain, usually at birth. "Cerebral" refers to the brain and "palsy" to lack of control over the muscles (Cerebral Palsy Facts and Figures, 1976, p. 1).

Communication Enhancement--Refers to the application of technology to aid human expression and perception of language and art. In its more narrow meaning, it refers to the application of technology

to the needs of persons who experience communication handicaps due to neurological or neuromuscular conditions. Communication enhancement involves not only the design and implementation of specific devices and techniques, but also the organization of educational, therapeutic, and social relationships in support of the integration of these devices and techniques into the life of the users. The fundamental principle of communication enhancement is the transformation of human expression from one modality into another to match the particular physical and cognitive characteristics of the participants involved in a communication experience (Eulenberg, 1978).

Communicatively Handicapped (CH)--Refers to one who is presently unable to use any form of expressive language in a manner that is functional, effective, and acceptable by society.

Goal--Formal pursuit toward a certain level of proficiency.

Hardware--Physical components such as the electronic or electrical devices in the computer.

Input/output--The parts of a computer which allow communication between users and the computer (Didday et al., 1978, p. 17). Input devices could include computer cards, typewriters, or various switching devices. Output devices might include card readers, strip printers, magnetic tape devices, discs, TV screen monitors, or voice synthesizers.

Interface--The interaction of two independent systems in order to promote communication, e.g., man-machine.

Least Restrictive Environment (mainstreaming)--Integration of the communicatively handicapped individuals into as normal a

setting as will allow for their successful participation (Education for All Handicapped Children Act, Public Law 94-142).

Nonverbal--The lack of ability to use words at all (Department of Health, Education and Welfare Conference, 1977, p. 5).

Nonvocal--The possession of cognitive linguistic capabilities but lack of motor articulation to produce speech that is intelligible (Department of Health, Education and Welfare Conference, 1977, p. 5).

Objective--Describes the intended outcomes for a specified duration of time.

Responsibility--Being answerable or accountable to society. to the C H individual, the family, peers, fellow educators, and the Board of Education for the results of decisions made in relation to certain administrative actions.

Software--Programs, procedures, and related documentations in their entirety, associated with the computer system.

Organization of Subsequent Chapters

In this chapter the author demonstrated the importance and need for the dissertation. A list of the researcher's purposes for the study and an outline of the procedure to be followed were included. In addition, the writer provided background information, limitations, and delimitations, and provided descriptions of terminology.

A review of related literature pertaining to the C H, to the new technology as it is related to the C H, and to MBO as an administrative approach completed the composition of Chapter II.

The author, in Chapter III, presented a historical-developmental orientation, or a documented descriptive study of the pilot C E program.

In Chapter IV, the author described administrative strategies for implementation of a C E program based on the descriptive study.

The author concluded with Chapter V by presenting a summary, findings, and conclusions. Recommendations for further study follow.

CHAPTER II

REVIEW OF LITERATURE

The Physically Handicapped Population

From an historical perspective, our society only recently has begun to develop a sensitivity to the particular needs and rights of the physically handicapped. In retrospect, physically handicapped children were commonly referred to as crippled, deaf and dumb, or blind. These handicapped individuals have been found, and will continue to be found, in every community throughout the world.

The handicapping condition may be the result of a birth defect, accidents, disease, or illness. The multiplicity and extent of the disability may vary from slight to severe.

During the early days of our country's birth, survival and maintenance of the normal took precedence. The crippled, blind, and deaf and dumb, as they were viewed, were considered as non-producers and liabilities. Often they were hidden and left to die.

With improvements in communications, urban living, an increasing humanistic philosophy, advanced medical technology, and public education, the handicapped soon attained a normal life expectancy, and homes (or asylums) were created for them.

Societal change continued with the birth of the industrial revolution, and compulsory education. New social philosophies increased social awareness by encouraging others to see the

handicapped as individuals who could be educated to take a meaningful place in society. For this purpose special schools were designed. Many of the handicapped spent their entire school years segregated from the regular school population. It has only been since the 1950's that the handicapped have been mainstreamed on some occasions into regular classes. While this practice has gradually become acceptable, special schools have continued to exist. In the 1970's, hints of ignorance continue to prevail when handicapped individuals take their place in society. Although the evidence of such comments, displaying a general lack of understanding, are slowly on the decrease, we may still hear:

If they're physically handicapped, they must also be mentally impaired. They all look alike really. They shouldn't and/or don't think of sex. "If you're not good, that's what will happen to you!" If we ignore the handicap, it'll go away. They all have a sense of humor. There ought to be a place for these people. Physical impairment is the result of the sins of their parents. We can't really expect much of these people. Possessed of the devil . . . you can't trust them. All crippled children have hearing losses. Oh, they are so wonderful, how they "take" everything. We just have to take care of them. I'd be afraid to have them around my young children. They really are not like us! I don't look, I just don't pay any attention (non-person approach). Of course, they don't ever expect to get married. We really should feel sorry for such people. We do a lot for them--they should be very grateful. Blind people just like to listen to their recorders. They shouldn't be around for normal people to have to look at. They don't really care--"just keep them happy!" Maybe there's some quiet little job in the background somewhere, which someone in a wheelchair can do (Ensign, 1976).

Educators, parents of the handicapped, and the handicappers themselves have just recently awakened. They have formed pressure groups, worked, lobbied, and protested to convince lawmakers and the public of their needs and rights for equality and understanding.

Today their problems, needs, rights, and potentialities are being voiced in all phases of the media. Laws for the handicapped have been enacted in every state, as well as at the federal level, making good the philosophies of the early 1960's:

The motivation back of such provisions has been an increasing conviction that the exceptional should be enabled to contribute to society more nearly to the limits of their capabilities, plus the humanitarian belief that each individual has a fundamental right to as complete self realization as is possible within our social structures (Magary, 1960, p. 5).

In 1971, Public Act 198, the Michigan Mandatory Special Education Act, was passed by the Legislature, signed by the Governor, and supported by the State Board of Education. The Act has three major provisions:

1. The Act establishes the right of handicapped persons, through the age of 25, to equal educational opportunity within Michigan's public schools;
2. The Act establishes procedures for accountability in the delivery of programs and services to those handicapped persons; and
3. The Act requires a system of state and intermediate school district plans for the delivery of special education programs and services (Educational Services, 1971, p. 1).

The rules became effective October 10, 1973.

The Education for All Handicapped Children Act, Public Law 94-142, was enacted by Congress in November, 1975, and is scheduled for full implementation in fiscal year 1978. The federal act has been hailed as a "Bill of Rights for the Handicapped." The bill requires that: ". . . children served by the act be educated in accordance with individual plans tailored to their particular needs and capacities" (Goodman, 1976, p. 10).

Another federal regulation having potentially far-reaching implications for the handicapped, implemented as of June 3, 1977, is Section 504 of the Rehabilitation Act of 1973, with regard to federal assistance administered by the Department of Health, Education, and Welfare (HEW). Section 504 provides that:

No otherwise qualified handicapped individual . . . shall solely by reason of his handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance ("Nondiscrimination," 1977, p. 22676).

The regulation defines and forbids acts of discrimination against qualified handicapped persons in employment and in the operation of program activities receiving assistance from the Department of HEW. Employers must make reasonable accommodations for the handicapped, existing and new facilities are to be accessible to the handicapped, and programs are to be operated in a nondiscriminatory manner.

The current philosophy of the 1970's, generally adopted by educational administrators when engaged in program planning for the handicapped, is that of "mainstreaming," or placing the handicapped child in the "least restrictive environment." The movement was spearheaded by the Leadership Training Institute in Special Education of the Bureau for Educational Personnel Development, United States Office of Education. The "least restrictive environment" essentially means providing efficient and effective special education itinerant supportive services to regular classroom teachers, thus ensuring a successful integrative experience for everyone concerned, i.e., school

personnel, students, parents, and the handicappers. The special educators providing the itinerant supportive services in this setting might include teacher/consultants, school nurses or health consultants, social workers, physical and occupational therapists, speech and language pathologists, and psychologists. The services offered may be comprehensive in nature, with the intent of providing the best possible special educational assistance within the general educational setting. The idea behind this approach is to help better prepare the normal population, as well as the handicappers, for taking a more successful, compatible, and competitive place in the adult world. "Not only words, actions also communicate values. The school as an institution communicates values by the nature of its organization" (Cohen, 1977, p. 14).

Usually the C H individual is thought of and is treated in the same manner as the mentally handicapped. Most of the advances have been made for individuals with mobility handicaps, and very little has been accomplished for those with communication handicaps.

New Technology for the Communicatively Handicapped

Recent rapid technological advances are now permitting and encouraging education for the C H. These individuals have been difficult, if not impossible, to serve until now. In addition, this technology now being applied to these individuals can be transferred to serve other populations.

Classifications of C H individuals have been altered:

A number of institutionalized children, believed to be profoundly retarded, have been given the communication opportunity,

and have turned out to have far greater ability than had been expected. . . . There are multiple physical handicaps . . . cognitive problems . . . severe social and emotional retardation . . . older people who lose communication capability because of traumatic injury. . . . Consequently it is difficult to define the group precisely, and one of the major unknowns is its prevalence as compared with other handicapping conditions (Department of Health, Education and Welfare Conference, 1977, Appendix A, pp. 1-2).

A representative estimate of characteristics of the target population primarily by type of etiology and prevalence can be found in Appendix C (Department of Health, Education and Welfare Conference, 1977, Appendix A, p. 4).

The categories of nonwriting, nonverbal, and nonvocal assist in determining the type of communication aids and groups of individuals who should utilize them. It should be recognized that an individual could start with one aid and progress to more sophisticated devices as their condition changes.

The group of researchers master-minding this technological wizardry is small. Their backgrounds include engineering, psychiatry, computer science, the therapies, and linguistics.

The following prominent researchers and government officials met with Dr. Allen Dittman, BEH Conference Project Officer, in April, 1977, to exchange information and to generate recommendations for further research (Department of Health, Education and Welfare Conference, 1977, Appendix B, pp. 1-2).

Government participants:

Mr. Robert Dantona
Coordinator, Centers & Services for Deaf-Blind Children
Bureau of Education for the Handicapped
Washington, D.C.

Mr. Herman Harvey
Program Manager, National Science Foundation
APRT/RANN
Washington, D.C.

Dr. William E. Johnston, Jr.
Bureau of Education for the Handicapped
Washington, D.C.

Mr. Richard R. Leclaire
Rehabilitation Services Administration
Washington, D.C.

Dr. Lyle L. Lloyd
Mental Retardation & Developmental Disabilities Branch
National Institute of Child Health & Human Development
Bethesda, Maryland

Dr. Christy L. Ludlow
Communicative Disorders
NINCDS--National Institutes of Health
Bethesda, Maryland

Dr. Eugene Murphy
Veterans Administration Regional Office
New York, New York

Dr. Frank Withrow
Bureau of Education for the Handicapped
Washington, D.C.

Nongovernment participants:

Dr. Kenneth M. Colby
Neuropsychiatric Institute
University of California, Los Angeles
Los Angeles, California

Mr. Terry De Briere
Director, Visual Acuity Research
Parsons State Hospital and Training Center
Parsons, Kansas

Dr. John B. Eulenberg
Director, Artificial Language Laboratory
Michigan State University
East Lansing, Michigan

Mr. Richard A. Foulds
 Director, Biomedical Engineering Center
 Tufts-New England Medical Center
 Boston, Massachusetts

Dr. Paul Goldenberg
 Logo Group
 Artificial Intelligence Laboratory
 Massachusetts Institute of Technology
 Cambridge, Massachusetts

Mr. Haig Kafafian
 President, Cybernetics Research Institute, Inc.
 Washington, D.C.

Maurice A. LeBlanc
 Chief, Rehabilitation Engineering Center
 Children's Hospital at Stanford
 Palo Alto, California

Mr. Gregg C. Vanderheiden
 Trace Research and Development for the Severely Communicatively
 Handicapped
 Madison, Wisconsin

Dr. Kenneth Wyatt
 Acting Chairman of Department of Special Education
 Georgia State University
 Atlanta, Georgia

Other participant:

Dr. Thomas P. Vogel
 Division of Medical Sciences
 Washington, D.C.

Technological researchers located in several centers throughout the world are working to develop various forms of effective communication media for the C H.

One such center is the Bliss Symbolics Communication Foundation (B.C.F.), located at the Ontario Crippled Children's Center, Toronto, Ontario, Canada. According to Shirley McNaughton, Director of B.C.F., the originator of Bliss Symbolics, Charles K. Bliss,

Sydney, Australia, worked from 1948-1965 to develop semantography into an international language for the purpose of bringing about peace. The B.C.F. was established in 1975 for a different purpose. Their intent has been to meet the growing needs for symbolic communication through the use of a communication board. Current B.C.F. research is concerned with the application of symbols with the retarded, deaf, autistic, aphasic, language development or reading readiness, and adult (particularly stroke) populations (McNaughton, 1977).

Although the cost is minimal, and these communication boards, or boards of similar types, can be constructed by almost anyone, such as parents, friends, teachers, and therapists, the user is somewhat limited. Since no memory is available, the client is unable to interact independently; furthermore, the amount of information available is limited to the size and arrangement of the board. Although various menus can be interchanged, the handicapper must rely on someone else to replace them. The evidence of these limitations has not prevented and should not prevent the widespread use of such communication boards. For some, this method has facilitated communication by challenging the upper limits of their intellectual abilities. For others, it can be a stepping stone in the development of more sophisticated means of C E. McNaughton reported that 400 users displayed during the fall term that the use of symbols does not discourage speech if it is available. It does not take the place of reading and writing but is a stepping stone toward this goal (McNaughton, 1977).

The Tufts-New England Medical Center of the Biomedical Engineering Center, Boston, Massachusetts, places a major emphasis on practical devices useful in vocational rehabilitation. A language acquisition and communication project attempts to convert symbols to spoken words. The processing of dysarthric speech through the use of a speech analyzer constitutes a second project effort.

Children's Hospital at Stanford Rehabilitation Engineering Center, Palo Alto, California, helps to develop useful rehabilitation devices and procedures. The needs might include devices designed in orthotics or to enhance mobility, prosthetics to increase function and to provide maximum cosmesis, or research in gait analysis, balance, and biofeedback. The exploration of simpler and less expensive communication systems, i.e., typewriters, television, voice amplification symbol-to-speech, and various input devices, has been a recent priority at the Center.

TRACE Research and Development Center for the Severely Communicatively Handicapped, Madison, Wisconsin, directs its efforts toward research by exploring, developing, and evaluating various communication aids and techniques. Much of the research effort has been sponsored by the National Science Foundation (NSF), Bureau of Education for the Handicapped (BEH), and United Cerebral Palsy Association (UCPA) grants. A Bliss symbolics research program for mentally impaired children and a language acquisition study complete two other branches of the Center's endeavors. In addition,

information dissemination and the provision of inservice workshops are also viewed as important parts of the TRACE operation.

The Cybernetics Research Institute (C/R/I) has conducted several studies in conjunction with the Bureau of Education for the Handicapped, Office of Education, United States Department of Health, Education and Welfare. The Cybercom man-machine systems were used to determine to what extent nonverbal severely physically handicapped students could communicate. Through the use of appropriate programming methods and individually designed interfaces, nonverbal severely handicapped individuals are now able to utilize their available motor control to direct automata to dramatically demonstrate their ability to communicate. At C/R/I, flexibility in interface design is the key in matching the performance capabilities of each individual. Manual coordination, dexterity, and strength are just some of the many areas to be objectively and quantitatively evaluated utilizing visual, auditory, and tactual response methods when selecting the most appropriate interface system. Sensory feedback is also essential in most learning processes. It was found that the education of many handicapped individuals could be significantly increased by matching writing and communicating systems with the handicapped person's abilities. C/R/I also investigated a large portion of the handicapped population who possess other disabilities such as hearing or language impairments, rendering them unable to use the telephone. Various technological devices have been developed, i.e., amplifiers, signaling lights, meters, and vibrators, to respond to coded signals. Their success has been limited due to

the lack of feedback, limited message capability, difficult coding programs, and the inability to adapt these systems universally.

Stored program digital computers have become widespread during the past two decades. This was due primarily to technological developments such as the introduction of transistors and integrated circuits, improvements in the storage elements used in the computer memory, increased reliability of the electromechanical peripheral devices, and the increasing use of microelectronics. Present-day digital computers include special-purpose computers tailored to a single use and general-purpose computers utilized for multiple diverse uses such as control, data processing, and scientific calculations.

Time-shared computer networks, which bring down the cost, have connected users by telephone from all over the country to the nodes of the network.

The availability of the less costly mini-computers made many new applications, particularly in education, cost-effective. The latest and smallest general-purpose computer available is the micro-computer. The variety of micro-computers and micro-processors (special-purpose micro-computers) has been ever increasing. This has led to a diversity in their applications. Through the development of miniaturization of electronic packaging, mini- and micro-computers are now currently affordable to small businesses, schools, institutions, and many individuals.

The use of modern computer technology has been shown to be effective in education. Computer-based education in a nationwide

learning center network appears to be the most workable. Two societies, the Society for Applied Learning Technology and the Association for Educational Data Systems, were organized to bridge the communication gap between educators and technologists. Under some circumstances computerized systems can augment and enrich the teacher's efforts by helping to provide a higher quality education at a lower cost.

. . . CAI (Computer-Aided Instruction) will become cost-effective in special education, which is also frustrating and time-consuming for teachers. The individual testing, prescribing, feedback, recordkeeping and analyzing--all done manually--require too much time, effort, and patience to be done effectively. The computer has infinite patience. It doesn't neglect any of those chores in favor of something more interesting. And it is private. The pacing factor in getting widespread usage is availability of courseware. But special education has a high priority with the U.S. government, and substantial resources are being committed to this area (Norris, 1977, p. 452).

The transformation of language via computers has become a reality only in the last few years. The C H, as well as the blind and hearing impaired, will find their limitations diminished and their potential enhanced (Nemeth, 1974).

In the next decade, computer-based systems will become a dominant factor in the lives of a large segment of the handicapped community. This dominance will be broadly based with computers playing vital roles in vocations, education, communications, and therapy. . . . Results point to important new possibilities for intellectual and communicational development of severely disabled persons (Miller, 1976, p. 25).

Centers have been established for applied and basic research on computer-related problems of language processing. Among the principal areas of research is the design of computer-based systems for persons who experience communication handicaps. Researchers

are beginning to demonstrate how those who have never uttered an intelligible word can speak electronically. Due to technological innovations, custom-made voice synthesizers can be utilized to speak for the nonverbally handicapped. The voice synthesizer uses computer circuits to perform as an analogue of the human vocal tract.

In addition to conventional input devices that use a physical movement, other devices are being developed, e.g., electromyographic (EMG) input which takes electrical impulses produced by the muscles, switches activated by a twitch of an eyelid, or switches which permit the user to enter symbols into the computer by purposive movements made with practically any part of the body. Speech prosthesis, or the use of the computer as an aid to speech impaired persons, seems to be one of the most useful applications of the talking computer to date. The Artificial Language Laboratory, Department of Computer Science, Michigan State University, East Lansing, Michigan, is one such center for applied and basic research on computer-related problems of language processing, categorized as follows:

1. Design of computer-based systems for persons who experience communication handicaps.
2. Design of special-purpose computer language.
3. Design of computer-based broadband (cable) telecommunication systems.
4. Design and implementation of systems of computer-assisted instruction.

The Michigan State University Laboratory was among the first to develop extensive software packages for the new (1972) relatively inexpensive, compact, digitally controlled voice synthesizers (Rahimi, 1974).

Researchers have been investigating means by which the C H can express themselves in written form or through the use of computer-generated synthetic speech. When necessary, special input devices are built to permit the client to interact with the computer utilizing virtually any part of the body. Voice recognition systems, or computers which accept human speech for input, are also being explored.

The Wayne, Ingham, Kent, and Jackson County Intermediate School Districts, Michigan, have established computer-based C E programs in cooperation with the Artificial Language Laboratory. Within these programs modern technological aids are being made available to students who experience speech and motor problems.

The Artificial Language Laboratory (ALL) has designed and implemented a voice output software package homebased on the Civil Service Commission's Honeywell 66/80 Computer, Macon, Georgia. This system allows blind employees at Civil Service Commission offices throughout the country to create and read files, as well as to perform mathematical calculations (Rahimi & Eulenberg, 1974). Researchers in the Laboratory have also developed a system for administering educational lessons over a cable television system. In the Computer and Cable Television in a University Setting (CACTUS) Project, a computer software and hardware system provides students the opportunity

to attend video-taped lectures at home via cable television hook-up and to take computer-administered quizzes using a touch-tone telephone.

In 1974, a group of handicapped students used "Alexander," the Michigan State University talking computer, to order a pizza over the telephone. The successful call was made to demonstrate that the handicapped can communicate for practical purposes over a telephone using voice synthesis. The success of prosthetic speech usage is based on the acceptance of the general public.

The ALL has developed numerous software packages by effectively utilizing equipment provided by the Vocal Interface Division, Federal Screw Works, Troy, Michigan, manufacturers of Votrax voice synthesizers.

A future goal is to develop portable and inexpensive voice prosthetics which will bring the user within the accepted limits of normal communication expectations. Perhaps speech synthesizers will eventually be made available to all individuals with speech handicaps. However, perfection of the system, along with extensive education and publicity with the public, will be necessary before individuals will be able to use this type of communication comfortably and acceptably in their activities of daily living. It is the hope of educators and researchers that this new technology will enhance learning, improve cognitive development, and increase the communication abilities and quality of life of the handicappers.

Publications, exhibits, workshops and published research should be encouraged with the public through the sharing of information by special educators, administrators,

occupational therapists, physical therapists, physicians, insurance companies, legislators, vocational rehabilitation counselors, parents, advocacy groups, social workers, speech therapists, consumers and professional associations (Department of Health, Education and Welfare Conference, 1977, p. 6).

Administrative Operation

School administration has evolved, over the years, with increased application of scientific management. It became apparent to educators that the field of education could benefit from the development of a framework for educational planning, inclusive of philosophy, activities, curriculum planning, organization, teaching, evaluation, and financial administration. What appeared to be a necessity was long- and short-range systematic planning designed to provide educators with choices for the future. The essence of such an approach is:

The effort to compare alternatives systematically, in quantitative terms when possible, using a logical sequence of steps that can be retraced and verified by others (Hartley, 1968, p. 25).

Management programs help guide people in making decisions. The relationship of the many elements within such a program is designed to accomplish a predetermined goal.

Among the elements in a system are problem identification, establishment of priorities, goals, objectives, inputs, outputs, environment, programs, decision-makers, measures of effectiveness and recycling (Lessinger, 1970, p. 217).

The interrelationship of these elements can be demonstrated within such a program.

When related directly to educational administration, the program design would be based on school or district planning organization and needs. Within such a broadly based educational program design, it has become equally important to develop individual administrative program operational plans for guidance in the management of such specialized programs as the Computer-Based Communication Enhancement Program.

The organizational resources and knowledge of electronics, electro-mechanics, and computer technology are enormous, yet the educational communities have been somewhat reluctant to pursue, exploit, and adopt these technologies on a widespread basis.

Pervasive public ignorance of the needs for communication devices for the nonverbal severely physically impaired, coupled with the lack of financial support, and reluctance on the part of educators, the handicapped become victims of a self fulfilling prophecy; they are labeled handicapped and "there's nothing much we can do about that" (Kafafian, 1973, p. 258).

These computer systems can be effectively utilized by administrators, teachers, and students within the educational setting if the software is properly designed.

. . . There is, and will continue to be, widespread rejection of innovation in education: . . . The reasons are numerous and complex. Extreme conservatism, concerns for maintenance of individual status, dislike for the idea of profit in education, and concerns for quality of results are some of them. . . . To eliminate the rejections and institutional inertia, one approach is to offer superior alternatives to the students (Norris, 1977, p. 453).

The Computer-Based Communication Enhancement Program is one such superior alternative.

A management framework thereby helping communities to gain the knowledge essential to understand the benefits of new technological innovations appears beneficial. Only recently have a few select boards of education, administrators, and educators become aware that new opportunities and hope exist for the C H, thanks to researchers in the technological world. Such an administrative management program can provide for logical thinking, for bringing order, unity, and manageability, unique to the specific program under consideration. It can also aim to assist in organizing the efforts within the program by calling for the mutual involvement of everyone, i.e., students, teachers, researchers, educators, parents, and support personnel. It is important that the program team plan, as they assess, design, and implement the basic program responsibilities. They may demonstrate a concern with leadership strategies from a human relations standpoint, as people must achieve the results. It is assumed that more will be accomplished if the personnel have a better idea of what they are to accomplish. The plan must provide clarification for why they are there and how they may best achieve their purposes. With the motivation, support, and aid of informed educators, physicians, psychologists, sociologists, physiologists, engineers, mathematicians, linguists, and computer scientists, contributions can be made which until now have been unachievable in the educational community.

In approaching this innovative program, it appeared to be desirable to find an effective professional appraisal and development

program. A modified Management By Objectives (MBO) System was planned and implemented. MBO, educationally based, serves to:

- * effectuate an effective school planning program,
- * increase the control and coordination of people and activities,
- * maximize proper utilization of personnel,
- * install more effective methods for appraising performance, and
- * initiate an improved training and development program (Lewis, 1974, p. 21).

MBO was first developed for business and industrial management; however, with some modifications it has gained acceptance in educational administration. Peter Drucker and Douglas McGregor are usually given credit for developing the MBO concept more fully in the 1950's.

The most frequently used definition of MBO was developed by G. S. Odiorne in 1965:

The system of management by objectives can be described as a process whereby the superior and subordinate jointly identify goals, define individual major areas of responsibility in terms of results expected of him and use these measures as guides for operating the unit and assessing the contribution of each of its members (AASA National Academy for School Executives, 1973, p. 4).

About five years later, his definition became briefer:

A system in which the first step of management is the clarification of corporate objectives and the breaking down of all subordinate activity into logical subdivisions that contribute to the major objectives (AASA National Academy for School Executives, 1973, p. 4).

An early proponent of MBO, Douglas McGregor, believed that a person's view of people would influence one's style of administration

and the organizational structural design. His two sets of assumptions were as follows:

Theory X--The average human being has an inherent dislike of work and will avoid it if he can. He prefers to be directed, avoids responsibility, has little ambition, and wants security.

Theory Y--One naturally expends physical and mental effort in work and in play. Ambition, ingenuity, imagination and creativity, and self-direction run high.

MBO seeks to stimulate creativity and to assist in the emergence of the self-directed individual--or by following the Theory Y viewpoint.

MBO is a process-oriented method of assigning responsibilities to the administrative team. All organizations are seeking to accomplish certain stated purposes. Goals and objectives can give direction and meaning to the personnel and to the activities seeking to obtain the desired results.

The purpose of MBO is to help administrators differentiate between movement and progress, and to help them establish more clearly the goals toward which the school district wants to move.

MBO calls for the mutual involvement of everyone, i.e., students, teachers, administrators, and support personnel. As a system it can provide clarification for why they are there and how they may best achieve their purposes. Ralph Tyler, during an interview, stated that systematic study of the kinds of learning that a school should emphasize is essential to curriculum development (Tyler, 1973). An objectives system can be most beneficial if

teachers can state these kinds of behavior so that the real meaning is not lost, and so that the objectives are attainable. Unless the teacher understands the objectives necessary to help the students achieve, and unless he believes that the students can achieve them, it is unlikely that they will be attained. MBO is concerned with leadership strategies from a human relations standpoint, as people much achieve the results. The MBO system has the capabilities of managing people better through performance appraisal, job descriptions, professional growth programs, and motivations. It is assumed that more will be accomplished if the personnel have a better idea of what they are to accomplish. The MBO mode calls for output-oriented job descriptions. Results are emphasized, rather than the activities to be performed. The management contract describes how the individual expects to meet the goals. Training needs, or objectives, may be divided into regular, problem-solving, or innovative objectives. All of these management approaches lead to self-directed, inner-motivated (McGregor's Theory Y) employees. In the systems-oriented concept of MBO, management encompasses the total organization. One can speak in terms of planning, supervising, and budgeting, as well as personnel MBO.

A school administration may set up a hierarchy of outcome statements, mainly a mission statement set by the board of education, goals set by the superintendent and his team, objectives set by the division administrators, performance objectives by unit teams, and targeted performance objectives by teachers and other professional personnel. These outcome statements will vary in focus.

The manner of development of objectives is as crucial as their quality. Objectives of high quality will be understandable, performance-oriented, measurable, challenging, realistic, significant, accurate, and brief. Revision must be made possible on an on-going basis. The identification of objectives may best be approached by first recognizing the problem areas. The pressures for action and staff aspirations also help to establish priorities in setting realistic, beneficial objectives. The following outline can be helpful when developing objectives:

1. Objectives are jotted down by staff members prior to initial conference with the administrator.
2. Objectives will be problem-solving or innovative in nature.
3. The administrator and staff member meet to discuss and determine which objectives are of highest priority. Not more than five objectives should be identified for immediate action.
4. The administrator and staff member agree upon time restrictions and criteria for degrees of accomplishment. Criteria for success must be measurable.
5. Resources needed by staff persons in order to accomplish objectives are discussed and mutually determined. Magnitude of objectives may be altered by available resources.
6. Date for the next scheduled conference is determined.
7. Essential aspects of each of the above are recorded in writing.

When implemented effectively, objectives are mutually determined by the administrator and employee; they focus on outcomes or results; they may be process oriented or product oriented (process objectives must ultimately be viewed in terms of overall results); they must be measurable; they may be classified as routine, innovative, or problem-solving; they are periodically discussed by the administrator and employee; they are flexible and may be adjusted or eliminated as the need arises; they allow an employee greater degrees of participation, creativity, and autonomy; they assume a positive view of man (McGregor's Theory Y); they provide a basis for evaluation and accountability; and they allow the administrator to function in a supportive, positive manner.

Important considerations when implementing an MBO management system are:

1. Take your time--A full year will allow an opportunity to build a solid foundation.
2. Use outside resources--Learn from their successes and mistakes.
3. Have an administrative inservice planned program.
4. Top administrators must be involved.
5. Get the Board Members involved.
6. Stress practical management objectives.
7. Practice writing management objectives.
8. Establish some easy procedures.
9. Have a clear line-staff organization.
10. Build in your own quality (Cunio, 1975, pp. 19-20).

Opposition to MBO includes such criticism as: The government is forcing the use of cost effectiveness and a "businesslike" approach to human problems. Teachers are being held accountable for "objectives"

over which they have little or no control. The teachers' associations must guard against mismanagement (by objectives) as it affects teaching and teachers. MBO has no strict format, no limits, and no agreed-upon definition or description. It can become whatever the administrator or school board wants it to be. Often it makes teachers the scapegoats for all shortcomings of the schools. Objectives can mandate that teachers count the uncountable. Writing behavioral objectives in measurable terms is complex and time consuming. An overemphasis can penalize creativity and limit educational goals. Measurement is needed and the validity of tests available for this purpose is questionable. Therefore, most teachers want no part of forced MBO. There is a tendency to emphasize those things easiest to accomplish rather than those that will contribute the most, therefore intensifying hostility, resentment, and distrust among personnel. Fear may also be related to appraisal and its effect on the appraised.

According to Drucker,

The greatest advantage of Management by Objectives, is that it makes it possible for a manager to control his own performance. . . . Self control means stronger motivation: a desire to do the best rather than just enough to get by (AASA National Academy for School Executives, 1973, p. 17).

The MBO system is only a tool that can provide structure for the leaders to help them do a better job.

The decision to approach the C E program utilizing a MBO system was based on the theoretical rationale that the program could only function effectively as a cooperative endeavor. Those

whose efforts constitute the organization of the program need to gain an acceptance of the objective or purpose. "A formal system of cooperation requires an objective, a purpose, an aim. Such an objective is itself a product of cooperation" (Barnard, 1970, p. 42).

Since the C E program members would constitute a multidisciplinary team, not only within education and research individually, but jointly and cooperatively within these two fields, individual attitudes and philosophies would have to be molded into a well-orchestrated operation. "Cooperative efficiency is the result of individual efficiencies, since cooperation is entered into only to satisfy individual motives" (Barnard, 1970, p. 44).

It is recognized that individual needs must be satisfied if a successful program is to be forthcoming. In his hierarchy of needs, Maslow identifies the social needs--egoistic needs. They are rarely satisfied, i.e., those that relate to one's self-esteem--needs for self-respect and self-confidence, for autonomy, for achievement, for competence, for knowledge; and those that relate to one's reputation--needs for status, for recognition, for appreciation, for the deserved respect of one's fellows.

The administrator of the C E program was looking for a management system that would make team members more conscious of why they are there and what they must do to achieve their purpose. The MBO system should elevate this purpose to a high order of priority in the activities of the program. It should also provide the administrator with a means to direct his own work and energies.

"Formulating objectives, winning commitment of all personnel to them, clustering resources around objectives, and managing to obtain desired results are really the essence of MB0. . ." (Knezevich, 1970, p. 4).

CHAPTER III

CHRONOLOGICAL DESCRIPTIVE ORIENTATION

Introduction

Historical Information--JCISD

Intermediate school districts were created in the State of Michigan by decree of the legislature in 1962 (Hare, 1963, pp. 406-19). Public Law 190 provided the JCISD with the authority and responsibility to provide special education services to an identified population of individuals with handicapping conditions.

The JCISD had first initiated special education services in 1958 to those school-age residents identified as handicapped. This special education staff consisted of professionals from these disciplines: Speech Correction, Visiting Teacher, Diagnostic Services, Homebound and Hospitalized, Type A Programs for the Retarded, Type C Consultant, Blind, Deaf, and Orthopedic (Jackson County Special Education, 1960).

As an awareness of the availability of special education services was developed throughout the county, the requests for such services intensified rapidly.

The JCISD has been in a supportive financial position to provide comprehensive quality special education services with the full support of the tax-paying community residing within the

intermediate district boundaries since 1958. Never has a proposal to pass JCISD special education millage been defeated.

The most recent election was held on April 12, 1977. The millage issue appeared as two separate proposals as follows:

I. SPECIAL EDUCATION MILLAGE PROPOSITION

Shall the 1.5 mills (\$1.50 on each \$1,000.00 of state equalized valuation) limitation on the annual property tax previously approved by the electors of Jackson County Intermediate School District, state of Michigan, for the education of handicapped be increased by 1.5 mills (\$1.50 on each \$1,000.00 of state equalized valuation)?

II. SPECIAL EDUCATION BONDING PROPOSITION

Shall Jackson County Intermediate School District, state of Michigan, borrow the sum of not to exceed One Million Four Hundred Eighty-Five Thousand Dollars (\$1,485,000) and issue its general obligation unlimited tax bonds therefor, for the purpose of erecting, furnishing and equipping an addition to the Lyle A. Torrant Training Center; and preparing, developing and improving the site (Special Education Millage, 1977, p. 1)?

The taxpayers passed the millage request (I and II) by a vote of six to one countywide. This was an obvious indication of community support for such an innovative program as the C E program.

Program for the Multiply Handicapped

Multicap Background Information

The JCISD, with a public-school-age population of 31,618 and a non-public-school-age population of 3,707 (Information and Comparative Data, 1977-78, pp. 12-13), has continued over the years to apply for and receive various state and federal title monies, such as Title VI. This has allowed for optimum program expansion in areas of designated critical need, such as the C H. As early as 1971, JCISD administrators and board members had recognized the

need for a program to be designed to serve young preschool multiply handicapped children. A program proposal was written by the Director of Special Education, JCISD, and Michigan Department of Education Title VI monies under Public Law 93-380 were granted specifically to serve this identified population.

Among the identified youngsters enrolled in this program was a choreo-athetotic cerebral palsied quadriplegic, Derek Moore, age four and one-half. Derek's mother speaks for all parents of multiply handicapped children when she says:

We consider the first 4-1/2 years of Derek's life wasted. We needed help. We didn't know how to care for him, how to stimulate him, how to provide for him during those developmental years (Moore, 1978).

Multicap Program Services--1978

Now the Multicap Program provides the services that Derek's mother and father would have liked him to have. Children are accepted into the program at infancy or as soon as they are diagnosed, providing formal evaluation and appropriate programming in the home and/or program setting in the following areas: psychological testing, speech and language pathology, occupational therapy, physical therapy, social work, health consultation, home training, and infant stimulation.

The need for an early recognition of cerebral palsy is emphasized, as treatment started later, i.e., after the age of 1 or 2 years, when athetosis or spasticity are stronger and abnormal patterns of posture and movement established, can achieve only limited results (Bobath, 1967, p. 390).

The health consultant and medical social worker initiate services by making a home visit to obtain a complete health and family

history. This information can then provide the foundation for the evaluation process leading to recommendations for appropriate programming by members of the educational team.

The program for management and treatment of the child with cerebral palsy has many facets and requires the skill and expertise of a team comprised of a wide variety of persons. . . . No single professional alone can provide all that is needed (Scherzer, 1974, p. 198).

An intensive Child Find, or early identification program, is in operation within the JCISD focusing primarily on infant and preschool children. One of its purposes is to increase public awareness of the types of services available to these youngsters with special needs.

Basically, the strength and effectiveness of a local school system depends upon the understanding and support it receives from the community. But how do we nourish understanding and support? "Effective Communication" is the answer given by the Michigan Communications Study after five years of study and research (Moore & Parsey, 1969, preface).

A pediatrician is now under contract with the JCISD as a consultant and serves as a liaison with the medical community.

From these efforts, agencies, physicians, parents, and the public have responded by referring young children with special needs to the JCISD for evaluation and programming.

These youngsters, like Derek, will no longer have to wait until age four and one-half to be identified, or until age nine and one-half to communicate for the first time.

Derek's Entry Skills

Derek's entry skills into the Multicap Program can be classified as follows:

Physical: When Derek entered the Multicap Program in 1971 his athetosis and hypertonicity prevented him from performing any type of neuromuscular task. Head control was nonexistent. He was unable to feed himself or even chew, and lacked bowel and bladder control. Testing had revealed that he possessed normal visual and auditory acuity. He was able to be transported in his wheelchair to and from the program on a school bus equipped with a hydraulic lift and served by a bus attendant.

Communication: The severity of the handicap also rendered him unable to make the sounds and gestures demanded by society's conventions of speech and writing. He could communicate only by signifying "yes" by raising his eyes, and "no" by lowering his eyes. These gestures he had learned at home from his parents.

Intellectual: He could express emotion through his normal facial features, was good natured, and appeared to be an alert, happy, receptive child. He indicated his awareness and interest in his environment by the use of his sparkling eyes, pleasing personality, and winning smile. He could appreciate humor and was very sensitive to criticism or failure on a directed task.

Family: The family constellation, in 1971, included mother, father, and a younger brother, age ten months. Derek's parents had spent and continue now to spend much time and provide many stimulating experiences for him. His mother reads to him, and his father,

his brother, and he avidly follow sports events. He has a pet dog for which he saved money and which he selected himself at the animal shelter. He spends a great deal of time with the neighbor children and swims in the pool with them.

His parents have continued to demonstrate a considerable understanding of his handicap and are eager to meet his needs. They provide love along with discipline. He interacts possessively with his brother, and his brother is in turn quite protective of him. His mother continues to be an active member of several organizations for the handicapped.

To his parents, family, staff, and others close to him, communication was carried out on a limited basis; however, these "yes" and "no" signs were not readily understood or differentiated by strangers.

Initial Programming Efforts

Such a handicapper was a certain challenge for the professional and nonprofessional staff. Obviously it was going to be laborious to attempt to educate Derek and to attempt to teach him any self-sufficient skills. A total team effort was required in order to stimulate ideas, and to follow through with continuity in the trial of newly devised methods and techniques.

The staff read and studied in their chosen fields and attempted to consult with professionals who had experience working with just such a youngster as Derek. They soon realized that very

little direct assistance was immediately available and they were to become pioneers in providing an appropriate program for Derek.

The various techniques that are described throughout this paper represent the best efforts of the staff.

The registered physical therapist (RPT) and assistant physical therapist worked under the order of a local orthopedic physician and focused initial efforts toward increasing muscle tone, developing range of motion, and general motor ability. Their efforts centered around improved head control, better arm coordination and hand grasp, improved sitting balance, and an attempt to crawl and to prevent contractures.

A program of oral-motor stimulation became the prime concern of the registered occupational therapist (OTR) and the Speech and Language Pathologist. Brushing, icing, and pressure were used to develop lip closure control.

The speech and language pathologist implemented exercises to improve breath control, worked for tongue control, and to improve verbalization of "yeah" and "no." She also creatively devised a set of lights that were sensitive to vocalizations. The more intense the vocalizations, the more lights would light and the brighter became the intensity. The purpose was to motivate and stimulate vocalization through the use of visual clues. Although Derek was able to produce some sounds upon command, the vocalizations were unable to be controlled on a reliable basis due to the involuntary hypertonicity and extensor thrust exhibited throughout his entire body.

The educational component of Derek's program consisted of varied short segments of preschool activities designed for responses utilizing the "yes" and "no" eye movements. By such maneuvering, he was able to match words and pictures; to identify colors, numbers, and letters; to recognize everyday objects; to identify concepts of time and seasons; and to partake in meaningful preschool activities.

Initial Positioning Innovation

Community-wide cooperation and support, professionally and financially, was essential in developing successful therapeutic and education program components. The therapists, orthopedic physician, and an expert in orthotics collaborated to design the vest, half-helmet, and spring, in order to improve positioning and head control (Photograph 1). The purpose of the design of the vest was to stabilize the shoulders in order to prevent slipping in the chair, for improved arm and hand control, and to keep the body from shifting to the right caused by his strong asymmetrical tonic neck reflex. Although this particular effort was not the best answer, it was an improvement, and paved the way for future cooperative developments from various community members.

Financial costs incurred for Derek's care and treatment had been partially covered by the following sources, e.g., the family, community donations, and the Michigan Department of Health, Crippled Children's Division. Occasional requests, i.e., a new wheelchair, had been paid by the local chapter of the United Cerebral Palsy Association or the Easter Seal Society of Jackson.



Photograph 1.--Derek's half-helmet and spring.

Staff Attitudes and Expectations

Progress in the program in all areas seemed extremely slow if not seemingly negligible in comparison to other handicapped youngsters. Several additional conditions were contributing factors, e.g., acute fatigue, inability to remain in an upright seated position, frequent upper respiratory infections and related health concerns resulting in frequent hospitalization, absences, and an inability to tolerate a full five-day-a-week program schedule.

Some staff members had openly expressed the belief that Derek was probably retarded and should be placed in a center for the trainable or severely mentally impaired. Even though progress appeared to be extremely slow, the majority of the staff never seriously doubted his potential.

. . . You see, really and truly, apart from the things anyone can pick up (the dressing and the proper way of speaking, and so on), the difference between a lady and a flower girl is not how she behaves, but how she's treated. I shall always be a flower girl to Professor Higgins, because he always treats me as a flower girl, and always will; but I know I can be a lady to you, because you always treat me as a lady, and always will [G. B. Shaw's Pygmalion] (Rosenthal & Jacobson, 1968, p. 183).

In order to obtain a professional, unbiased opinion concerning Derek's potential, and to confirm or refute beliefs of the majority of the staff, Derek was evaluated in 1973 by a team of professionals, i.e., pediatrician, psychiatrist, psychologist, speech pathologist, occupational therapist, and diagnostic teacher, at the Genesee Educational Diagnostic Center, Mott Children's Health Center, Flint, Michigan. The Mott Center had been designated by the State

Department of Education as a Regional Diagnostic Center, serving a specifically defined geographical area, of which JCISD was a part.

Because of the extreme amount of energy Derek had to expend to communicate, only informal subtests were performed. The results indicated that his intellectual capacity appeared encouraging. Some subtests indicated that his intellectual endowment could be within the superior range. These results encouraged the staff at the JCISD Multicap Center to continue their total program efforts.

Periodic evaluation of the C H individual from an impartial point of view is important in maintaining a belief that the expectations that are being developed for the individual are realistic and achievable. As has been demonstrated through experimentation, ". . . change in teacher expectation can lead to improved intellectual performance" (Rosenthal & Jacobson, 1968, p. 183).

Educational Planning and Placement Committee (EPPC)

According to Michigan's Mandatory Special Education Act, an EPPC must meet to determine the best program for a special education child. The members of the EPPC, i.e., psychologist, social worker, speech and language pathologist, RPT, OTR, classroom aide, parents, teacher of the orthopedically impaired, and program directors, agreed unanimously that Derek deserved a chance to function and learn in as normal an environment as was appropriate. The decision was made to enter Derek into the kindergarten-early elementary self-contained classroom program for the orthopedically impaired in the fall of 1973. These two classrooms were housed in a regular elementary

school building (Bennett School) within the Jackson Public School System, allowing for integration with peers attending a regular classroom program to as great an extent as was reasonably appropriate.

Approval in 1973 of this mainstreaming opportunity for such a severely physically handicapped student was precedent setting. The JCISD had moved ahead of federal mandates by ensuring education for this multiply handicapped individual in the least restrictive environment.

By allowing Derek to become socialized in as near a normal environment as is possible, he will have a better opportunity to develop a personality compatible with the characteristics of all men in society: ". . . Every man is in certain respects like all other men, like some other men, and like no other man" (Starr, 1974, p. 2).

It was agreed that Derek's program would combine time in both the kindergarten and early elementary classrooms. Speech and language pathology, physical therapy, and occupational therapy would be provided. Various modes of communication would be explored, including typing with a hand, head, or left-foot stylus, and the use of a code grid using his eyes as the selecting device.

Kindergarten-Early Elementary Classrooms for the Orthopedically Handicapped

Program Activities

When Derek entered this program in 1973, physical change, other than growth, was difficult to measure. He was unable to roll over from supine to prone and the reverse. The therapist had to

tuck his arm and leg to initiate the roll. He was also unable to sustain head control for any length of time when he was prone, using only his arms for control, or a bolster to help facilitate the control.

Periodic video taping was completed by the physical and occupational therapists. This provided documentation of the various techniques being tried in the therapies along with evidence of progress or change in Derek's responses. The therapists would often use the video tapes to confirm or reaffirm a particular condition that they were concentrating on at the time. The video tapes were also shared with the orthopedic physician to demonstrate Derek's current level of functioning and thereby to assist in determining appropriate therapy orders.

Documentation enhanced communication within Derek's program and provided tangible evidence of progress being made over a period of time, no matter how minimal or insignificant it appeared to be.

All academic classroom work was carried out by presenting material so Derek could answer "yes" and "no" with his eyes. When this instructional method was not operating on a one-to-one basis with the teacher's aide or the classroom teacher, Derek was forced to be a passive observer.

The notion that ". . . almost all human behavior is learned throughout life from other human beings . . . man . . . must learn through personal experience to be what he is" (Starr, 1974, p. 1) suggests that the goal to find ways to make Derek an active,

participating member of the class was important and essential to his development as a human being.

Second Positioning Effort

It was obvious that Derek needed a new wheelchair with a head support, or some other type of chair, in order to function effectively in this classroom setting.

Adaptive Therapeutics Systems, Inc., Madison, Connecticut, had recently marketed the Mancino Relaxation chair with tray table and attachments that appeared to be of help in attaining this goal (Photograph 2). The chair was purchased by the JCISD using budgeted equipment funds.

An intensive training program ensued. The therapists first pursued the idea of using the handwriter as a pointer. It was hoped that enough control could be developed to point to a "yes" or "no" taped to his tray, instead of using his eyes to respond. The lack of voluntary control became increasingly evident and did not appear to improve. The head-pointer helmet for pointing and/or typing was also tried. Again, the definite lack of head control did not show improvement. The self-feeder was purchased for possible use following a comprehensive oral-motor program. Head support was somewhat facilitated by reclining the seat. Derek's thinness necessitated cushions being added along the trunk, foot straps and leg straps to counteract extensor thrust. An extra-wide band across his thighs was added to keep his hips flexed. He could participate better in class, but there was still needed improvement, especially as he grew



Photograph 2.---The Mancino chair.

taller and head control did not improve measurably. Video tape was again used to document the training program used with the attachments. Although the Mancino chair did not fulfill all of the expectations for Derek, it did provide another substantial improvement. In addition, the chair was of benefit to several other youngsters in the program and is still in regular use.

Staff Observations of Derek

By March, 1974, staff felt that Derek had made a good adjustment to larger groups and reduced adult attention. He had received speech and language pathology, physical and occupational therapy. He received one-half hour of individual instruction from the kindergarten teacher. This length of time appeared to be the limit of his current ability to maintain attention, as he became quite fatigued using his eyes to respond following the efforts of this intense demand for a response on his behalf. During this time he had demonstrated reading at the primer level.

The RPT continued to work to develop head control while sitting Indian style using his arms for support. Some days the control was better than others, but progress was limited. As he grew and his head became larger, with such a thin trunk and arms to support his head, it sometimes seemed that Derek was regressing.

Status at the onset of oral motor therapy in September, 1975, consisted of a flaccid obicularis oris muscle, mouthing and roofing reflex still predominate, extensor thrusting of the mandible and tongue, no voluntary control of the oral structures, excessive

drooling, inadequate head control, and an inability to produce meaningful oral sounds. The speech and language pathology program concentrated on improving oral-motor functioning and increasing head control. Methods employed included manual manipulation of the obicularis oris muscle, brushing and icing of the obicularis oris muscle, vibration of the obicularis oris muscle, stimulation of the tongue through manual manipulation and icing, head control exercises, and exploration of a realistic method of nonvocal communication.

Progress

As of May, 1975, speech and language pathology was continuing to stress oral-motor function. There had been a slight increase in lip activity with some evidence of voluntary control.

Occupational therapy had concentrated on left-arm control, with little progress noted.

Given time and intensive therapies, it had been hoped that Derek would someday be able to demonstrate voluntary control in some neuromuscular area, and make certain vocalizations to communicate his basic needs.

By the spring of 1975, the staff realized that if Derek was to remain in the current academic setting, priorities would have to change from focusing on gaining control over his peripheral musculature to the addition of another program component--mainly, that the presence of this severe neuromuscular dysfunction need not deter Derek from learning communication through the use of a surrogate aid. Educational programming could only benefit Derek optimally

by providing opportunities necessitating mental rather than physical skills. It had become evident that an effective communication system was essential to his progress in terms of ensuring an active academic program as opposed to one almost entirely passive in nature.

The investigations continued in order to locate a better method of positioning. Efforts also were initiated to locate an efficient and effective communication system especially designed for a boy with handicaps of the above-described nature.

Pursuit of Improved Positioning and an
Effective Communication System

May 27, 1975--Initial Efforts--
Communication System

The Supervisor of the Department of Physically Impaired, JCISD, first actively initiated efforts to discover an appropriate communication method for Derek by contacting the Orthotics Department, University of Michigan Hospital, Ann Arbor, Michigan. The Director suggested that a letter be drafted to Dr. Dudley S. Childress, Ph.D., Prosthetic-Orthotic Center Research Laboratory, Northwestern University Medical School, Chicago, Illinois, seeking his advice and assistance (Appendix D).

September 14, 1975--Various
Systems Explored

Dr. Childress responded as of June 16, 1975 (Appendix E). Due to the summer vacation period, no action was taken until September of 1975.

One of the seemingly never-ending frustrations for the staff was the extensive time encountered between the initiation of an idea to the time it was enacted, i.e., the letter to Dr. Childress dated May 27, 1975, to September 14, 1975, when action was taken. The staff was always eager to have things happen for Derek right now. They believed that too much time had been wasted already.

The ETRAN Eye-Signalling system was discussed and discarded after it was agreed by the team of professionals that Derek lacked enough head and eye control to perfect such a system. It appeared that strangers would still be unable to communicate freely with Derek unless they had received instructions regarding the use of the system. The device also did not seem to lend itself effectively to portability. It appeared that the choices of "yes" and "no" through the use of eye movements were still required in this process.

An inquiry was made by telephone to Shirley McNaughton, Director, Bliss Symbolics Communication Program, Ontario Crippled Children's Centre, Toronto, Ontario, Canada. Her written response was encouraging (Appendix F).

Plans were initially completed to send a team of staff members to a Bliss Symbolic workshop, in November (Appendix G). At the same time arrangements were made to take Derek to Toronto for an evaluation. Following much discussion and evaluation the team agreed that a communication board, Bliss Symbolics or otherwise, would be of little assistance in solving this particular communication dilemma, since Derek lacked any means of input necessary to identify the letter or word which he wanted to communicate. When considering

follow-up consultation that would be necessary regarding the effective use of the communication board with Derek, from such a great geographical distance, the team decided to cancel the trip and pursue other avenues that appeared to offer greater potential for Derek.

Their intense desire to evaluate each idea and to pursue the most feasible one became evident as they proceeded to reject the ETRAN Signalling System and later the Bliss Symbolics Communication Program.

By 1975 the staff believed that they knew Derek very well. They had tried so many techniques that had failed to meet their expectations. They were ready for a success, not only for Derek, but for their own professional satisfaction.

Staff Organizational Communication Structure

The active involvement of the staff in decision making and program planning kept them alert and open to new ideas.

The system of communication with the team already provided for an open two-way channel of communication among all team members (Figure 1).

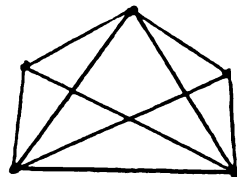


Figure 1.--Two-way communication channel.

According to Leavitt (1972), in this organizational structure no clear organization is imposed. People can send messages, they can get around more, and thereby spend more time. They can locate and correct more errors through this two-way communication. They also have more chance to participate and take responsibility. They are less dependent on one person since they can check with another person. So they are more happy and satisfied.

Because of the nature of the program, the administrator determined that a two-way channel system would work to the best advantage of the program. Time was not to be a critical factor. Trial and error would play a major role. Ideas from all team members would be an integral part of the operation. It would provide for more valid communication, more accurate transmission of facts, and also for more in-depth perceptions of working relationships. The staff could provide support for each other's efforts, including successes as well as failures and frustrations.

October 2, 1975--Evaluation, Positioning

The OTR was still pursuing new alternatives to achieve better positioning for Derek. She had taken video tapes of Derek to a colleague who was presenting a workshop. From there, arrangements were completed to have Derek travel to Indiana University Medical Center's Cerebral Palsy Clinic, Indianapolis, Indiana, with his parents, the RPT, OTR, and speech and language pathologist for evaluation, positioning, and program development (Appendix H).

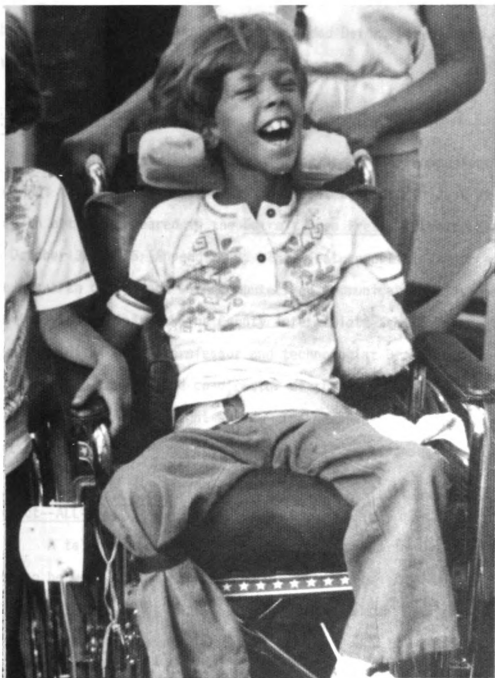
Financial support was made available through the Great Lakes Area Regional Resource Center Project (GLARRC):

. . . to assist in the diagnosis and evaluation of handicapped individuals whose problems are unique and unusually difficult to diagnose. . . . The diagnoses made by psychological, physiological and/or of programmatical definition, i.e. severe cerebral palsied child evaluated by a special clinic to determine efficacy of communication device as speech substitute; . . . (Howard, 1975).

A wheelchair insert was designed and built for Derek. From Photograph 3 is it evident that it was a better solution to his problem. It features an upright padded head support, T-shaped padding on the back to protect the spinal column and to protract the shoulders with firm upholstered lateral trunk supports. The seat is elevated at the front to help flex his hips to facilitate sitting. The tray has bilateral wrist cuffs to position his shoulders, arms, and hands. The footboard is at an angle to dorsiflex the feet in orthopedic shoes. Firm straps and heel cups help maintain the position. A seat belt also helps keep Derek in the seat. One glance demonstrates how much more studious and ready to participate in classroom activities Derek has become.

The timing was right for successful positioning at the Indiana Center in three respects:

1. Chronologically and psychologically, Derek was ready for positioning.
2. The Center was ready and able to provide the service requested.
3. Monies became available, allowing the service to become financially feasible.



Photograph 3.--The wheelchair insert.

This was the first real success for Derek, experienced by the staff. Everyone was elated! That included Derek, his parents, and the staff.

October 30, 1975--Detroit Free Press-ALL-MSU

The Supervisor's next step in the search for communication aids was to call the TRACE Center, Madison, Wisconsin. Just at that time an article appeared in the Detroit Free Press, Detroit, Michigan on October 30, 1975 (Appendix I). This feature article reported on the research being done with computerized communication aids for the C H individuals in the Wayne County Intermediate School District, Plymouth, Michigan, by professor and technologist Dr. John B. Eulenberg, co-founder and co-director of the ALL-MSU.

The timing was right again. The newspaper article appeared just at the time the Supervisor was urgently seeking such help.

October 31, 1975--Initial Contact--ALL-MSU

A telephone call to Dr. Eulenberg provided for an initial meeting between the Supervisor and Dr. Eulenberg. This meeting was followed by a visit by Dr. Eulenberg to the Jackson POHI classroom to meet Derek and the special education staff working with him.

November 8, 1975--Visit and Evaluation--ALL-MSU

The Jackson contingency, i.e., Derek, his parents, and the staff currently working with Derek visited the ALL-MSU.

The purpose of Dr. Eulenberg's visit to Jackson and the visit of the Jackson personnel to the ALL-MSU was to provide Dr. Eulenberg with the appropriate information so that a thorough evaluation of Derek, as a potential candidate for some type of computerized communication device, could be completed.

The evaluation was carried out orally in an informal manner, with procedures taking on a two-fold approach.

The first assessment took place at Derek's school. Dr. Eulenberg familiarized himself with Derek in his academic and therapeutic environments. He also became acquainted with Derek's peers and with the professional staff working in that setting.

Dr. Eulenberg's evaluation also provided these answers to the following pre-determined questions:

<u>Question</u>	<u>Answer</u>
1. Can this individual communicate by the use of any written form(s)? If so, by what method(s) and how proficiently?	1. No.
2. Can this individual communicate by the use of any oral method(s)? If so, by what method(s) and how proficiently?	2. Yes--eye movements; up for "yes," down for "no," occasionally accompanied by gross vocalizations.
3. Can this individual read books? If so, at what level of proficiency?	3. Yes--estimated Primer level.
4. Does this individual listen to talking books?	4. Yes--also to radio and TV.

<u>Question</u>	<u>Answer</u>
5. What are this individual's hobbies and interests?	5. Sports, listening to his CB radio, playing with neighbor children, swimming.
6. Does this individual drool? If so, to what extent and under what circumstances?	6. Yes, nearly all of the time.
7. Does this individual possess a hoarseness of voice?	7. No.
8. Can this individual vocalize? If so, to what extent?	8. Yes, frequently upon command.
9. Is there an involuntary tongue thrust?	9. No
10. Is there lip closure?	10. No.
11. Does the individual have control of his: arms? hands? legs/feet? head? If so, to what extent?	11. Little functional control, extreme hypertonicity manifested. Some wrist control when arm is restrained by cuffs just above the wrist. This can be used for control of a pull switch. Little or no functional control. Possible control of a pull switch attached to side of left knee. Possible control of lateral movement, although complicated by involuntary component.
12. Is the individual right or left handed?	12. Left
13. Can the individual squeeze and open the hand on command? To what extent? In different positions?	13. Not reliably so.

<u>Question</u>	<u>Answer</u>
14. Does this individual use body language or gestures with some success?	14. Yes, eye movements, facial expressions.
15. How is the health of this individual?	15. Good, improving.
16. What is the general attitude of this individual?	16. Excellent, positive.
17. What is the general attitude of the staff regarding this individual?	17. Positive--anxious to make positive gains.
18. What is the attitude of the parents or family?	18. Positive, cooperative, excellent.
19. What is the attitude of the staff regarding the possibility of developing an effective communication aid for this individual?	19. Positive and eager to get started.

The second phase of the evaluation took place at the ALL-MSU. Derek, his parents, and the staff visited the ALL for one-half day in order to become acquainted with the work being done in the field of communication for the handicapped.

Dr. Eulenberg demonstrated various possible communication instruments and discussed several input devices that could be considered for Derek's use, e.g., electronically controlled communication boards, portable micro-computers, myo-electric switches, knee-operated switches, joy sticks, and head pointers.

The evaluations clearly demonstrated the need for a research project in order to determine the most appropriate communication system for Derek if he was ever to function effectively in society as a contributing adult.

December 12, 1975--JCISD-MSU
Officials Meeting

The first official meeting between JCISD administrators and MSU officials was composed of the following personnel:

JCISD: Deputy Superintendent (Director of Special Education);
Supervisor, Department of Physically Impaired (Communication Enhancement Administrator To Be)

MSU : Chairman, Department of Computer Science; Administrative and Financial Advisor, Division of Engineering Research; Co-Director, Artificial Language Laboratory

The meeting was arranged to explore the possibilities of signing a cooperative research agreement in order to develop an efficient and effective computerized communication aid for Derek Moore.

This luncheon meeting provided a congenial atmosphere for both parties to become acquainted, and to review their respective positions in relation to the proposed program.

Figure 2 displays the administrative organizational relationship among these management personnel. This meeting could be considered as the first formal step in the evaluation process, before a letter of intent was submitted by the JCISD.

ALL-MSU Program Evaluation

JCISD officials evaluated the proposed program, taking under thorough advisement each designated area of responsibility in order to determine if the district could provide all of the ingredients necessary for the successful implementation of such an innovative endeavor. The evaluation was based on the following criteria:

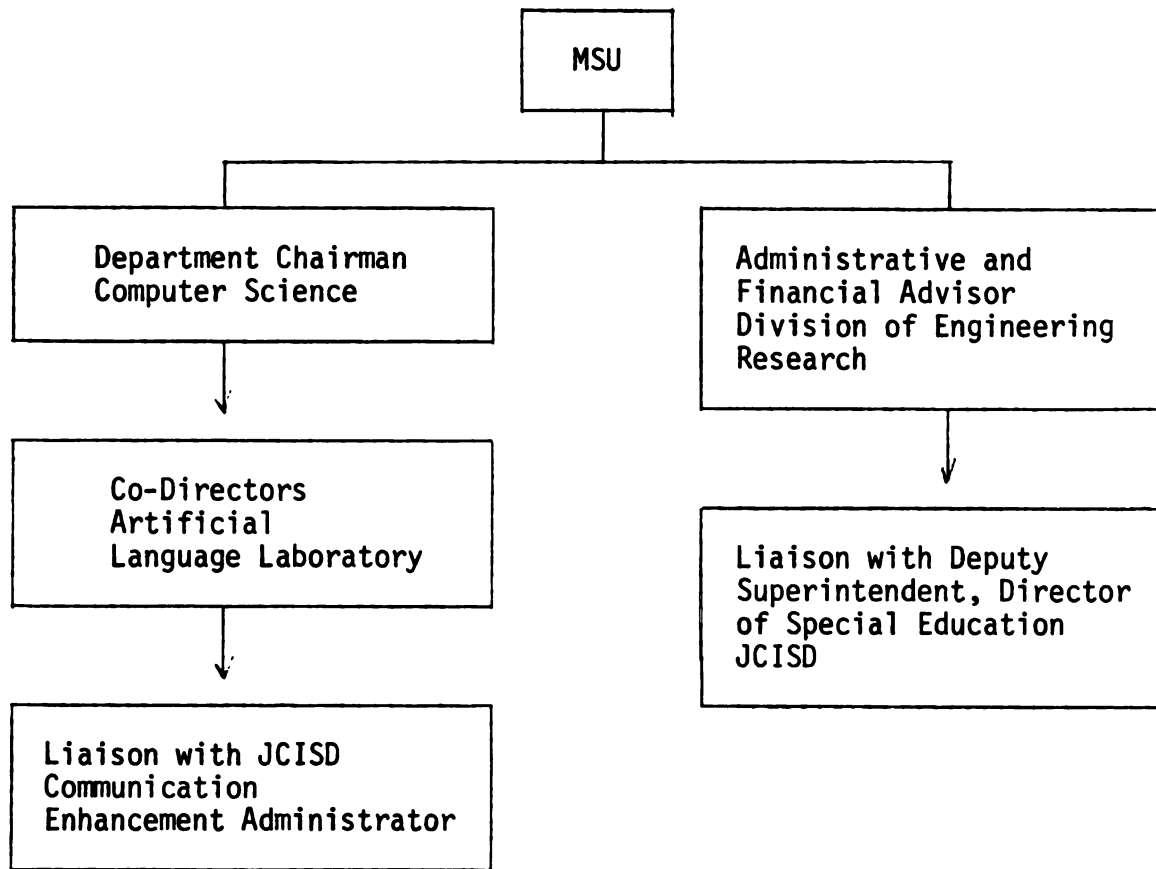


Figure 2.--Organizational management chart.

Evaluation of the Candidate

MSU personnel agreed that the staff, school setting, and classmates all appeared to be conducive to the successful operation of a C E program.

The results of the evaluation of Derek were reported on pp. 72-73. As the evaluation indicates, there was no question that Derek qualified for such a program. His inability to speak or write was the first legitimate qualifier. His inability to control any of his peripheral musculature in a functional endeavor exemplified

a second challenging qualification. Belief in Derek's intellectual potential by those working with him provided an added incentive.

By 1975 Derek and his parents were well aware that one of the top priorities of the JCISD was to secure a communication aid for him. Therefore, when they were first made aware of the ALL/MSU they were enthusiastic and eager for the pursuit of the idea.

The positive attitudes of Derek, his family, and staff all contributed toward a bright outlook for the success of such a program.

Financial Commitment

A minimum of \$30,000 was quoted by MSU officials as the cost required to enable the computerized communication aid to become a reality. This dollar amount included the continuing on-site consultation of the technologist, faculty advisors, graduate assistants, work at the ALL in the development of the system, and the experimentation necessary to construct a reliable input device.

The initial reaction of JCISD officials was that this program was far beyond what the district could financially consider at that time. Administrators realized, however, that this youngster had waited for nine years for a chance to speak. Now the opportunity was near. The budget clearly showed that the most the district could financially commit to the program during any one six-month period was approximately \$10,000. The earliest any such commitment could be made would be July, 1976.

MSU officials viewed Derek as an excellent candidate for the proposed program. They also were pleased with the interest and

enthusiasm displayed by the JCISD administration, staff, parents, and Derek.

Personnel Commitment

Derek was currently being served in the school setting by one POHI teacher, two classroom attendants, one registered physical therapist, one physical therapy assistant, one registered occupational therapist, and one speech and language pathologist. Theoretically, the JCISD team was already formed.

Considerations had to be given to the amount of time and additional commitments that would be required of these educators while working on the project, since they were all responsible to other youngsters as well.

It was agreed that since all of the personnel, with the exception of the speech and language pathologist, were assigned at the elementary school on a full-time basis, conditions should lend themselves easily to the utilization of a team approach, and consultation meetings that would occur with ALL personnel.

If and when warranted, an adjustment in responsibilities would be made to allow the speech and language pathologist additional time that could be devoted to the program.

The district also would have to agree to give time to team members when travel to the ALL/MSU was deemed advantageous, or when their attendance was required at other related events.

The budget would not allow for additional personnel to be hired especially for this program. It was important that

administration and staff jointly agree on job descriptions in order to meet these new responsibilities while continuing to function on their regular caseloads and under their signed union contractual agreement. This was carried out through discussion, with mutual agreement and understanding being reached at the verbal level. In this instance all parties concerned were of the same mind-set and unanimously agreed that the commitments decided upon were necessary and feasible. In instances where complete unanimity is unachievable, perhaps written policies and/or contractual addenda could be formalized for future reference if necessary.

From these initial observations, it appeared that the required personnel commitments could be met without difficulty.

Facility Requirements

It was determined that no special facilities would be required, under this agreement, as the communication aid would be designed to function within Derek's least restrictive environment. Any modifications, major or minor, might have imposed an insurmountable financial burden. The fact that no modifications are necessary is an asset to anyone considering such an endeavor.

Justification

Program justification is always a prime concern, as school district personnel are accountable to the public regarding the efficient expenditure of funds. Justifications for some type of C E were defined in the form of proposed program goals and objectives.

1. To make a major contribution to society, through research efforts to develop appropriate communication surrogates for C H individuals. By implementing innovative ideas that appear to be helpful to one individual, other handicappers from throughout the world will be able to benefit in the very near future.
2. To meet the requirements of the Federal Mandatory Law, i.e. to provide severely physically handicapped children with an appropriate education.
3. To assist handicapped individuals in gaining independence and self-confidence by providing them with a means to communicate on a more free and equal basis.
4. To reduce the time involved for both student and staff in the accomplishment of various tasks.
5. To provide staff with gratifying professional experiences with C H children.
6. To provide a reduction in the future cost to the school district in terms of requiring fewer staff to meet the needs of this individual and to permit this individual to attend school in his home school district, thereby reducing the cost of long distance transportation to special classrooms.

After becoming apparent that some type of C E program was justified, it then became essential to determine why this particular program should be selected over other types of available programs.

1. The particular needs of this boy could not be met by the purchase of equipment alone. Experimentation and adaptations would be necessary in order to develop an appropriate communication system.
2. As was discussed on pp. 65-67, other systems were considered; however, the district was interested in purchasing a device that could be adaptable to other youngsters with various types of physical handicaps.
3. The geographical commuting distance to and from the ALL-MSU was convenient and easily accessible. This became a prime consideration when the realization was made that on-going consultation would be a necessary factor in meeting the ever-changing needs of this individual.

4. The reputation preceding the ALL-MSU staff was positive. The ALL was highly recommended by the TRACE Center personnel, Madison, Wisconsin; personnel from Children's Hospital at Stanford, Palo Alto, California; and from the Wayne County Intermediate School District, Plymouth, Michigan.

The JCISD personnel were already familiar with the Wayne County-MSU Communication Enhancement Program and could be certain that the proposed JCISD-MSU program was worthy of JCISD affiliation. If this were not the case, it might be best to become acquainted with programs already in operation under the direction of the research center being considered. Legal counsel may also be available for consultation when discussing, agreeing on, and reviewing the contractual terms.

Since this pilot program was designed to work primarily with human subjects in a research endeavor, it is important that the program be approved by the University Committee on Research Involving Human Subjects. This ensures that the rights and welfare of the human subjects involved appear to be adequately protected. A document such as the one found in Appendix B should be an integral part of any contractual agreement of this nature.

Conclusion

After taking the above factors into consideration, a letter of intent was written by the Director of Special Education, JCISD, indicating that a joint agreement was to be reached between the JCISD and MSU to initiate and implement a Communication Enhancement Program Start Up Phase (Appendix J).

JCISD-MSU AgreementJune 3, 1976--Cooperative Research Agreement (Installment I)

The first formal JCISD-MSU C E Pilot Program agreement was signed on June 3, 1976 (Appendix K). This document was signed for the duration of six months, July 1, 1976-December 31, 1976. A six-month agreement was signed to enable the JCISD to spread initial financing of the program over three six-month periods. At the end of each six-month period, the program could be evaluated, objectives redefined, and expected progress could be determined. Each new research agreement could then be written to better meet the newly defined goals and objectives, thereby utilizing financial and personnel commitments in the most advantageous manner.

June 4, 1976-June 30, 1976--
JCISD Program Planning

Program Administration: When an administrator is selected as Coordinator or Director of the Program, familiarity with programming in special education for the physically impaired and/or for the speech and language impaired would perhaps be beneficial.

A Communication Enhancement Program Director with a background in special education administration should be in a better position to realize the staff's total job commitments, i.e., case-loads, scheduling, time, and geographical restraints. This should be of great assistance in establishing and coordinating a smooth operational base for research center and school district personnel.

The Supervisor for the Department of Physically Impaired assumed the responsibility as administrator of the JCISD/MSU Communication Enhancement Program. This individual had made the initial contact with the ALL-MSU personnel, and was responsible for the implementation of appropriate programs to serve the physically handicapped population within the JCISD.

Now that a program had officially been agreed upon, the program administrator was responsible for short-range planning.

Program personnel: One of the first considerations was the selection and deployment of an optimum staff. In this particular instance, the staff was already working with Derek and assisted in defining the role of the team, as well as their individual roles.

An administrative decision was made to change one staff member, the speech and language pathologist. This was accomplished over the summer months in order to provide a continuity of personnel to the program from its initiation in July to the full program implementation in the fall of the 1976-77 school year.

Officially identified multidisciplinary team members included an OTR, RPT, physical therapy aide, POHI teacher, Teacher/Consultant POHI, two classroom aides, speech and language pathologist, speech and language supervisor, and a medical social worker.

The role of this multidisciplinary team was to:

1. function as a cohesive team,
2. attend and actively participate in team meetings as scheduled,
3. work cooperatively with ALL-MSU personnel,

4. visit ALL-MSU upon request,
5. be available to attend conferences and/or meetings either as an attendee or as a presenter, and
6. be directly responsible to the Communication Enhancement Administrator regarding all matters related to the Communication Enhancement Operation.

Individual roles were broadly defined as:

1. Registered Physical Therapist (RPT)--To develop range of motion and motor ability, suggest adaptive equipment and a variety of input devices;
2. Physical Therapy Aide--To follow the direction of the RPT and to assist the professional team members during the instructional periods as is deemed appropriate;
3. Registered Occupational Therapist (OTR)--To develop range of motion, appropriate positioning, oral-motor stimulation, to care for personal needs, to direct the feeding program, suggest adaptive equipment and a variety of input devices;
4. Speech and Language Pathologist--To assess and develop expressive and receptive language, assess appropriate language levels, help to determine vocabulary to be used, monitor effects of general language ability, to monitor frequency, duration, and intensity of vocalizations, to facilitate more vocalizations;
5. POHI Teacher--To assess and implement a curriculum, based on the student's achievement level;
6. Classroom Aide--To follow the direction of the POHI teacher and to assist the professional team members during the instructional periods as is deemed appropriate;
7. Medical Social Worker--To maintain an on-going contact with the family, providing them with information and assistance as the situation arises;
8. Teacher/Consultant POHI (T/C)--To consult with the POHI teacher and to provide tutorial instruction to the individual;
9. Speech and Language Supervisor--To consult with the speech and language pathologist and to offer guidance and suggestions to the total team effort.

Administrative approach: The team members were coming to the program from differing administrations and departments of supervision. The POHI teacher and two classroom aides were hired and administered by the Jackson Public School System. The Speech and Language Pathologist, although from the JCISD administration, was under the direct supervision of the speech, language, and audiology department supervisor. The RPT, Physical Therapy Aide, and the OTR were under the direct supervision of the JCISD Supervisor of the Department of Physically Impaired.

The C E Administrator viewed the program as one with a long lead time and a high probability of not succeeding in the eyes of outsiders. Therefore, it appeared to be in the best interest of everyone concerned to proceed with the program in a manner that would create the least amount of change within already existent schedules, caseloads, and daily operational procedures.

The C E Administrator was responsible for effecting a stable program by utilizing and germinating ideas from a competent staff. To accomplish this, the program administrator chose to fashion the C E program using a modified MBO system.

School MBO is useful in the following ways: it provides a means for systematically conducting long- and short-range planning; it improves control and coordination . . . by keeping check . . . on all the activities. . . ; it makes for maximum utilization of school personnel through the distribution of specific performance objectives; it assures equitable distribution of time, work load and compensation through the review of job performance; it establishes a more effective method for appraising the performance of school personnel by the objective nature of the specific performance objectives; and it fosters better training development programs through . . . personal development objectives (Lewis, 1974, p. 29).

Overall program objectives were developed in the first Pilot Program Cooperative Research Agreement (Appendix K).

Each JCISD team member would be expected to develop individual program objectives, and would be individually responsible for their accomplishment.

The purpose in identifying individual objectives was to assist each staff member in providing definite direction to their segment of the program. By exchanging these objectives with other team members and with the administrator, a clearer in-depth understanding of the direction of the program could be reached.

The effective use of objectives could also allow the administrator to be sensitive to each member's problems, to look at each person's strengths, and to work to get "a good operational fit" within the team.

Developing an efficient and effective C E Program can be likened to the conductor and his orchestra. In the beginning they each perform as individuals playing different instruments. The conductor assists them in emitting a beautiful, harmonious piece of music. Here we can see the individual communication enhancement team members and the administrator evolve the program into a harmonious C E organization.

Daily operation: The program was to be implemented as a matter of routine. High visibility during the initial phases might elicit unfounded criticism and be the ruination of a potentially successful program.

Regular daily school operations were to continue for the team members. Scheduling changes would only occur as the needs of the program dictated. Schedules were to be compared and meetings would be conducted at a time agreed upon as being most convenient to all members.

Meetings were to be called by the administrator. Team members would be asked to keep a log of telephone calls, contacts, and trips made to the ALL/MSU.

Since this was the first program of its kind, any alteration would be made according to the dictation of the needs and progress of the program.

Interface--JCISD-MSU: In actuality, such a C E program requires two teams, i.e., the ALL/MSU team composed of the technologists, faculty associates, and their undergraduate and graduate research assistants; and the JCISD team composed of Derek, his parents, and the educators.

It appeared necessary that an effective interface be developed between the two teams.

Occasional visitations to the ALL were arranged for the team and Derek to become acquainted with the personnel in that setting and to obtain a more in-depth understanding of the processes required to develop such a highly sophisticated communication aid.

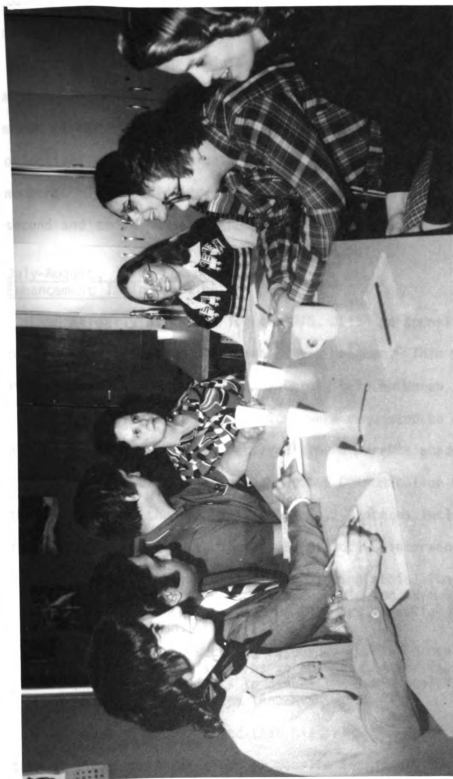
The telephone was also to be considered invaluable in maintaining contact between the various JCISD team members and the MSU technologists.

The multidisciplinary team agreed to meet formally every other week in the Jackson setting (Occupational Therapy Room), to discuss such agenda items as the current status of the project, progress being made, the latest developments in technology, any concerns that might have surfaced, any new ideas, and ways to improve and continue the program (Photograph 4). This time would also be devoted to discussing other projects and devices in the outside world that had come to the attention of the team members. These regularly scheduled "Team Meetings" were considered to be an especially effective and valuable step in the administrative program plan.

Public relations and acceptance: This program was the first of a research nature to become a part of the JCISD. There was concern expressed by some administrators as to just how the program would be accepted by both staff and the community. The administrator believed that the school district had more than adequately justified the need for the program and could easily provide this justification to the staff and community. Any questions that should arise were to be handled individually by the administrator of the program.

Evaluation: Informal evaluation would be in operation daily, due to the multidisciplinary interface that would be developed through the various methods of communication cited above. An informal but regular evaluation procedure was built into the written objectives and regularly scheduled team meetings.

As a part of each meeting agenda, team members would be invited to discuss and evaluate the progress being made. The group



Photograph 4.--The multidisciplinary team.

could then decide on any changes to be made to improve the daily operation of the program.

The same type of informal assessment would also be conducted at the conclusion of each school year, summer program, and/or six-month research agreement. Program objectives and personal program objectives would be evaluated in an open discussion forum by all team members. This would serve as a foundation for the writing of the second and third phase of the program objectives.

July-August, 1976--Communication Enhancement Implementation

As early as the spring of 1976, JCISD personnel were actively planning for some type of communication program. This thinking was reflected at the EPPC meeting for Derek, held on March 30, 1976.

Medical social work services were requested to explore parent and teacher concerns which centered around Derek's academic program.

Social work participation on the Communication Enhancement team is based on the nature of the role. Concerns include improving the quality of life by various modes of social intervention, including:

- a. restoring, maintaining and enhancing social functioning of individuals and families by equipping them with resources, and competencies that are essential for social participation,
- b. developing and securing resources may not be sufficient; one may need to serve as an advocate and/or facilitator on behalf of clients to assure the individual/family obtains the resources (Romanyshym, 1974).

Derek's teacher noted that his primary mode of learning was through vicarious experiences or passive learning. She emphasized how difficult it was to develop measurable objectives. She seemed

frustrated by the lack of feedback, both positive and negative, regarding her teaching efforts. The issue of teacher accountability also seemed to contribute to her anxieties concerning Derek's progress. She appeared to hold herself fully responsible for Derek's success in school.

The medical social worker reviewed Derek's progress and noted the socialization gains made by Derek's presence in the classroom. She had hoped to compliment the teacher for the gains made, no matter how small they were. An additional purpose was to allow the teacher to vent her frustrations and concerns, thereby allowing the medical social worker to make recommendations.

A home visit revealed that the family felt that Derek would benefit by greater individual instruction focusing on basic skills. They were appreciative of the allowances made for a special bus run. They also expressed concern that Derek's program was primarily passive in nature.

The medical social worker's role as advocate and facilitator of transactions has assisted staff and the parents as well as Derek.

By March, 1976, there had been very little progress noted by the speech and language pathologist. There seemed to be a mild increase in the strength and control of the lips. Derek could approximate them to a limited degree upon command; however, they were still held open in the rest position.

These progress reports reinforced the need for communication.

Derek's first communication aid--"The Communicator": The decision was made by the staff and administrator to order a Communicator from Adaptive Therapeutics Systems. The delivery date was too late for use in the classroom; however, it was introduced to Derek during the summer program. This is the simplest of linear scanning devices presented using a circular approach (Photograph 5). Various messages such as letters, numbers, words, phrases, or pictures are presented and the individual responds as the indicator moves in a clockwise motion to the choice he has selected. Various menus can be made by the instructor to be interchanged on this device.

The Communicator became the first facilitator of communication for Derek. While it works well for a child with limited cognitive ability, it is a slow method allowing the individual to make the selection from only a relatively few items at any one time. The variation of menus that could be presented for use on the Communicator is endless; however, the preparation time for the instructor and/or aide could become quite extensive, depending on such criteria as the complexity of subject matter and/or the quantity of subject areas to be covered during the instructional period. The student also remains totally dependent on the instructor in the selection of the menus. The Communicator could perhaps be viewed as a better instructional tool than as an effective communication aid. The Communicator benefited the C E Program by providing a means to teach Derek to track visually while placed in an upright position, as well



Photograph 5.--The Communicator.

as for the experimentation of various switching methods, while readying Derek intellectually for the computer.

The OTR and speech and language pathologist mounted a control switch on its side on Derek's lap tray. The idea was for him to push against it with his left hand (Photograph 5). This was continued until he began to extend his fingers over the back of the switch plate, thus catching them in the plate. Consistent responses were also unattained using this method.

The C E Program quietly moved into official operation during the summer months on a limited basis as the summer program consisted only of physical therapy.

The initial visits by Dr. Eulenberg were exploratory and evaluative in nature. Various switching devices were tried for use with the Communicator. The ALL-MSU research group made a knee switch for control by pushing against it with his left knee. Although this method seemed to have gained more reliability, it still did not appear to provide the consistency needed to establish an effective communication system. The evaluation of a variety of switches continued. Derek learned to track visually and to attempt to coordinate his physical and visual responses. Derek had control of something by himself for the first time in his life. This independence provided tremendous positive feedback. When a response was correctly time, the positive feedback was double.

The amount of material provided for his direct response increased in all academic areas. The presentation/selection mode

of educational materials using the Communicator ranged from simplistic to more complex.

First the field was divided in half; then in fourths, sixths, eighths, and twelfths. With the twelve-area presentation, the responses became more difficult because of the gross movement of the pointer in a small area. The switch would seem to produce a one-second lag, which was just enough to prevent Derek from making a correct selection.

The classroom teacher, homebound teacher, speech and language pathologist, and the OTR joined to develop and make appropriate educational and entertaining programs or menus for the Communicator, i.e., discrimination between shapes, colors, and sizes; discrimination between sounds and their association with visual letters; presentation in the visual mode of small words from Derek's reading book; presentation and discrimination of numbers; presentation and discrimination of words from Derek's reading book and from Derek's vocabulary such as the names of family members, animals, and playmates; sports and games.

The Communicator had provided a beginning, just as it was intended, and was used daily until another practice exerciser was developed at a later date for use prior to the arrival of the computer system being especially developed for Derek, dubbed the Omnicom.

Staff attitudes and expectations: This "readiness period" caused the staff members much anxiety and frustration. They had come to the program possessing differing attitudes, experiences, and philosophies. At times they held unreasonably high expectations,

in terms of both the communication aid and Derek. They blamed their frustration much of the time on the equipment; i.e., the switching mechanism was not reliable or it was not positioned properly, or the pointer would fall off, or the connection to the Communicator would be faulty and therefore not respond appropriately. At times, they would expel their frustrations at the technologist. At other times they would find it easy to blame one another or themselves.

Participating in research experimentation and development was a new experience for the educators.

In the beginning, some staff appeared to feel threatened by their own actions, as if their every move was being "judged" by their superiors and colleagues. They also became impatient. They expressed their unwillingness to wait an undetermined length of time for the Omnicom.

Frequent reminders of the goals and objectives of the program helped to keep realistic expectations in focus. Gradually they learned to overcome their fears. They asserted initiative and began to experiment with new ideas and techniques in their own respective fields. They began consulting with one another. Cooperation and patience became essential components in the daily and monthly operation of the project. Everyone soon found it rewarding not to be afraid to try various techniques. They could fail and still feel good about themselves. If they failed with one idea, they tried another, until they succeeded. Pride in their role and in the C E Program took precedence.

Early parental involvement: During the infancy stages of the program, information and progress were relayed to Derek's parents by telephone. Staff made home visits and Dr. Eulenberg also kept in touch with the Moores via the telephone.

By August of 1976, the entire C E team was called together to visit Derek and his family at their home. Accompanied by Derek, Dr. Eulenberg demonstrated a number of communication systems being studied at the ALL and currently under consideration for Derek. All JCISD team members were present. They attended eagerly and voluntarily without pay during their vacation time. The meeting was documented by video tape. The purpose of the meeting was to provide the family with first-hand information regarding the latest developments in technology and to provide them with some insights into the progress being made on the program with Derek. This home visit also provided the team with a clearer picture of the home setting, thereby better enabling the design of the device to be appropriate and applicable in either the home or school setting. Derek's positive interaction with his friends, brother, and his parents, his interest in sports, swimming, and the CB radio was evident.

August 26-28, 1976--Communication
Enhancement Institute--MSU

Being one of the leading research centers in the development of C E aids in the United States, the ALL/MSU hosted the first nationwide Communication Enhancement Institute. The Institute was sponsored by the Michigan State Department of Education and was held on the MSU campus.

The main purpose of the Institute was to acquaint interested persons with the latest developments in the field. A second purpose was to bring several of the leading research technologists together from throughout the United States to display their devices, to exchange ideas, and to relate progress being made with their various products. The following representatives were present:

Jana Fothergill, M.A.
TRACE Research and Development Center for the Severely
Communicatively Handicapped
University of Wisconsin-Madison

Richard Foulds, Director
The Biomedical Engineering Center
Tufts-New England Medical Center
Boston, Massachusetts

Maurice LeBlanc, M.S.M.E., C.P.
Chief, Rehabilitation Engineering
Children's Hospital at Stanford
Stanford, California

Louis Esposito, Vice President
Adaptive Therapeutic Systems, Inc.,
Madison, Connecticut

Barry Romich, B.S.E., P.E.
Prentke Romich Company
Shreve, Ohio

J. R. Charbonneau, Senior Research Engineer
Medical Engineering Section
National Research Council of Canada
Ottawa, Canada

Kathryn L. Fons, Speech Scientist
Research and Development
Federal Screw Works Company
Troy, Michigan

John B. Eulenberg, Assistant Professor
Director, Artificial Language Laboratory
Computer Science Department
Michigan State University
East Lansing, Michigan

Judith Montgomery, M.A., C.C.C.
Fountain Valley School District
Fountain Valley, California

Cheryl A. Rogers, C.C.C.-Sp.
Senior Speech Pathologist
United Cerebral Palsy Association of Western New York
Buffalo, New York

Travis M. Tallman, M.S., C.C.C.-Sp.
Speech Pathologist
United Cerebral Palsy Association of Middlesex County
Edison, New Jersey

Throughout the entirety of the JCISD-MSU C E Program the administrator has found it beneficial to attend the various institutes and seminars focusing on communication aids for the handicapped. It is during these times that the administration can become acquainted with prominent researchers in the field, be able to view the various products, and have the opportunity to become better informed about the efforts being made the world over to help the C H. Upon returning to the C E Program, this information is shared with the team members.

1976-1977 School Year--Official Program Implementation

By the fall of 1976, Derek was enrolled full time in the elementary POHI classroom at Bennett School, Jackson Public Schools. The administrator initiated the C E Program formally by arranging for the first Team Meeting to be held on September 23, 1976. Minutes of each Team Meeting are prepared by the C E Administrator. These are distributed to all team members prior to the next team meeting. The recording of the Team Meeting minutes has been reduced to

narrative form in order to provide a more concise description for the reader.

Team Meeting: Thursday,
September 23, 1976

Notification of the first official team meeting was mailed out to all team members prior to the meeting (Appendix L). The meeting agenda was distributed at the meeting (Appendix M). Minutes follow:

- I. Copies of the Research Agreement were distributed and program objectives were reviewed.
- II. Team members were asked to write individual objectives. These were to be ready by the next meeting.
- III. The team agreed to hold a team meeting every other Friday, at 11:45. The next meeting was scheduled for October 15, 1976.
- IV. Notebooks were distributed for the team to keep a daily log of phone calls and meetings. Individual anecdotal records of the time actually spent with Derek and the content of that time would also be recorded. Concerns, progress and pertinent information should be communicated to the Communication Enhancement administrator.

Materials and equipment are to carry over and be placed in total use by all team members. All requisitioning of supplies, materials, aids or equipment must be submitted to the Communication Enhancement administrator.
- V. The team established the following as initial priorities:
 1. Behavior management--work must be done with Derek to reduce his apparent fatigue factor and/or display of disinterest, i.e. short attention span.
 2. Derek's parents should be informed regularly of the program and should be encouraged to participate.

The Communication Enhancement administrator was to meet with the parents. Each team member was to make a home visit or invite Derek's parents to school for a meeting.

3. Individual work schedules were to be shared among the team members and with the parents.
4. Staff was to stress that their efforts should be carried out at home as well as at school.

The actual logging of phone calls and meeting dates has been minimal. In most cases it has been nonexistent. The itinerant varied schedules of the staff have prevented them from recording this information on a regular basis. Most phone contacts to the ALL can be traced on the office telephone statements if this information is needed. The regularity of the team meetings has enabled the team members to communicate the frequency of contact with MSU personnel and with one another. Therefore, logging of these particular items has not appeared to be a necessary or valid request.

A large three-ring notebook personally identified for each team member lends organization to the program. The use of dividers allows for the C E information to be filed in an orderly fashion. It is also easily accessible, portable, and allows all material to be centrally located.

The program has centered around team decisions whenever possible. The decision to hold the team meetings bi-weekly was such a decision. This schedule has seemed to work well for both MSU and JCISD personnel.

The establishment of initial priorities was done to give some immediate direction to the team members and to initiate their thinking in terms of writing their individual objectives.

Team Meeting: Friday,
October 15, 1976

The team reviewed Dr. Eulenberg's visit on Thursday, October 14, 1976. Because of their commitments to other students from throughout the county they would like advance notice of visits. In addition to the regularly scheduled team meetings, Dr. Eulenberg often visited Derek to experiment with various switching devices. Without advance notice, the staff found it difficult to change their schedules so they could be in attendance. This was corrected.

The team was anxious to know when to expect the new communication system. Although a date was not able to be projected at this time, discussion did center around progress being made and on projected work to be done.

The JCISD expressed a need for a large screen and large letters. Concern centered around Derek's ability to track and focus due to the involuntary extensor thrust and its effect on his head control and eye direction. An evaluation to determine the best size screen and print will be a priority for the next meeting.

A head switch being especially designed for Derek will be ready by Friday, October 22nd. This made the team happy.

The speech pathologist is using the Communicator with Derek. The knee switch elicits inconsistent responses. Derek has overflow of head movement and therefore responds with his eyes.

The teacher will use the Communicator in the classroom, reinforcing the activities of the speech pathologist.

The RPT noted that Derek should have stationary placement of his legs to function in his chair. When his legs are released, he exhibits extensor thrust. At home his head is held as he sits on his mother or father's lap to watch TV, or he is in a prone position on the floor.

The team shared and discussed their initial objectives. They are presented next in their original form.

The staff members were asked to limit their objectives to a few (five or so) select areas of major emphasis. They were asked to jot these down in a direct, simplified manner. The staff is accustomed

to writing individual program objectives in a more detailed manner for their various respective roles. If staff members are not accustomed to writing detailed program objectives, the writer suggests using the following format as a guide. This form has served as a valuable outline enabling staff to write objectives in a consistent, acceptable format (Appendix N).

The team decided that Thursday was a better meeting day than Friday. The next team meeting was scheduled for Thursday, October 28, 1976, during the lunch hour, 12:07-12:42.

MSU COMPUTER RESEARCH GRANT OBJECTIVES
MARY WILLY, REGISTERED OCCUPATIONAL THERAPIST
10-19-76

- I. Begin to help Derek develop a personal needs vocabulary.
- II. Begin to help Derek develop a how do you feel vocabulary.
- III. Reinforce and practice as directed by Speech and Language Pathologist.
- IV. Use (Mancino) headpiece pointer to type for head control practice.
- V. Use (Mancino) feeding adaptation to develop hand to mouth pattern for feeding.
- VI. Work with Aide to Physical Therapist to develop potty and feeding practices.

MSU COMPUTER RESEARCH GRANT OBJECTIVES
ELLIE MADDEN CASTEEL, REGISTERED PHYSICAL THERAPIST
10-19-76

- I. To continue to work on head control, in prone, supine, and sitting; fascilitation techniques such as brushing, stroking. . . .
- II. Developmental activities, i.e., all fours, indian sitting, on knees. . . .

- III. Relaxation techniques, i.e., rocking, rolling. . . .
- IV. Diaphragmatic breathing, concentration on expiration
- V. Functional hand to mouth activity
- VI. Co-ordinate on computer speech program as instructed, and as deemed most beneficial

MSU COMPUTER RESEARCH GRANT OBJECTIVES
SHIRLEY STUTZMAN, AIDE TO THE PHYSICAL THERAPIST
10-20-76

- I. Building up tolerance to sit on his potty chair, following the direction of the Registered Occupational Therapist and the Registered Physical Therapist.
- II. Communicating with Derek at lunch time, during feeding. To provide oral motor stimulation during feeding time.
- III. Building up Derek's tolerance, using therapeutic exercise so several team members can work with him in one day.
- IV. Working with the team to help me develop a better understanding of Derek's education, other than transporting and doing the above.
- V. To assist the Speech Pathologist in logging Derek's responses when using the Communicator and in other ways determined to be of benefit.

MSU COMPUTER RESEARCH GRANT OBJECTIVES
RITA FORSYTH, MEDICAL SOCIAL WORKER
10-14-76

- I. Immediate:
 - A. Schedule interview with family and summarize role with them last Spring and assess present role with them. Report back to team about our mutual agreement with respect to my present relationship with them.
 - B. Gain greater understanding of Derek's communication program and his progress by attending team meetings, work sessions with each team member, meeting with MSU technologists, and parents.

II. Long-term objectives:

As Derek's progress is assessed, my role with the family may be better defined; i.e., exploring environmental supports.

MSU COMPUTER RESEARCH GRANT OBJECTIVES
LARRY JACOBS, TEACHER CONSULTANT,
PHYSICALLY AND OTHERWISE HEALTH IMPAIRED (POHI)
10-17-76

- I. To develop a positive rapport with Derek Moore through regular contacts in the school classroom setting.
- II. To become better acquainted with the communication enhancement program for Derek Moore by reading literature, attending conferences, and observing Dr. John Eulenberg, his MSU team, the physical and occupational therapists and the speech pathologists.
- III. To become better acquainted with the classroom program for Derek Moore through regularly scheduled visitations to the classroom.

MSU COMPUTER RESEARCH GRANT OBJECTIVES
ANN HEATH, M.A., C.C.C.
SPEECH AND LANGUAGE PATHOLOGY

- I. To adjust the Communicator (with periodic assistance from Dr. Eulenberg, Computer Science Program, M.S.U.) for guaranteed operation on a daily basis.
- II. To coordinate the response apparatus with Derek's responses upon verbal command. "Point to . . ."
- III. To design Communicator menus for informalized receptive and expressive language testing and therapy.
- IV. To implement the use of the Language Master for tracking purposes.
- V. To design Communicator game menus for stimulation and to maintain a high interest in this artificial form of communication.
- VI. To record any changes in vocalization, in voluntary and involuntary muscle control during therapy using the Communicator.

- VII. To maintain a daily log of the therapy sessions.
- VIII. To coordinate the goals, therapies and lessons of the other team members for consistency, progress and success in this project.
- IX. To confer with Mr. and Mrs. Moore regarding Derek's use of the Communicator in therapy and suggestions for use in the home.
- X. To implement the recommendations and new programs suggested by Dr. Eulenberg and his staff at the M.S.U. Computer Science Program.

Team Meeting: Thursday,
October 28, 1976

The next team meeting will provide team members the opportunity to demonstrate their findings concerning Derek's functional strengths and limitations.

Derek is using the Communicator one hour per day with the OTR and Speech Pathologist. The Physical Therapy Aide is logging the responses during the sessions with the Speech Pathologist.

The teacher is using long and short sounds in the classroom as well as rhyming words and conceptual development in reading.

Discussion centered around Derek's integration with his peers. He is integrated in assemblies and other special school functions. He is active with his family and is in regular contact with normal peers. Integration into a regular classroom could only be done if he is accompanied by a Teacher's Assistant. This should be considered when more reliable communication is achieved.

The team agreed that following an in-depth evaluation over the past two weeks, Derek can use small print.

This meant that the size of print need not be a concern when purchasing a TV monitor or when programming the computer. This was good, because a smaller screen can lend itself to greater portability. Smaller letters on the screen means that a greater amount of material can be presented at one time.

It was agreed that a call should be placed to the family each week following the Team Meetings. The C E administrator will assume that responsibility.

Team Meeting: Thursday,
November 11, 1976

A report was given on the pre-arranged meeting with Dr. Eulenberg. Emphasis was placed on: (a) mat activities and exploration; (b) head switch, good, alterations to be made; (c) phonation on mat, good, to be continued.

The staff expressed the desire to continue exploration of various modes of communication; however, were anxious to be able to use a reliable switch with Derek.

Derek's teacher states that he works well using upper and lower case letters when responding with eye movements. The Speech Pathologist states that the carry over to the Communicator is extremely limited. This will continue to be pursued.

The Medical Social Worker reported that she made monthly home visits, i.e., September 23, 1976, October 22, 1976, and November 4, 1976. Her findings were that in September and October Derek had been resisting school attendance and the new Teacher's Aide. Derek's mother thought that perhaps he was bored with school. By November, an improved relationship had developed. Derek also became more actively involved in classroom activities. Derek's mother noted that he was striving more because she believed that there was a greater focus on academics. He was also being challenged by the brother who was also in school. The Medical Social Worker observed Derek and the OTR working with the Communicator on November 11, 1976. She could observe that the development of a consistent response system would be crucial in the success of the C E Program.

The C E administrator also related that progress is being made at MSU on the development of the controlled TV display for Derek. Copies of the controlled TV display plan were distributed to team members (Appendix 0).

Team Meeting: Thursday,
November 23, 1976

Dr. Eulenberg drew a diagram of the controlled TV display on the blackboard. One TV monitor will take care of input and output. Eventually Derek may be able to draw graphic

expressions on the display. The video board and circuits are being developed at the ALL. Software into the micro-computer system is being programmed.

An adequate response system is needed with the Communicator.

Staff is learning how Derek conceptualizes and uses language: first with spelling, then sight vocabulary, then phonetic symbols.

Derek phonates best when on the mat in a relaxed position. His voice could be used as a signaling device. The team should encourage phonation.

The movies demonstrate that Derek can control the switch. He should try expanding the number of responses he can make.

Team Meeting: Thursday,
December 9, 1976

A trip to the ALL/MSU for team members is scheduled for Friday, December 10, 1976, to help them gain a greater awareness of the progress being made on Derek's computer system.

Derek's next trip will be in January.

Emphasis is now being placed on getting a differentiated tone through vocalizations.

Derek is motivated and excited.

It has been nice to see such an enthusiastic, positive team at work!

Dr. Eulenberg's colleague, Dr. Morteza Rahimi, joined the JCISD/MSU Program upon his return to MSU following a two-year assignment overseas.

Team Meeting: Thursday,
January 13, 1977

Dr. Eulenberg fit a new head piece containing a new response system to Derek's chair.

Photograph 6 displays the head piece as it is aesthetically viewed by the public. Attention is directed to the location of the embedded head switch. Once the terry cloth cover and foam rubber padding are removed, as is shown in Photograph 7, the switch mounted on the wooden frame is easily exposed for changes in positioning and/or repairs if necessary.

Derek will begin working on his own for 5-10 minutes. The goals will be threefold:

1. Introduce Derek to the concept of time periods.
2. Learn to work independently.
3. Learn to experience "expressive" language independently.

The Speech and Language Pathologist described her recent use of the workbook Consonant Sounds and Symbols, Level 2, Ginn. She showed rhyming words to Derek, instructed him to say them in his head and respond "yes" and "no" as to whether they rhymed. Some words could have several responses, i.e., bag, luggage, suitcase. Derek successfully indicated the concepts of rhyming and auditory discrimination. She also suggested that movie magazines or teen magazines be used as high-stimulus material, i.e., using Fonzy to teach a language concept.

Derek is responding well to a new Student Teacher and Aide in the classroom.

The Medical Social Worker has an appointment with Derek's mother on January 21, 1977.

Team Meeting: Thursday,
January 23, 1977

The new switch is working fine.

The Therapists are working on the head motion to attain consistency, ease of movement, and accurate responses.

Several new menus for use with the Communicator were demonstrated. Everyone please bring in new ideas.

Derek now has a notebook to take home daily with a letter to Mother and Father noting his activities and accomplishments. They send back responses.



Photograph 6.--The head piece--covered.



Photograph 7.--The head piece--uncovered.

The medical social worker reported that Mother is pleased with Derek's health and school attendance. Derek is eager to attend school. She is pleased with the program.

Because of a scheduling conflict, the team agreed to meet on Wednesdays from now on. The next team meeting will be Wednesday, February 16, 1977.

Six-Month Program Evaluation

The first six-month evaluation, in terms of program objectives and individual objectives, brought about a reaffirmation and decision to continue functioning with the original objectives. See Appendix P for the second JCISD/MSU contractual agreement and pp. 103-106 for individual objectives. This decision was made by the team and was substantiated by the fact that all of the objectives were currently in process and were determined to be appropriate for the continuation of the program.

Team Meeting: Thursday, February 16, 1977--Cooperative Research Agreement (Installment II)

Copies of the Research Agreement were distributed to all team members (Appendix P). This revised version of the June 3, 1976, agreement provides for further refinement in the design and development of the projected communication prototype.

The team agreed that small team meetings should be held to improve communications between team members. The pressures of time can create problems.

The teacher and speech and language pathologists will meet to better coordinate the use of the Communicator.

Derek's mother will be invited to observe Derek working on the Communicator on Friday mornings. She will also be able to meet with the various team members at that time.

The medical social worker is playing an important role with the family by helping them to retain a realistic outlook regarding Derek's progress. On January 23rd, Derek's mother reported to the medical social worker that she appreciated hearing from the team members regarding progress being made

with Derek. The family was pleased with Derek's attendance and academic program at school. The February 4th home visit centered around baby-sitting needs and the difficult managing required while a parent is working. The team suggested that the medical social worker help the family to retain a realistic outlook regarding Derek's progress, and to reinforce the occupational therapist's efforts regarding the implementation of an effective program designed to teach Derek to assist in caring for his personal needs. The February 3rd home visit was cancelled due to illness with flu in the family.

The response system has been sticking. It seems to need constant readjustment, which can be frustrating.

It appears that another Communicator is needed. Two more students in the class could use it. Derek could use a second one at home. Because the Communicator is a temporary communication, it was agreed that another one would be ill-advised. If the teacher finds it to be an effective teaching aid and would like to purchase one or two more, she may do so out of her classroom budget.

The teacher has initiated a task analysis plan in order to record and use the amount of time spent with Derek by the various team members.

The teacher's task analysis plan was a good one, but just never reached fruition. The time required to carry this out did not become feasible with the teacher or her assistant.

It was good to see an enthusiastic cooperative team with refreshing new ideas ready for implementation. Let's keep up the good work!

Educational Planning and Placement Committee (EPPC)

An EPPC was held in the spring of 1977 to determine the best educational placement for Derek during the 1977-78 school year. The decision of the EPPC was to place Derek in an upper elementary POHI resource classroom, Ridgeway School, Jackson Public Schools, on a

nearly full-time basis. He would be interacting with peers of his own age and would be integrated in regular school activities when appropriate.

The EPPC had made the recommendation that some type of a summer program be planned for Derek.

The acquisition of the Omnicom was near and staff was anxious to provide some continuity to the program and to Derek's academic achievement.

Financing was not a deterrent as the Jackson Chapter of United Cerebral Palsy had provided \$5,000 to finance summer therapy programs for cerebral palsied youngsters residing within the JCISD.

Staffing Changes

The C E team met to discuss the purposes, staffing, and scheduling of a summer program.

During the first eleven months of the program, continuity of staff members remained stable. It was not until the summer of 1977 that changes in personnel became necessary.

In some school districts there may not be a choice of personnel since only one professional at each level in each category may be on staff. If there is a choice, then it becomes important for the administrator to select members who are competent, self-confident, interested, enthusiastic, innovative, work well using a team approach, and are willing to take on this assignment in addition to carrying their regular caseloads.

Several staff changes were imminent. Due to the resignation of the RPT, services would have to be provided during the summer months by another RPT until a new team RPT was selected.

A new OTR would join the C E team, begin assessing Derek's needs, and provide appropriate services during the summer months. This person would continue as a member of the team during the 1977-78 school year. This personnel change would be necessary because of Derek's move to a new school in the fall.

Since there would be a change in POHI teachers come fall, due to the change in school placement, and the Jackson Public School POHI teachers were unavailable for summer employment, the homebound teacher (POHI certified) from the JCISD agreed to work on the team during the summer months. Her goals included: helping Derek to respond accurately to questions using his communication aid, establishing a level of functioning in mathematics, and allowing time to experiment with the different response programs and input devices on his computer.

The Speech and Language Pathologist would continue providing services following the goals established for the C E Program in January, 1977.

The Team agreed that medical social work services would not be necessary during the summer months.

May 19, 1977--Colloquium--
Gregg C. Vanderheiden

Research centers, e.g., TRACE, ALL-MSU, are working cooperatively to improve the usability of the microprocessor by developing a highly versatile control system, allowing for adaptability in the

type of direct selection, scanning, or encoding mode best suited to the abilities of the handicapper.

Gregg C. Vanderheiden, Director, TRACE Research and Development Center, University of Wisconsin, Madison, Wisconsin, visited the ALL-MSU on May 19, 1977, to discuss and better coordinate the related research being performed at both centers.

The lecture presented by Mr. Vanderheiden was stimulating in terms of the information presented relating to the Autocom currently being produced for use by nonvocal severely physically handicapped individuals. Wheelchair portability, a strip printer, a functional vocabulary of 2,000 words, easy maintenance, durability, light weight, and correctability are the key features. One challenging aspect has been to develop an Autocom whereby various interfaces might be interchanged as the controlling unit, in order to evaluate and meet the special needs of those C H able to utilize such a device.

The particular operational mode for an aid need not be defined until the aid actually reaches the hands of the teacher in the classroom. In this manner, the aid can be more closely fitted to the abilities of the individual and can be changed as the child develops (Vanderheiden, 1977).

Through collaboration by the TRACE Center, ALL-MSU, and other centers, goals such as these can more easily be accomplished.

The administrator attended the colloquium by Gregg C. Vanderheiden to relate the information to the JCISD team members. It was beneficial to learn that research and progress being made at the TRACE Center related directly to the computerized aid being developed

for the JCISD Program. It also has allowed JCISD team members to better evaluate other individuals who might be able to utilize other devices.

Team Meeting: Tuesday, June 7, 1977

Dr. Rahimi arrived with the Exerciser (Photograph 8).

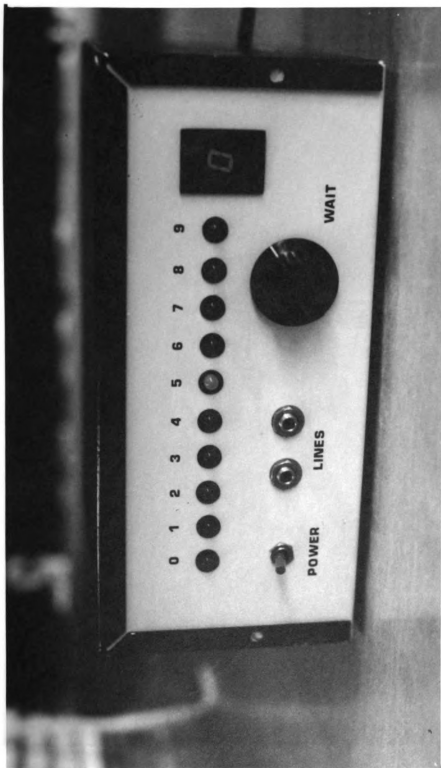
Since Derek would be expected to use the Omnicom by July, the technologists thought it to be in Derek's best interest to devise a linear scanning device for him. This simplistic communication aid would allow him to practice tracking visually from left to right, and to develop in Derek the internal timing necessary in order to anticipate accurately the movement of the cursor and make a correct selection. He could practice making selections using the head switch, the same input device as he would be using with the Omnicom. A light would serve as a cursor and would move across the board, lighting up each selection sequentially. The speed of the cursor could be regulated slower or faster as desired. The Exerciser was one more step in the readiness process.

Derek was quite successful in his first effort.

The RPT suggested a "shrug of the shoulders" movement as another means of controlling the device. It was decided to explore this movement, along with as many others as is possible (Photograph 9).

If used at all, the Communicator will only be used as a change of pace.

The OTR suggested that various types of switches should be available as alternatives for Derek to use in different environments.



Photograph 8.--The Exerciser.



Photograph 9.--The shrug of the shoulders switch.

All team members should be aware of Derek's fatigue factor and work to get the most from him.

The team members will evaluate the extent of Derek's understanding of the use of the Exerciser.

A record will be kept of the accuracy with the device, to get a quantitative measure of his success. This turned out to be a necessary and good idea.

Other avenues of communication aside from scanning will be explored, i.e., myoelectrodes.

Six-Month Program Evaluation--
Cooperative Research Agreement
(Installment III)

The third JCISD-MSU Cooperative Research Agreement (Appendix Q) reflects the outcomes of the second evaluation session. The overall objectives remained the same. The current procedures for accomplishing these objectives were stated and the accounting of progress made was spelled out. The team members agreed that they should continue functioning with their current set of objectives and write new objectives for the fall of the 1977-78 school year. The Omnicom would be arriving in July and the adjustment period could take place during the summer months of July and August. Assessment of the daily operation and programming efforts was being carried out on a regular basis during each team meeting. All team members were pleased with the progress being made to date.

The third six-month installment, July 1, 1977-December 31, 1977, provided the financial resources necessary to complete the program design of the computer, to purchase the Omnicom package solely for use by the JCISD, and to provide for the continued research and exploration of appropriate input devices adaptable for

effective use between the handicapper and the machine. A description of the features of the Omnicom are presented in Appendix R. Photographs 10, 11, and 12 complement the description found in Appendix R.

Team Meeting: Thursday, July 6, 1977

The purposes of this meeting were:

1. To discuss the summer programming for Derek and other potential students for the Program.
2. To discuss the scope of the C E Program.
3. To discuss Team operation.
4. To discuss delivery date and features of the Omnicom.

Daily Log

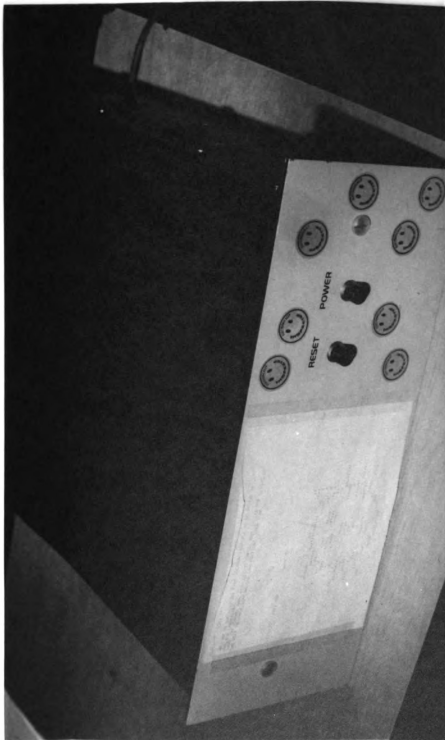
The daily log was kept by the Speech and Language Pathologist during the summer program and is presented next.

July 5, 1977--Derek was tired and anxious. No head rest and no Exerciser. Used oral motor therapy. Tried to get Derek to drink water from squeeze bottle. Doesn't like water. Took a P.T. break. Session too frustrating. Then bombarded Derek with phrases on language master--guessing game: "Do you know what this says?" then played it on machine. Phrases good for sight vocabulary and visual tracking. Buy Gatorade!!!

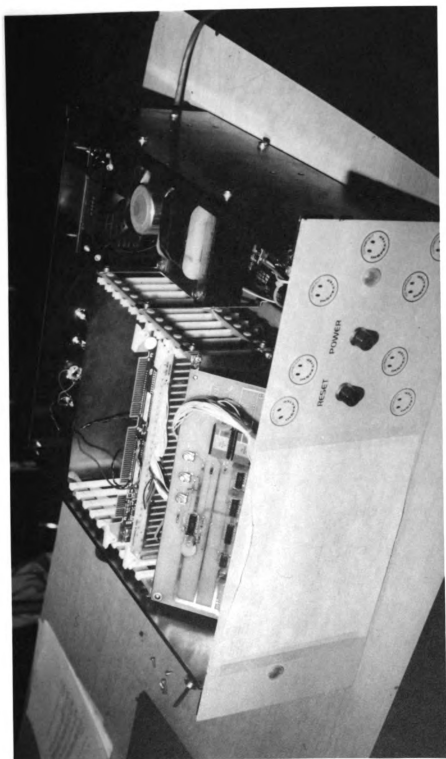
July 6, 1977--Oral motor therapy--not so good. Makes no effort to suck juice. No choking, however. Exerciser--Head switch appears close to face and triggers a response from an involuntary movement of the jaw. P.T. before. Derek looks washed out. Had a pep talk to increase motivation. Did fine with Exerciser when his head was manipulated. Needs hands in cuffs to operate head switch more effectively.

July 7, 1977--Worked primarily on good use of the headrest without banging on the response system. Overflow, extensor thrust, or anxiety caused Derek to lift head out of rest and bang on switch. Did quite well at times. Used M&Ms.

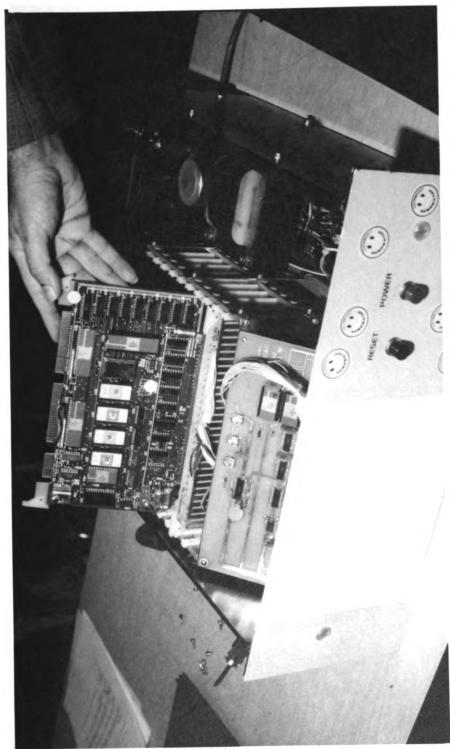
July 8, 1977--A trip was made to the ALL-MSU for Derek's computer, the Omnicom. Hurray!!! (Photograph 13).



Photograph 10.--The Omnicon processor--externally.



Photograph 11.--The Omnicom processor--internally.



Photograph 12.--The Omnicom processor--program components.



Photograph 13.--The Omnicom--TV monitor.

July 11, 1977--FIRST DAY WITH THE COMPUTER. Explained menus to Linda Moore, Derek, and Deven. Derek was extremely anxious today--much extensor thrust and little control of headrest and response. There may be some problems with Deven working second switch along with Derek--too competitive for what little control Derek has over the switch at this time.

July 12, 1977--FIRST DAY ALONE WITH THE COMPUTER. Derek banging away at the headrest--no consistencies. Difficult to stay with one menu. Seemed to be a lot of extensor thrust today. Difficult to keep him in his chair. Worked well playing with it by himself--nothing consistent or profound except that it appeared that Derek stayed on the same menu J-Z for most of the space.

Observed that the cursor was not allowed to move past the mid-line of the screen without Derek hitting the response switch and triggering whatever happened to be on that particular line and bringing the cursor to its original position, sometimes causing a change in menu.

July 13, 1977--Much extensor thrust. Took Derek to P.T. Came back more relaxed. Derek vocalizes when the cursor is lodged as in PR to let me know--this is when he is working alone. I noticed two important factors today: Derek works well alone (not as much extensor thrust) and he vocalizes a need, help attention as in releasing the cursor when it gets lodged. He appears to be structuring sentences. Used A-I menu, "BUT IN HIM WAS SO WHICH SHE MY WAS THEY."

July 14, 1977--An administrator and Speech and Language Pathologist observed. Worked on common expressions such as I'M TIRED I'M SCARED I'M HUNGRY. Derek was relaxed and it was easy to manipulate his head. Responds well to observers, a real showoff!

July 15, 1977--Head switch came apart--plastic came unglued. Took it to Audio-Visual Repair and it was glued with silicone glue. Before this, Derek had constructed the following sentences with the use of the headrest: I'M SAD I'M HUNGRY GET LOST I'M TIRED T.V.? BASEBALL ON T.V.? Derek was trying to tell about the All Stars Game when the switch broke. He had ALL on the screen.

July 18, 1977--A friend, Johnny, and Derek's brother, Deven, came with Derek today. The first lesson was to put everyone's name on the screen. We then worked off the music menu with the three boys. Disconnected Derek after manipulating his turn to save everyone the frustration. Johnny, Derek's best friend, seems to really cater to Derek's every need and want. Almost treats Derek like a baby but Derek seems to eat up the attention. Johnny doesn't seem to mind either. Sometimes I don't know whether I should allow Derek to make mistakes especially when he is playing with other children, as mentioned above, or help him out so that the game can continue to be enjoyable for all. I think Derek can learn about mistakes when he

works alone awhile longer. He still needs to get the feel for the machine. I do not want to discourage him in any way from all the multiple purposes this communication system has to use.

July 19, 1977--Derek has worked on the system six days now. This is the seventh. No coherent message yet. Was able to get to music menu by himself today. Showing good head control. WXYS PIAWXSNE ME WHICH SHE NO was interpreted to mean play piano, Mom teaches me. (Derek agreed with interpretation.)

July 20, 1977--Attempted to spell ice cream--I guessed at that word. Derek's spelling seems to be poor. He seems to prefer to abbreviate his sentences.

Suggested format for therapy:

1. Ask Derek if he has any messages from home.
2. Cuff arms and check to see if feet are strapped. Derek should be sitting deep into his chair.
3. Check to be sure that headrest is at appropriate level for good switch control. Have Derek click it several times and ask him if it feels all right.
4. Ask Derek if he would like to work alone first or would he like to do a lesson first.
5. Allow for individual free time.
6. Work towards individual assignment time.

July 21, 1977--T 4 TIRED I'M AUNT TO PLAY LET'S GO GINGER FISH GRANDPA TIRED *** First Sentence: LET'S GO TO PLAY BILL KICKBALL (Cleared) LAURIE MOM LAURIE GINGER AUNT ANGEL ANGEL AUNT ANGEL FISH SWIMMING FISH Derek was tired today! His head kept dropping, more overflow causing poor head control, more drooling. Flashcards were used for finding words and making sentences on one menu at a time (A-L), (J-Z), (DM). Morse Code was introduced. The Director of Special Education came to observe.

July 22, 1977--Derek was home sick today.

Week of July 25, 1977--Camp--no therapy.

August 1, 1977--Derek came without his tray today--computer was not used--needs hands cuffed.

August 2, 1977--Speech Pathologist was sick.

August 3, 1977--Computer lesson came first. Constructed following sentences: I'M HUNGRY I'M TIRED HELP ME PLEASE THANK YOU Took each sentence and put each word under a Foke's Sentence Builder heading. Who is doing what where when which Head is very passive today. Working alone and vocalizing with "ahs" as he works. AALG HHWEB GRANDMA AI "Now" is the cue for Derek to hit the switch. Slow cursor down three times for Derek's rate.

August 4, 1977--He worked alone initially. Cleared monitor after he hit the PG menu. He worked on flashcards--Derek's jaw and chin kept elevating. I concluded that my flashcards were too high. I had to manipulate his head quite a bit today. Said "yes" when I asked him if he was tired. I feel it was my fault that we were not as successful as we could've been.

August 5, 1977--Last day for the summer. The computer will receive an invoice from the JCISD and then be delivered to the Moores next Tuesday. Derek has been looking forward to the computer going home with him and it would have been a big disappointment if we hadn't kept our agreement. I feel that the Moores are prepared with some rules for Derek and the computer. It's better that he feel comfortable with the computer before he goes to Ridgeway than to get re-acquainted with it in the fall.

Recommendations:

1. Begin with a lesson that needs head manipulation.
2. Assign same lesson for Derek to do as someone observes--allows for errors.
3. Discussion--sentence structure, spelling, semantics.
4. Free time for Derek to do whatever he wants.

A foreseeable primary goal of speech and language services may be to instruct Derek on the means of obtaining messages to communicate on the T.V. monitor.

The daily log kept by the speech and language pathologist recorded a great deal:

1. The instructor's feelings
2. Derek's feelings
3. Progress (or lack of it) being made
4. Problems encountered
5. Successes encountered
6. Techniques and types of lessons used
7. Observations and inferences made by the instructor

It also provided the instructor with a means of referring back to develop recommendations and goals for future programming, including all team members.

Summer Program Evaluation

The proposed summer program had been implemented according to schedule beginning on June 16, 1977. Unfortunately, several interruptions occurred due to unforeseen transportation difficulties and necessary wheelchair repairs. Other disruptions were due to more positive circumstances, i.e., camp attendance and a preplanned vacation period for the entire Moore family.

The Omnicom did arrive in July and was in use the five school days each week.

An informal evaluation of the summer program was conducted in September, 1977. The discussion revealed the following:

1. The transportation difficulties were beyond control of the C E administration, staff, or student, but were internal within the transportation system.
2. The wheelchair repairs were unpredictable and circumstantial.
3. The camp attendance and vacation periods were anticipated. The staff followed a schedule designed to best meet the needs of all students.
4. The summer program did allow staff to accomplish their objectives.
5. With the arrival of the Omnicom in July, the Speech and Language Pathologist and the teacher were immediately able to begin work with Derek on a regular basis. It was learned that the Speech Pathologist had scheduled several additional meetings with the family to assist them in the use of the Omnicom.

6. As Derek entered the fall program it became evident that the summer program was profitable since Derek could use the Omnicom with the continuity that had been anticipated.

August 29-30, 1977--Presentation--
Roger M. Jefcoate

Roger M. Jefcoate, British government advisor on electronic aids for employment, came to the United States primarily to speak to the International Disabled Exposition in Chicago. He then moved to Grand Rapids, Michigan, to speak on "Toys and Technology for the Handicapped" and "Technical Aids for Disabled Persons."

The presentation was co-sponsored by the Kent Intermediate School District, Grand Rapids, and the Michigan Department of Education.

Mr. Jefcoate spoke of remotely controlled toys, using joy sticks controlled with the foot, micro-switches with a hard-snap action, pneumatically operated or air bottle switches. These would be totally safe for use with a child confined to a wheelchair.

He encouraged the use of light-weight electric wheelchairs. He showed slides of a page turner for use with paperback books. He is currently working on ultrasonic switching devices for the blind and paralyzed.

. . . Roger helped develop the equipment from the simple early typewriters, operated by a foot switch, chin pressure or "suck and blow" method, to the highly sophisticated environmental control systems in use today (Plummer, 1977).

Mr. Jefcoate's lectures were attended by the JCISD C E administrator. He provided ideas that could be shared with parents of young severely handicapped children.

September 12, 1977--Presentation
of the JCISD-MSU Program

Being the first research program of its kind in existence, time was needed to determine whether the program was meeting its objectives, and whether it was proving to motivate and profit Derek. Only at this time did the JCISD believe that they were ready to discuss the merits of the C E Program.

The first presentation of the JCISD-MSU C E Program to the Jackson community was given by the Speech and Language Pathologist. The presentation was made to the Jackson Civitan Service Club on September 12, 1977. She presented a detailed explanation and demonstration of the Omnicom. The purpose and objectives of the program were also stressed.

The club members responded with approval and interest, making the presentation a successful endeavor.

ALL-MSU Communication
Enhancement Expansion

The work of the ALL-MSU has gained in prestige since 1975. Their encouraging outcomes have resulted in requests to establish similar programs within other intermediate school districts. Two such districts have been the Ingham Intermediate School District, Lansing, Michigan, and the Kent County Intermediate School District, Grand Rapids, Michigan.

Through experience, the ALL personnel have found that their first task is to educate the intermediate staff to their various programs already in progress. This is accomplished by providing a

one-day inservice meeting. The inservice is planned to include a video tape demonstrating the functional use of a computer by a communicatively handicapped individual. Another handicapper demonstrates the use of a portable micro-processor. Small-group sessions allow staff to informally view, discuss, and experiment with a variety of computerized communication aids. A myoelectric control switch is also demonstrated. Administrators and/or staff members from the Wayne County Intermediate Program and the JCISD Program are invited to participate in the presentation.

The Jackson staff demonstrates the use of the Omnicom during the small-group sessions. The administrator of the JCISD Program then describes the administration and management components of the program.

Being a part of this presentation has enabled the team members to summarize their roles and involvements in the project, to discuss these issues with their colleagues from other districts, and to gain a feeling of confidence and expertise in the area in which they are working.

September 21, 1977--Presentation--
JCISD Program to the JCISD Board
of Education

The first presentation of the Program was made to the JCISD Board of Education on Wednesday evening, September 21, 1977. The administrator of the program provided background information, goals, operational procedures, and results achieved to the present time. The Speech and Language Pathologist discussed her role and presented

a scrapbook with pictures documenting the progress being made with Derek.

Dr. Eulenberg then made a presentation about the Omnicom to the Board members. He also described in detail several other computerized aids that are in various stages of development by ALL personnel.

Dr. Rahimi presented a demonstration of a myoelectric (EMG) control switch (Photograph 14). With modern electronic techniques, this rich EMG signal can be analyzed and put to use by obtaining information through the muscles about what an individual intends to do.

The various devices presented were described because they are being considered as alternative modes of communication for the young C H individuals of Jackson County.

As the presentation was concluded, it was obvious that the C E Program had the Board's continued support.

Upper Elementary POHI Resource
Classroom--1977-78 School Year

The C E Program works well when the C H individuals are attending a self-contained program, i.e., where academics, physical therapy, occupational therapy, and speech pathology are provided as support services by itinerant personnel as many times a week as is required by physician's orders, or as the schedule will allow. Since the entire team is unable to work together daily, it becomes more difficult for them to see one another regularly. In such a resource room setting the team may find it advantageous to schedule an



Photograph 14.--E M G.

additional meeting so they can meet regularly as a team to discuss their work and progress.

Because Derek had moved to an upper elementary school POHI classroom setting, new appropriate therapeutic equipment was needed. He was unable to tolerate sitting in the wheelchair for the entire day. Floor mats were ordered so he could be prone on the mat. A wedge was also ordered so Derek could be placed in prone position but would still be able to participate in classroom activities.

In this setting Derek is seen by the itinerant OTR a minimum of two times per week. The therapeutic sessions are conducted in his classroom on a one-to-one basis. At times the POHI teacher is included so that she may carry through with suggestions. Lesson plans usually include mat activities to increase left upper extremity control. At least one time per month is spent working with the Omnicom.

A typical lesson plan is described below:

- I. To improve head control while on the mat.
 - A. When sitting Indian style, Derek tries to bring his head to an upright position.

While holding his head Derek turns his head to the right and left.
 - B. While prone on the mat, Derek pushes up on his arms and raises his head until he can see a positioned object.

While positioned prone on his elbows, Derek raises his head.

While positioned prone on the mat, Derek turns his head to the right and left.

- II. To improve left upper extremity control while prone on the mat.
 - A. Position an object in various places. Derek tries to hit it with his left hand.
 - B. Position an object in various places. Derek tries to reach and grasp it.

Although Derek appears to have fair control between 90° and 150° abduction while prone on the mat, voluntary control of the grasp is questionable.

- III. To improve left upper extremity control while in the chair.
 - A. Use objects same as were described in II, A and B above.

Control is much less when Derek is in the wheelchair.

- IV. To improve hand-to-mouth patterning.
 - A. While in the wheelchair the proximal joints of the left upper extremity are stabilized. Then Derek is helped to bring his hand from the lap tray to his mouth. He then tries it by himself.

The OTR met with the POHI teacher to discuss Derek's physical needs, such as the necessity for a regular change in positioning during the school day. Characteristics of the wheelchair insert were also described.

Arrangements were made to have linens and diapers delivered to the school on a regular basis.

The wedge arrived and was found to be very slippery. Because it was vinyl, it was also very hot. Derek was unable to maintain position on it. The OTR made a covering for it out of terry cloth with velcro attachments. She also contacted Derek's mother regarding

the use of the urinal. Derek was still in diapers. Mrs. Moore said that she did attempt the use of the urinal over the summer with no success. Derek did not seem receptive to a toilet training program. At this time it also did not appear to be a primary concern of Mrs. Moore's.

On a return visit to school, the OTR found that the wedge was still slippery. Another terry cloth cover was made so that one-half of the wedge was covered. This appeared to be a satisfactory solution.

During the first few weeks of school, the OTR worked with Derek on the Omnicom to help him become accustomed to using it with a variety of people, and to help the OTR become familiar with its characteristics. Derek was using the head control switch. The sessions seemed very discouraging since Derek displayed only minimal head control. He needed much physical assistance to keep his head away from the switch until it came to the correct word. He seemed very anxious when working and had a great deal of extraneous movement. The OTR also evaluated Derek regarding his physical ability. He showed the best control in the use of his head and his left upper extremity. The left upper extremity demonstrated more control when Derek was prone on the mat stabilizing his shoulder than when he was in the wheelchair. The session continued with work on some head control activities.

At this time physical therapy evaluation of Derek's body control placed his motor ability at about the six-month level. His actions were inhibited by the persistence of the primitive reflexes

which tended to lock him into various postures whenever he initiated a voluntary action or was placed in a different position. The total extensor thrust pattern predominated in most positions. This pattern included extension of the head and opening of the jaw. The asymmetrical tonic neck reflex (ATNR) was also not integrated into active patterns of motion. When Derek turned his head to the right his right arm extended and the left flexed. He was unable to change this posture voluntarily without a great deal of effort.

Derek's athetoid movements demonstrated that when he was able to make a voluntary motion it was total flexion or total extension. Therefore, he had marked difficulty with graded action.

In the normal developmental sequence it is essential to gain head control in order to control other body parts. Treatment was started with head control for this reason and because it was apparently the best means of using the switch for the computer.

Physical therapy techniques used are as follows:

1. Place Derek in prone position to increase the general tone in the flexors of the body and therefore inhibit the extensors.
2. Place body in pattern of complete flexion so as to facilitate voluntary control of the head. Muscles work in synergy patterns.
3. Place deep pressure on a tendon end to inhibit its action and facilitate the antagonist muscle (pressure on extensor muscle tendon inhibits its action and facilitates the opposite action of flexor).
4. Stroking of Derek's muscle belly tended to facilitate contraction of that muscle.
5. Work for resistance to voluntary motion, thereby facilitating stronger contraction.

6. Work for voluntary motion of one muscle in a synergy pattern in order to facilitate the action of the other muscles in this pattern.
7. Work for integration of vestibular reaction by giving Derek total swinging and turning motions.
8. When Derek was "caught" in a primary reflex pattern such as the ATNR to the right, by placing him in the ATNR pattern to the left helped to release him.
9. Plan to control outside stimulation such as noise, smell, motion, increased light so as to decrease the environmental interference with voluntary control.
10. Use general relaxation techniques to start treatment, such as speaking in a gentle, soft voice, moving slowly, stroking, and rocking.
11. The use of a quick stretch of the muscle facilitated contraction.

A typical treatment to increase head control included:

1. Place screens around treatment area. Lower blinds. Ask for unnecessary noise to be stopped. Reduce all extraneous stimuli.
2. In a gentle voice tell Derek in what position he was to be placed. All positions were used.
3. When supine position was used, his knees, hips, back, and neck were placed in flexion. The therapist straddled his bent legs holding flexed upper extremities against his side, flexed if possible with his knees. Derek was in the semi-sit up position.
4. Derek was asked to precede all his head motions with eye motions, of which he had the best control.
5. Resistance was given to the motion as needed.
6. When flexing his head, the therapist stroked flexors of neck, and pressed on base of tongue under the chin, which inhibited protrusion, a part of the extensor pattern. By stroking the muscles which close the jaw, this would stretch the jaw open further to facilitate closure.

Derek was then able to be placed across the therapist's knees and appropriate techniques were used to facilitate head control.

Derek was positioned in his wheelchair using the aforementioned criteria for posture efforts and then facilitations and inhibition techniques were used to accomplish the best environment for learning control of the computer head switch. Example: Instructor stood to the left and instructed Derek to lead his motion to activate and release the head switch with his eyes.

The following anecdotal records were kept for documentation purposes:

Daily Log

September 27, 1977--Using the head switch, with help from the teacher, Derek moved to the DM menu. He placed the following words on the screen in an undirected activity: GO GINGER ANGEL AUNT AUNT LAURIE MOM FISH ANGEL ANGEL FISH ANGEL A A ALL ALL ALL AAA AUNT GINGER AUNT FISH I'M BILL FISH AUNT ANGEL ANGEL BOWLING FISH LAURIE A A WILL M U. At this time he became anxious and the drooling increased.

September 28, 1977--While using the A-M and N-Z menus, Derek wrote: I MY ME OR THIS NO THEY AS K E HAD N H O H 210. He then moved to the Morse Code menu and produced: T T T T TTT ALL HA C FISH LAURIE (Derek Moore Menu).

September 30, 1977--Derek played a game with the teacher. The reward for a correct response was a sucker. If he "jumped the gun" the teacher got the sucker. The game lasted 15 minutes. Tenseness or nervousness was not in evidence, as drooling was not profuse.

Derek then worked alone for seven minutes. The results were:

BY ME _____ ME AAA

Derek purposely cleared the line and began a new line.

OR A ____ BEEN A TIRED

October 3, 1977--During the month of October the OTR continued to evaluate Derek and worked on the program plan.

Derek worked on the Omnicom with the teacher for 20 minutes. His responses included words, short phrases, and names.

October 4, 1977--In the beginning stages much work was done with the teacher, OTR, or Speech Pathologist moving Derek's head to the switch

at the proper time through manipulation with their hands. Using this method Derek and the Speech and Language Pathologist wrote (Photograph 15):

HAPPINESS IS HARD WORK.

By this date, Derek was able to purposefully clear the Omnicom, place selections on the screen, and then move to another menu. Errors, of course, occurred frequently.

October 10, 1977--The teacher and Derek (using head manipulation) wrote:

DEREK MOORE LIKES CHOCOLATE.

Tenseness was observed.

October 12, 1977--Together again they wrote:

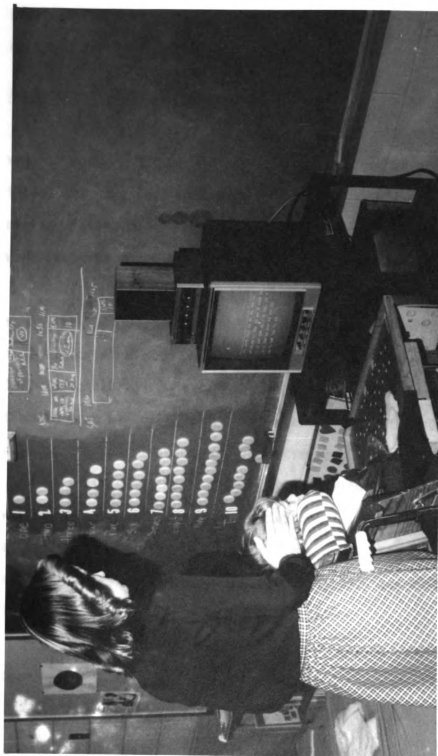
I HAD MY PICTURE TAKEN.

Derek tended to rest on the switch and inadvertently moved back and forth from the alphabet menu to the A-I menu.

The documentation continued to describe the successes as well as the problem areas and the frustrations being experienced by the staff and by Derek. However, progress was evident. Derek was printing more during each lesson using various menus. He was also working alone with the computer for an increased period of time, in addition to working on the computer with the instructors.

Head manipulation was necessary to give Derek the sense of rhythm, the knowledge of intensity needed to hit the head switch, the length of time to hold the head switch down before releasing it, and the sense of timing as the cursor moved along to determine when to hit the switch to obtain a correct response.

Having never before controlled a mechanism by himself, Derek had much to learn, i.e., patience with himself and with his instructors, to relax, to concentrate, to coordinate his eyes with his head movement to get the correct response, and not to lose eye contact with



Photograph 15.---Head manipulation.

the TV monitor. These were great expectations for a boy with Derek's physical limitations. Although progress was slow, progress was evident and Derek was off to a good start!

Administrative Communication

The C E Administrator prepared nearly all communications in written form. This served not only as a record of procedural operations, but gave the staff official notices in advance. Changes in meeting dates, additional meetings, or notices with short lead times were sent via telephone by the secretary of the C E Administrator.

The notification of the first team meeting date of the 1977-78 school year, the agenda, and the minutes are presented in Appendix S in their original form. The agenda for the first team meeting of the 1977-78 school year was sent out in advance of the meeting. If any team members wished to contribute agenda items, they could do so by calling the administrator or the secretary.

Invitations to team meetings and minutes of team meetings were always sent to the Directors of Special Education, JCISD and JPS, as well as to the staff. The Directors would attend the meetings on a periodic basis; however, the primary purpose was to keep them informed of the progress being made.

A narrative describes the content of the remainder of the team meetings.

Team Meeting: Tuesday,
October 4, 1977

The following updated objectives were shared by the team members. These objectives were based on the progress demonstrated to date and on the overall direction that the C E Program was taking, as was indicated by the JCISD-MSU Cooperative Research Agreement.

SPEECH AND LANGUAGE PATHOLOGY
Objectives for Derek Moore
Ann Heath, M.A., C.C.C.

- I. To modify involuntary assaults on the head switch using temporary restraints.
- II. To see more self-initiated control of cursor for scanning and selective purposes.
- III. To encourage "crossing the midline" of the screen with the cursor as a voluntary action.
- IV. To coordinate the use of the switch and Derek's responses after verbal command using no temporary restraints, e.g., "Spell . . . ," "Copy . . . ," "Print"
- V. To record any increases in vocalizations.
- VI. To record any changes in voluntary and involuntary muscle control during therapy while Derek is using the computer.
- VII. To make adjustments with regard to Derek's resting pose away from the switch.
- VIII. To provide another unit for use at home. (Processor would have to be transported.)
- IX. To prepare Derek for the printer.
- X. To use Derek's computer as a means of gradually expressing his physical, emotional and educational needs.
- XI. To see Derek rely on the computer gradually as a means of communicating with substance.
- XII. To observe, evaluate, and discuss the content of material Derek displays on the monitor over designated periods of time.
- XIII. To rely less on the eyes for communication.
- XIV. To coordinate the goals, therapies, and lessons of other team members for purposes of enhancing Derek's abilities to use a nonvocal communication system.

- XV. To see more proficient use of telegraphic communication once the switch is controllable.
- XVI. To experiment with other types of switches utilizing existing vocalizations and myoelectric (EMG) signaling.
- XVII. To work closely with the Moore family.
- XVIII. To improve head movements for better control of the headset switch using direct manipulation and passive restraint controls.
- XIX. To encourage vocalizations using the laryngeal switch for direct selections on the menus.
- XX. To encourage consecutive vocalizations on the laryngeal switch for more letter selections on the Morse Code menu.
- XXI. To voluntarily allow the cursor to cross the midline of the T.V. screen for selections to the right of the screen.
- XXII. To produce short, meaningful sentences using the (A-M) or (N-Z) menus for purposes of syntax, semantics, and word recognition.

SPEECH AND LANGUAGE PATHOLOGY
Objectives for Derek Moore
Betty Jo Van Schoick, Supervisor
10-1-77

- I. Support the Speech Pathologist and share in the discouraging and encouraging events.
- II. Offer support for the Program to the Deputy Superintendent for Special Education and his administrative assistant in terms of the budget as to its value for Derek and others.
- III. Attend team meetings for the purpose of information exchange.
- IV. Visit the ALL with the Speech Pathologist.
 - A. See research in various lab projects.
 - B. Watch application of projects to other nonverbal or nonvocal conditions of verbal expression.
- V. Suggest materials or other resource professionals to help with Derek's academic programming.
- VI. Report to others concerning the C E Program.

OCCUPATIONAL THERAPY
Objectives for Derek Moore
Christine Southwell, OTR
10-31-77

- I. To explore different switches to find which is most suitable to Derek's needs.
 - A. While in the wheelchair.
 - B. While out of the wheelchair.
- II. To observe and evaluate maintenance of, or need for improvement of, proper positioning in the wheelchair.
- III. To increase function of the left upper extremity while in the wheelchair or in prone position.
 - A. Beginning activities to include targeting and patterning. Long-term goal of hand-to-mouth patterning.
 - B. To explore use of left upper extremity as a possible way to operate switch, especially when prone.
- IV. To evaluate the need for any adaptive equipment that will improve Derek's functioning in school or at home.
- V. To work closely with Derek's family to assist in any functional problems in the home.
- VI. To coordinate programming with other team members.

PHYSICAL THERAPY
Objectives for Derek Moore
Kenneth Lauterwasser, RPT
9-30-77

- I. Become familiar with Computer in order to understand Derek's needs in using it.
- II. Foster a positive natural attitude in relation to use and purpose of Computer.
- III. Improve head control in all positions.
- IV. Develop any other physical means of reliable control.
- V. Promote relaxation to enhance controlled motion.
- VI. Improve breath control to keep lungs clear, esp. expiration.
- VII. Improve developmental activities: Indian sitting, on knees, all fours.
- VIII. With C.E.T. co-ordinate.
- IX. Become familiar with home, Derek's routines, physical layout, etc. so as to be aware of total program.

MEDICAL SOCIAL WORK
Objectives for Derek Moore
Rita Forsyth, MSW
9-26-77

- I. I see my immediate role as being available to the family and participating in the team meetings.

Maintaining realistic expectations is best achieved by involving the family in periodic conferences and visits to the classroom (Ann met frequently with Linda last year). A log between family as well as staff member visits will also be helpful (per Ann's suggestion for staff working with Ken).

Linda and Betsy have already communicated several times and Betsy reports feeling comfortable contacting Linda when she needs to.

I plan to make a contact soon with the family; after this initial contact--others will be dependent upon need.

II. Long-term objectives:

As Derek grows and becomes more difficult to manage physically, I see more involvement with re: to realistic alternatives and acceptance of these.

To: Communication Enhancement Team
From: Betsy Mark, Teacher
Re: Derek Moore 1977-78 Educational Objectives
Date: October 14, 1977

Following are the Mead Objectives chosen for Derek. These objectives are subject to change or amendment, and suggestions are welcome at any time. The math objectives have been coordinated with the Heath Math Program being used by the Jackson Public Schools. Science, Health, Spelling, Social Studies, Reading, Language, and Computer objectives not specifically stated here follow the course books prescribed for Third Grade Students enrolled in the Jackson Public Schools.

- 060B Identifies four shapes by name
- 060C Picks up two objects of similar shape
- 064B Counts to five and shows corresponding numeral cards
- 064C Counts sets of objects and states cardinal number of set (1-9)
- 065D Names penny, nickel, and dime
- 069C Points to sets having same number of objects
- 069D Places string around set with more members
- 069E Places string around set with fewer members
- 070A Picks picture of unmatched sets and says which has more members
- 070B Picks picture of unmatched sets and says which has fewest members

- 071E Points to one of two numerals which is greater than other
- 072A Picks out requested numeral card (1-5)
- 072D Says number of any point on number line
- 076E Finds correct sums using number line
- 077A Finds correct difference using number line
- 077B Counts and groups objects in sets of tens and ones
- 077C Puts numbers under proper place value
- 077D Shows knowledge of place value in written form
- 078C Arranges pictures from shortest to tallest
- 078D Arranges pictures from smallest to largest objects
- 079A States sum of two sets of objects
- 079B Writes sum of two pictured sets with number sentences (1-5)
- 079C Writes sums of five problems no greater than five
- 079D States sum of two sets of objects (1-10)
- 079E Writes sum of pictured sets with number sentences (1-10)
- 080A Writes sum of five vertical or horizontal problems no greater than ten
- 080B Writes addition facts to 19 using number line
- 080C Writes missing addend no greater than five in number sentences
- 080D Writes missing addend no greater than ten in number sentences
- 080E Writes missing addend no greater than nineteen in number sentences
- 082B Writes sums for 3-digit problem with renaming-carrying
- 082C States and demonstrates role of zero in addition
- 082D States difference of two sets of concrete objects
- 082E States differences no greater than five of two pictured sets
- 083A Writes difference no greater than five of two pictured sets
- 083B Writes difference no greater than five of vertical problems
- 083C States difference no greater than ten of two sets of objects
- 083D Writes difference no greater than ten of two sets of objects
- 083E Writes difference no greater than ten of vertical problems
- 084A Writes subtraction facts up to nineteen using number line
- 084B Writes difference of 2-digit subtraction problems with renaming/carrying
- 084C Writes difference of 3-digit subtraction problems with renaming/carrying
- 088B Identifies and writes half, third and fourth when parts presented
- 088C Writes half, third and fourth when presented as part of set
- 089D Identifies and writes fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ as parts of whole
- 089E Identifies and writes fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ as parts of set
- 094C Tells time to nearest hour and half-hour
- 095E Matches money equivalents
- 097A Writes money values in symbols from written words
- 105E Measures objects to nearest inch, foot, yard
- 106E Equates cups to pint and quart using water
- 108B Identifies terms, abbreviations of metric linear measurement
- 108C Measures to nearest centimeter
- 110D Identifies, interprets, constructs bar, broken line, picture graph
- 126B Writes whole name in cursive

- 126C Writes father's and mother's names
- 126D Writes own telephone number
- 126E Writes address
- 127A Writes birthdate
- 161B Corrects error shown to him
- 161C Corrects error discovered by self
- 161D Works on task for specified period of time
- 163D Follows appropriate direction
- 163E Follows direction after specific time interval
- 164A Attempts to follow directions
- 181A Identifies words with same initial consonant
- 181B Reads letters left to right
- 181C Relates initial consonant sound to symbol
- 181D Identifies ending consonant of words
- 181E Identifies initial consonant blends of words
- 182A Identifies ending consonant blends of words
- 186E Pronounces Preprimer Dolch list
- 187A Pronounces Primer Dolch list
- 187B Pronounces First Grade Dolch list
- 187C Pronounces Second Grade Dolch list
- 187D Pronounces Third Grade Dolch list
- 187E Infers meaning from statement
- 188A Distinguishes between fact and fantasy in written selection
- 188B Distinguishes between statements of fact and opinion
- 189D Tells if paired words have same meanings
- 189E Tells if paired words have opposite meanings
- 190D Recalls orally information presented orally
- 190E Recalls details of story read

Derek is scheduled for an eye exam in Ann Arbor, Michigan.

The speech therapist will work on the Omnicom with Derek on Tuesdays and Thursdays.

The media director will provide a Polaroid camera for use on a trial basis to determine the best camera to purchase for the program for documentation purposes.

The Omnicom has been reprogrammed. Features of the new program are:

1. ability to correct
2. expanded vocabulary
3. easier to lock in different menus
4. ability to talk
5. into the future: the computer will be lighter in weight and come in two boxes.

The teacher and speech therapist have been conditioning Derek for control.

The teacher is not using the Omnicom for academics with Derek at this time.

Derek works on the Omnicom on a daily basis.

A cassette tape recorder and cassette video tapes will be provided for documentation purposes.

The next agenda will include:

1. EMG demonstration
2. Discussion of additional students

October 7, 1977--Presentation--
American Academy of Cerebral Palsy
and Developmental Medicine (AACPDM)

In the fall of 1976, Dr. John B. Eulenberg, Dr. Morteza A. Rahimi, and Lucylee Neiswander submitted an abstract describing the JCISD-MSU C E Program. The intent was to present a paper based on the C E Program to the AACPDM at the October, 1977, National Conference, Atlanta, Georgia.

Over 135 abstracts were submitted, from which the JCISD-MSU abstract was one selected to be presented. The abstract, as published in Developmental Medicine and Child Neurology, accompanied by displays of foreign correspondence received concerning this research program, is presented in Appendix T.

The presentation was entitled: "The Administration and Management of a Computer-Based Communication Enhancement Program." The presentation was made during the Friday afternoon session, October 7, 1977, to over 300 conference participants.

Due to the enthusiasm of the audience, composed mainly of physicians, physical therapists, occupational therapists, and administrators from throughout the world, the news media videotaped a

broadcast for the Channel 11 News, Atlanta. This was the only presentation deemed worthy of coverage by the news media.

It was the first time in history that such a presentation had taken place, interfacing the latest developments in communication computer technology with the medical and educational communities.

The Omnicom was taken to Atlanta, Georgia, for the AACPDM Conference presentation. In the interim, the Exerciser was used with Derek in the classroom. The purpose was to educate interested professionals worldwide in the technological advances being made in the field of communication aids. It was also intended to be a stimulant to professionals to pursue such a program to better assist their C H individuals in obtaining the best educational program possible.

The OTR and the RPT C E team members also attended the Conference for the purpose of gaining knowledge in their respective fields which would be beneficial in programming for Derek, as well as other youngsters on their caseloads.

Team Meeting: Tuesday,
October 18, 1977

In order to involve the family to the fullest extent possible, the Moores are now being invited to the team meetings. A calendar of meeting dates is enclosed (Appendix U). The Moores function as team members by offering agenda items, report on Derek's progress and condition, and partake in the discussions.

The team will visit the ALL-MSU on Friday afternoon, November 11, 1977, 1:30 p.m. We'll meet for lunch at 12:00 noon at the Pretzel Bell.

Everyone was pleased to see that Derek is using the head rest both at home and at school.

Derek may be outgrowing the chair insert. The occupational and physical therapists will do a joint evaluation and follow up on appropriate adjustments.

A future goal of the program will be to duplicate computer components for home use.

It is the responsibility of the team to help others understand the program. Everyone needs to share their progresses. A yellow pad is being left by the Omnicom so everyone can leave notes.

A video tape of EMG was shown. At the next meeting Derek will use EMG.

Dr. Eulenberg reported on the AACPDM national conference.

The main new features of the Omnicom are:

1. Cancel feature--should reduce frustration.
2. Music--now just put notes down--much faster to compare music.
3. Cursor starts at the best speed for Derek.

The teacher asked if Derek could control his wheelchair by using the computer. The answer is "yes"--in the future.

Next meeting agenda:

1. Derek will use EMG or voice input.
2. Discuss other C H candidates
3. Council for Exceptional Children (CEC) State Convention presentation format
4. Be thinking of a logo design for the program.

Daily Log

The anecdotal record-keeping continued by the various team members as they worked with Derek during their regularly scheduled sessions.

October 20, 1977--While working on the Omnicom with the speech pathologist, Derek selected: BRUCE LAURIE AUNT ANGEL GINGER GINGERALL I MALL HELP FOR ARE HAVE HAS AN SHE NO WHICH NO WITH.

October 24, 1977--Derek wrote three letters on the Omnicom while working by himself.

October 25, 1977--When a letter was deleted in the middle of the page, everything thereafter changed to the deleted symbol. This denoted a problem with the Omnicom. The problem was minor and was immediately remedied by the staff.

October 26, 1977--The technologists provided a movable switch so that the occupational therapist could vary the positions. She tried the switch on Derek's knee, left hand, and various positions on the head. It was difficult to assess because it was not stationary and the therapist knew she was giving Derek clues as when to hit it. At present the head switch appeared to be the best solution.

The OTR also observed and evaluated Derek for proper positioning in the wheelchair. He did not seem too big for the chair but did not appear to be getting enough hip flexion.

November 2, 1977--The OTR worked therapeutically with Derek on the Omnicom. He did not seem to be operating the switch consistently. He seemed to be resting on the switch and not bringing his head back to midline. His head appeared always turned to the right. She thought the switch might be too easy to operate so she switched the headrest around so the switch was on the left side. Derek had a great deal of difficulty with this approach. It seemed that the switch was too far back or too far to the side. He was unable to turn his head far enough to the left. Some suggestions were given to the teacher; i.e., Derek's hands needed to be restrained in wrist cuffs while working on the Omnicom to decrease extraneous movement which overflows to the head. It was best for Derek to be repositioned in the wheelchair each time he used the Omnicom to get optimal positioning.

November 7, 1977--It appeared that the sensor was not sensitive enough. The team was still experimenting with equipment. The sensor was sensitive enough. It was the positioning of Derek and of the switch that needed adjusting.

The anecdotal records show that Derek is now working with no head manipulation.

Problems with the Omnicom have been minimal. Any minor repairs have been done by the MSU team. The problems that have occurred occasionally have been with the switching device.

Visitors to JCISD
From Rackham School

The presentation delivered at the AACPDM Conference prompted staff from the Rackham School, a center-based program for POHI, Ypsilanti Public Schools, Ypsilanti, Michigan, to call for an appointment to visit the JCISD Program. The notification to the C E team members, accompanied by the agenda, is displayed in Appendix V.

Two RPTs, one OTR, and one Speech and Language Pathologist arrived on Tuesday, November 8, 1977. This date was selected so the Rackham staff could attend the regularly scheduled team meeting, as well as being able to view Derek working with the computer. Each team member was available to talk with the Rackham staff about their role in the program. The therapists discussed various ideas for the use of straps to obtain improved hip flexion and better positioning.

A small party was also enjoyed by the group in honor of Derek's birthday, November 7, and the JCISD-ALL-MSU program's second anniversary.

The purpose of their visit was to become better informed about the JCISD/MSU program, so that plans could be made to encourage the establishment of such a program at the Rackham School.

Daily Log

November 11, 1977--The OTR visited the ALL-MSU to see the various types of input devices available. She discussed the need for a switch that could be attached to a sturdy object so that staff is not giving clues to Derek as to when to hit the switch.

November 14, 1977--The teacher and Derek began using different menus to construct a sentence (the DM menu and the A-M and the N-Z menus).

DEREK MOORE IS HUNGRY AND TIRED.

By himself, Derek wrote:

AUNT MOM IS HIS

The teacher requested and received from Derek:

BY AND BEEN FOR HELP HAS A

The teacher asked for names:

DEREK MOORE ANGEL BILL BOB DAD MOM BRUCE DEVEN SUSIE GINGER
GRANDMA GRANDPA AUNT LAURIE JOHNNY RUSSELL

The lessons varied--e.g., the teacher asked for: words ending in "ing," words with "m," words ending in "d."

By November Derek has begun using different menus to construct sentences. He is also now able to accurately respond to questions. Academically oriented questions are also receiving accurate responses by Derek using the Omnicom (Photograph 16).

Expansion of the JCISD-MSU Communication Enhancement Program

Parents, additional JCISD staff, the JCISD C E team, and the technologists were all eager to expand the program to other potential C E candidates. The JCISD has chosen to limit the C E Program to students thought to possess normal intelligence. This does not mean that similar programs cannot and should not be developed for the Trainable Mentally Impaired and the Severely Mentally Impaired populations. In terms of the financial status, priorities had to be set. Eventually the goal is to serve all those C H individuals, regardless of intellectual ability, on the belief that everyone deserves an opportunity to communicate.

The identification of five potential JCISD C E candidates prompted the informal evaluation of each candidate.



Photograph 16.--Educational use.

Dr. Eulenberg and Dr. Rahimi visited each student in their respective school settings. Parents were notified of the evaluation and the purpose, and were invited to attend. The evaluations took place on November 15, 1977. The C H students under consideration varied in many respects; however, all were classified as possessing normal intelligence.

<u>Gender</u>	<u>Age</u>	<u>Diagnosis</u>	<u>Vocal Communication Level</u>	<u>Physical Restrictions</u>
female	14	Cerebral Palsy	syntactic	yes--very restricted
male	8	Autistic	phonemic	none
male	7	Cerebral Palsy	syntactic	yes, few restrictions
male	9	Cerebral Palsy	syntactic	yes, tremors, some restric- tions
male	8	Cerebral Palsy	syntactic	yes, tremors, some restric- tions

The same basic evaluation format was followed as was described earlier on pp. 72-74. As a result of these evaluations, the cerebral palsied girl has used the Omnicom on a trial basis. Two of the boys, one cerebral palsied and one autistic, are being schooled in the use of the Handivoice. Evaluation will continue as they become more familiar with the equipment.

The other two candidates were determined to have enough improving intelligible speech to be placed on a waiting list, to be reevaluated at a later date.

The JCISD could easily identify numerous potential candidates attending programs for the retarded. Because of the extensive commitment required on the part of the school district in terms of both personnel and finance, it was agreed that it was essential to establish priorities in order to do what is attempted in the best manner possible.

As the current program gradually expands to include additional candidates, the financial factor per client should decrease to some degree and staff will be better versed in serving these C H individuals.

At this time the program can be extended to include the retarded C H.

Daily Log

November 16, 1977--The OTR worked therapeutically with Derek on the program plan. He appeared to be increasing in head control as he was operating the head switch more accurately. He was able to bring his head back to midline.

Thanksgiving Week--Derek was absent.

November 28, 1977--Derek worked for 20 minutes, then became tense when aides and other students entered the room. Concentration was lost and the lesson was terminated.

November 30, 1977--He selected notes from the music book and wrote them on the screen using the music menu. He then worked alone for 30 minutes selecting words of his own choice and some requested by the teacher.

He appeared to be more tense. Perhaps this was because the teacher didn't joke with him before the lesson to loosen him up and relax him.

December 1, 1977--Working with the speech pathologist, using head manipulation, the student wrote:

YES PLEASE. WILL YOU? NO. WE WANT THIS ONE. PLEASE.
 NO NO WE WERE THERE. THAT ONE PLEASE. DEREK ON THE FLOOR.
 I'D LIKE TO PLAY. I'M HUNGRY.

The OTR talked with Derek's mother about the wheelchair, straps and the need for adjustments. They agreed that he did not need a new insert at this time. It was agreed that an appointment should be made at the orthotics shop to investigate the possibility of having adjustments made to the insert.

The team had continued to experiment with various input devices. One appearing to hold promise was the laryngeal switch (Photograph 17).

December 2, 1977--Initially it was held to Derek's vocal cords and he worked for 15 minutes producing the short sound of e and the long sound of t. He produced many e's and two t's.

December 5, 1977--By himself using the head switch he wrote:

BILL DAD GRANDPA FISH GRANDMA MOM BRUCE GINGER ANGEL SWIMMING
 ANGEL GINGER ANGEL TIRED ON THE FLOOR.

December 7, 1977--The laryngeal switch was used for 20 minutes to teach Morse Code. Derek was able to get six t's spread out over the three lines and place e's next to each other in groups of 2, three times, and groups of three once (t's require long signals; e's require short signals). With the OTR using the laryngeal switch taped to his neck he wrote:

TRUCK A P B V O U

December 8, 1977--The teacher asked, "Who's been making all that noise?" With the head switch, Derek replied (taking ten minutes):

I HAVE BEEN. HE HAD BEEN. IT IS ME. WE ARE. SHE WAS. YOU WERE.

The teacher asked for the following (taking 20 minutes):

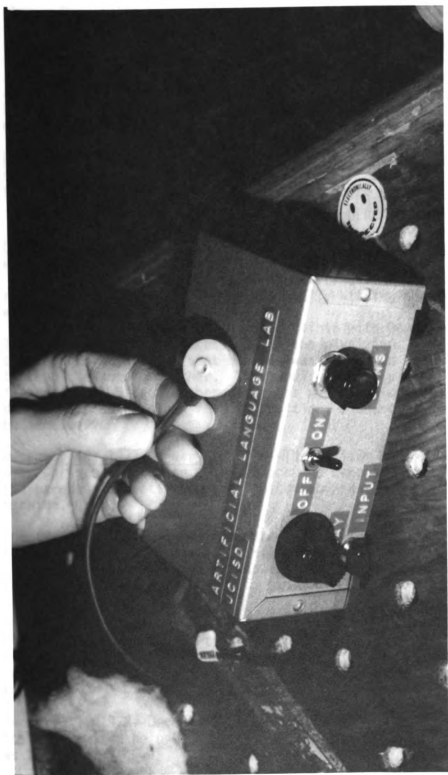
HELP IS BE BUT WANT

Then he moved by himself to the Derek Moore menu. He selected:

DEREK TV BRUCE I'D LIKE

Using the laryngeal switch for ten minutes with the Morse Code, the teacher asked Derek for as many T's as he could give. (T's require longer control on the switch.)

E EE E ET T E T E E TE EE EEEE EE E T E T
 E E E EE T E T E E T T T T E E T E



Photograph 17.--The laryngeal switch.

The OTR, Derek and his Mother went to the appointment at the orthotics shop. They talked with the orthotics expert about ideas for maintaining Derek's position in the wheelchair. They decided to place seat belts inside the lateral pads instead of around the insert. A center post was also suggested. It was decided that Derek's feet come out of the straps because he was not wearing orthopedic shoes as was designed for the chair. The OTR suggested a Y-strap to keep his hips flexed. The appointment offered many suggestions. These would be presented to the physician at the orthopedic clinic.

December 12, 1977--While working on the Omnicom, Derek used the head switch (taking 20 minutes) and the alphabet menu except for the last two words which he formed from the Derek Moore menu; he wrote:

HAPPY HANUKAH AND MERRY CHRISTMAS FROM DEREK MOORE.

December 12, 1977--Today is the first day that Derek cancelled a wrong choice on the Omnicom. He was excited about that.

The Omnicom was shutting off inadvertently. The teacher finally realized that Derek had been accidentally hitting the reset button with his knee.

The OTR attended the orthopedic clinic with Derek and his mother. The suggestions were discussed with the physician. The final decision was to adjust the seat belt as was suggested and try knee straps to keep the knees together. This would hopefully keep Derek more flexed at the hips. Orthopedic shoes were also ordered. If these do not help to keep his feet in position, a change in foot straps may be necessary.

December 16, 1977-January 4, 1978--The Omnicom went home with Derek over Christmas vacation. The Speech and Language Pathologist assisted the parents in setting up the Omnicom and in the operation of the machine.

January 6, 1978--Derek demonstrated the Omnicom to a junior high school teacher using the laryngeal switch.

Using the head switch he answered the following questions correctly asked by the teacher:

Who is your best friend?	Johnny
Who is your brother?	Deven
What sport do you participate in on Mondays?	Bowling
Where do you like to go after lunch?	On the floor.

He had very good control and demonstrated a minimum of anxiety and tension.

January 11, 1978--Derek worked for 40 minutes. In addition to using the head switch he used the laryngeal switch and chose as many t's as he could.

E E E T E E E E T T E E T T E T T E T T T E
T E E E T T T T T T T E T T E

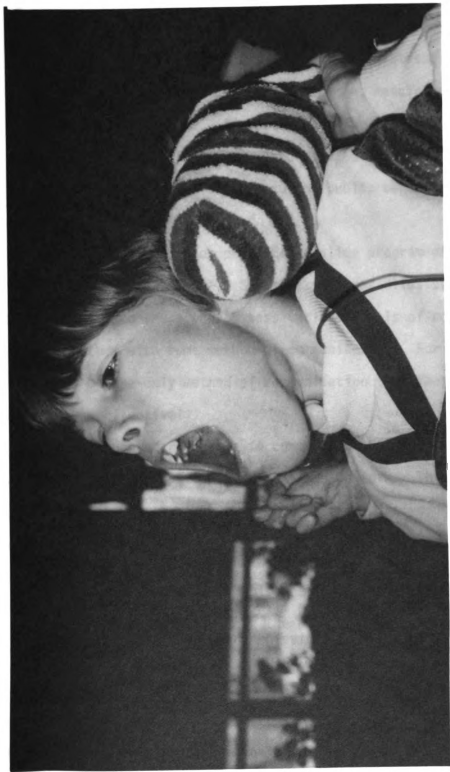
January 12, 1978--This was the first time that Derek used the laryngeal switch taped to his neck without using the Morse Code menu (Photograph 18). He worked for 15 minutes using the Derek Moore menu.

The laryngeal switch has been quite successful, as Derek's ability to phonate on command has been reasonably reliable.

Derek remains quite sensitive to mistakes and to his perception of failure on his part. On two occasions Derek has cried when asked to perform a task on the Omnicom in the presence of a large group of professionals. This has happened only after Derek's efforts failed to produce the results he desired. The pressure appeared to be too much for him. The team has learned to be sensitive to his feelings and not to treat him as a performer before a large group of individuals. This has been a difficult lesson for the team, as they are all just as curious and anxious as Derek to see the results of their total team efforts. Derek has recently displayed maturity and is learning that the entire team is there for the same purpose. This learning experience has profited Derek and the team.

December 6, 1977--Presentation--
Shirley McNaughton

The Director of the Bliss Symbolic Communication Foundation, Toronto, Ontario, Canada, Shirley McNaughton, visited the ALL staff at MSU on December 6, 1977. Her trip centered around the latest research being conducted at the ALL. Experimentation has been carried out to make an electronic Bliss symbolics board "speak" by attaching it to a computer equipped with a voice synthesizer. The



Photograph 18.--Derek using the laryngeal switch.

board can be triggered by touching an area within the selected word field with an electronic pen.

Representatives were also present from Votrax, Vocal Interface Division Federal Screw Works, Troy, Michigan, manufacturers of the Phonic Mirror Handivoice. A prototype of the latest model, Handivoice HC110, was available for discussion, evaluation, and experimentation. This model is available to the public beginning in the spring of 1978.

Shirley McNaughton presented a slide program of the Bliss Symbolic Foundation's work. She stressed that Bliss symbolics can be beneficial to those who possess various levels of retardation by providing them with some method of communication. For these people, Bliss may be the only method of communication that they are ever able to use effectively.

For youngsters unable to communicate by any other method, an apron printed with the Bliss symbols can be worn. This allows for portability and is available for use whenever the youngster has a need to communicate.

Four hundred symbol users have displayed, during the fall term, that the use of symbols does not discourage speech if it is available. The user will point to the symbol and speak. Bliss does not take the place of reading and writing, but is a step toward achieving this goal (McNaughton, 1977).

The program first started six years ago by working with children at the primary level. Now the program has expanded to include the use of Bliss symbolics with individuals of all ages, including adults.

Since Bliss symbolics were being implemented at the Trainable Mentally Impaired and Severely Mentally Impaired Program within the JCISD, the C E administrator attended the lecture by Shirley McNaughton.

December 12, 1977--Newsletter--
Communication Outlook

The International Action Group for Communication Enhancement is addressing interested individuals through the quarterly newsletter, Communication Outlook. The ALL-MSU and the TRACE Center for the Severely Communicatively Handicapped, University of Wisconsin, are co-editors and publishers. The first issue was published in April, 1978 (Appendix W).

Financial contributions were accepted from the Wayne County Intermediate School District and the JCISD, to enable this publication to become a reality.

Communication Outlook was created to increase the dissemination and exchange of information about the on-going developments in communication aids technology to meet the needs of persons who experience communication handicaps due to neurological or neuromuscular conditions.

The newsletter is also aiming to bring together individuals from widely varying backgrounds and academic disciplines, i.e., professional developers, teachers, therapists, aides, communication aid users, their families, and the medical community.

Topics might include new aids, setting up a communication aids program, conference notices, review of literature, employment

listings, sources and strategies of funding, and various types of communication systems.

Six-Month Program Evaluation

The Speech and Language Pathologist wrote the following evaluation: Derek has shown considerable improvement in his ability to voluntarily control the headrest switch. Movement is much more deliberate and concise. At times manipulation of the head or passive restraint is necessary for purposes of controlling overflow contributed by the cerebral palsy or for purposes of structure such as sentence building. It has only been recently that Derek has taken more interest in the laryngeal switch. He has been very successful in his ability to independently select words from the (DM), (AM), and (NZ) menus with the laryngeal switch taped to his neck. The vocalizations consist of "ah" and have increased considerably since September. Lately Derek has been encouraged to attempt consecutive vocalizations such as "ah-ah" so as to produce different letters on the Morse Code menu. At the present time he is limited to T and E (one long or one short vocalization). Although it appears that Derek is attempting to modify the vocalizations, auditory success has been extremely limited. Imitation and patterning have been the instructional tools used to encourage sound variations. Laryngospasms have been observed during attempts to vocalize, probably caused by involuntary opening of vocal fold muscles as a result of cerebral palsy. It is advised not to overtax the vocal folds so as to discourage any possible vocal abuse to the folds. Although there is improved head control, Derek

continues to have some difficulty allowing the cursor to cross the midline of the T.V. screen. Structuring short, meaningful sentences such as "You were there," "This one please," "This one or that one?" or "We want to please" has been a direct teaching-learning approach to the computer. Sentences are presented auditorily or visually through the use of flashcards. It is then Derek's responsibility to reproduce these sentences on the T.V. monitor. The (NZ) menu is frequently used. Passive restraint with the headrest switch is used during this exercise. This structure admittedly discourages errors. Derek's ability to consistently recognize words or comprehend word order (syntax) is questionable. It is assumed that he understands the content of the sentence (semantics). His current expressive communication mode using the computer consists of an understandable schema based on key words representative of a message being sent by telegram, e.g., LET'S GO TIRED (Photograph 19).

December 31, 1977 to Present--
Epilogue

The future of the Program holds much promise. Cooperative Research Agreement (Phase IV) was agreed upon and signed as of January 1, 1978 (Appendix X). This agreement was written with financing of \$5,000. Future program objectives reach beyond the intent of the original agreement.

JCISD/ALL-MSU is now looking toward achieving communication for the several additional candidates who were recently evaluated.

The team is interested in reaching out to secure additional financial resources. Agencies may prove to be of the greatest

NAGABOCZALL BY BEEN HIS IAU
 AOOAB DERK DEREK ANGEL MOORE LET

'S GO TIRED

-----■-----
 >AL >A-M >N-Z FW BK DL IN CL

AN AU BA BI BOB BO BR D DAD DE

FI GI GRM GRP HU I'M IDL JO KI

■ LA LE MOM MO ONF PI RU SU

SW TI TOP TOU TV WI . ?

Photograph 19.---Menu and message.

immediate assistance in this pursuit, although other sources will also be investigated.

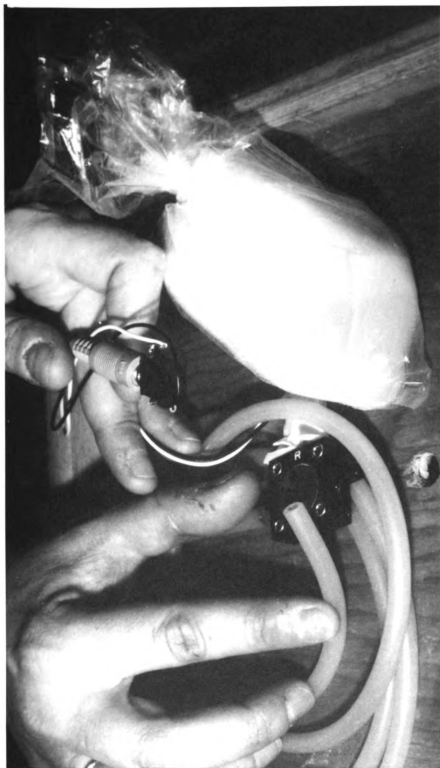
Regular consultation with the technologists is essential to the maintenance and improvements necessary to make the Omnicom a functional machine for Derek. A strip printer and a voice synthesizer have been added to the Omnicom. A remote-control switch is now being developed for Derek's use while he is lying prone on the mat--or out of his wheelchair. This will eliminate the necessity for Derek to be "hooked up" to the machine. A variety of switches continues to be tried in order to improve Derek's control of the Omnicom. One such switch is the pneumatic squeeze switch (Photograph 20).

His growth and development, both physically and mentally, require that this sophisticated combination of man and machine be in a constant state of assessment and reevaluation.

Programming needs are likely to change frequently. As new control mechanisms are discovered, they must be given a trial, evaluated for effectiveness, and either implemented as an additional effective mode of input or discarded as inappropriate for this particular individual.

Since this program was conceived for the purpose of developing a unique computerized communication aid, it remains the obligation of the program staff to initiate innovative ideas and to implement those that have merit.

As these events culminate in actuality, the results will not only provide Derek with an effective mode of communication



Photograph 20.--The pneumatic squeeze switch.

but will become common knowledge and will provide the communicatively handicapped from throughout the world with an answer to their "silent plea for help."

CHAPTER IV

ADMINISTRATIVE STRATEGIES FOR THE ITERATION
OF A COMMUNICATION ENHANCEMENT PROGRAM

Based on the descriptive study, several considerations are presented following the basic skeletal outline, i.e., assessment, design and development, and implementation, as diagrammed in the Basic Conceptual Design for Administration and Management found in Appendix A.

Flow Chart 1, Appendix Y, provides the administrator with a procedural, step-by-step outline of the C E Program iteration, including assessment, design and development, and implementation. Flow Chart 2, Appendix Z, describes the direct relationship of possible available resources to each of the three categories, e.g., assessment, design and development, and implementation.

Assessment

During the assessment period, answers to the following questions might be helpful as an administrator develops programming guidelines for the C H population.

1. What is the minimum and maximum number of C H individuals that can be served by such a C E program?

As was demonstrated by the JCISD-MSU program, only one C H individual is required. The philosophy of this program had been to

initiate the program with one student and then if successful to expand the program to include additional appropriate candidates. This was done primarily because the program was the first of its kind, and outcomes remained highly questionable.

A classroom consisting of several C H individuals would appear to be ideal. In this setting various types of communication equipment could be concentrated as diagnostic and evaluation tools to be used interchangeably for all identified students. The opportunities to experiment with a variety of adaptations for each communication device could be implemented on a more economical basis and on a time-saving schedule.

Another mode of operation might be to develop satellite programs in a variety of settings (wherever the identified individuals are located) utilizing a variety of staff members to function on each team. This method could provide for program coverage to a larger identified population spread over a large geographical area. The variety of staff could also allow for more ideas to be tried in the total program. Each staff from the various satellite projects could join together on a regularly scheduled basis (meeting on a rotating schedule at each program) to exchange ideas and to compare progress notes regarding the C H individuals.

All indications are that any number of candidates could be served by such a program if technological, personnel, time, and financial resources were available to meet the programming needs of each C H individual.

2. How large does the school district have to be to effectively implement such a program?

The size of the district need only be a factor from a staffing and financial point of view. The MSU Research Center has chosen to work primarily with intermediate school districts (ISDs) within the State of Michigan because they are responsible for special education programming throughout the state. Each ISD is accountable for the provision of quality services to all school districts within the designated ISD boundary; e.g., JCISD serves all twelve local school districts and nonpublic schools.

- a. The ISDs are large enough to provide the variety of staff necessary to serve all identified individuals.
- b. The ISD is the sole recipient of educational monies allocated in the State of Michigan for serving handicapped individuals.

For these reasons, it appears advisable for several neighboring school districts, large or small, to form a consortium, like an ISD, and jointly to implement one Communication Enhancement Program to serve their combined population.

3. Does the school district need to be located near a Communication Enhancement Research Center such as the ALL/MSU, or can consultation be carried out by phone or mail?

The geographical proximity of JCISD to the ALL/MSU was an important consideration in the decision to sign the research agreement with MSU.

The need for regular, almost daily communication with the research center is absolutely essential. Progress, or the lack of it, and why, must be communicated immediately. If the response

system or input device needs adjustment, it must be done as soon as possible in order to establish a feeling of continuity, dependency, and reliability between the communicatively handicapped individual and the system being developed.

As experience has demonstrated, nearly every system must be designed especially for that particular individual. The development of the design may take months of experimentation, trial, error, and consultation until a satisfactory system has been achieved. And then growth and development, both physically and mentally, create the need for constant reevaluation. A communicatively handicapped person could advance from a fairly simplistic unit to a highly sophisticated alternate mode of communication.

To date, reprogramming, experimentation, and adjustments cannot be made over the phone or via the mail.

It is realized that only a very few research centers exist that currently possess the capabilities of developing a communication enhancement program of the scope and dimension described here. However, knowledge and interest are spreading fast.

Administrators in every school district should be encouraged to explore the possibilities of such a program with their respective university research centers. Through consultation with the well-established center personnel, fresh new ideas will be born as these new centers are formed, and progress in the field of communication enhancement will flourish.

4. Must equipment be purchased or can it be borrowed from a nearby research center?

At present, the type and number of communication aids is extremely limited. Perhaps only two or three of a kind exist in the country or the world.

Initially, the research center will be using several types of equipment for trial and experimentation. Once the decision has been made on a particular alternative mode of communication, a commitment must be made to purchase such a unit. This allows for the center to use those same devices elsewhere.

Ownership can be a highly motivating factor, not only to the communicatively handicapped individual and his parents, but also to the staff working to gain proficiency with the device.

To only borrow a unit (and that could only be done if it was already designed and available) could denote to the individual and his parents that it really is not an important, worthwhile, lifelong surrogate. By making a purchase, the educational personnel are saying, "We believe in you. We want to help you communicate with us because we want to communicate with you. We want to help you become an independent, contributing member of society."

In the future it is hoped that these individuals will be able to go to a nearby center designed specifically to loan various types of aids for trial only. In this way, C H individuals could find a device most helpful to them, and then by themselves, or with assistance, purchase or pursue the development of just such a device for themselves.

5. Can anyone effectively implement a C E Program?

Parents, physicians, friends, agency personnel, and numerous others should be encouraged to become knowledgeable of what is available in the area of C E. In this way the C H can more easily and readily become identified for such a program. Implementation of such a program almost certainly requires the expertise of a variety of professional personnel (technologists and educators) to evaluate, plan, experiment, implement, and reevaluate the individual's needs as well as the long-range program needs (see Chapter III). These professionals have the opportunity to be in contact with other researchers and educators in this field and in related fields and can bring to the C H individuals the latest in research and technology from throughout the world.

Schools appear to be in the best position to recruit a team of appropriate professional personnel and to receive the necessary financial support to provide a C E Program to serve this population.

When salaries, time, equipment, and program costs are totaled the commitment can be quite extensive. And when this program is accurately viewed as an extended long-term program, the commitment becomes even more intense. In certain instances where agencies, hospitals, or rehabilitation centers have completed a self-evaluation and have found themselves in a comparable position to support such an endeavor, they should take advantage of the opportunity to incorporate a similar program into their operational framework.

6. Do the C H have to be moved to a center to effectively implement a C E Program?

C E Programs may be implemented in any location where a C H individual is attending an educational program.

The technologists and staff may work itinerantly, if necessary, seeing these individuals located in a variety of settings. The program philosophy is to provide C E for these individuals in the least restrictive environment. Therefore, the C E team and the communication equipment can quite easily be transported to the C H individuals. Portability and functional everyday use of this communication equipment is the desired result. By serving these identified individuals in a natural setting, the staff is contributing toward making them as independent and self-sufficient as is possible.

7. How can school districts meet the financial demands required by such a program?

School districts are finding themselves legally responsible for providing an increasingly broad scope of special education services in every community. At the same time the local, state, and federal financial aid never quite seems to be enough to meet these mandates. Therefore, if an innovative program such as this one is to be effectively implemented, financial resources in addition to those budgeted may have to be secured.

A basic list of potential financial sources is listed below:

LOCAL: Agencies--United Cerebral Palsy Association, Cancer Society, March of Dimes

Service Clubs--JayCees, Civitan, Rotary, Elks

Gifts and bequests--private individuals

Fund raisers--marathons, bingo

STATE: Foundations--Kellogg, Mott

FEDERAL: Government--Bureau of Education for the Handicapped (BEH)

Foundations--Kennedy, Kresge, National Science
Foundation (NSF)

Corporations--Enco, Textron, Control Data Corporation,
Bell Telephone

If the school district can respond favorably to the assessment questions just presented, the administrator will likely direct attention to the design and development phase. Several issues of concern at this stage are highlighted for the administrator's consideration.

Design and Development

Effective communication within the community can assist in increasing public awareness and understanding of the needs of the C H. This support can be of assistance in a number of ways; i.e., passage of millage elections which in turn helps to provide financing for such programs as the C E Program; professionals from a variety of community disciplines will perhaps be more inclined to provide cooperative expertise and financial support for the C H; agencies, private foundations, and local industry may also be more willing to provide financial support; the medical profession can offer valuable assistance in the early identification of C H individuals and can collaborate with the C E team on the treatment and care of the C H.

The investigation of all known available resources will help constitute a well-informed board of education, administration, and

staff. This will allow them the opportunity to be open and alert to ideas and suggestions from other research centers and school districts interested in the C H. They can benefit by openly campaigning for information about C E from such sources as periodicals, newspapers, companies, neighboring districts, radio, TV, and universities. Administrators and interested staff can also be encouraged to attend various institutes, seminars, or colloquiums relating to C E.

Also, before deciding on a C E program design, school district personnel would most likely benefit from investigating the best C E programs or ideas firsthand by conducting a formal evaluation of each program or idea before a commitment is made. Consideration might include: appropriateness of the program for candidates, financial commitment, personnel commitment, facility requirements, program justification, reputation of the research center and existing programs, and legal contractual terms including approval for research involving human subjects.

Following the appointment of a program administrator, short-range planning can be accomplished by including the careful selection of staff, the definition of roles, the establishment of a type of management system, the identification and writing of individual objectives, the establishment of daily operational procedures, and the development of evaluation procedures as an integral part of the daily operation.

Implementation

The initial identification of individuals for a C E program will most likely consist of candidates of all ages.

Among the early programming concerns for the C H might be provisions for an early identification program for young C H individuals, coupled with periodic, thorough, impartial evaluations by a team of professionals.

The administrator may want to consider as a primary goal the development of an effective interface between the university research technology team and the school district educational team. This can be enhanced as the staff becomes actively involved on a regular basis in the decision-making process and program planning. This two-way channel of communication among staff members allows for all team members and the administrator to be an integral part of the operation.

Active parental participation can also be encouraged by including them as members of the team.

Experience has demonstrated that contingency program monies should be made available at the local level for small incidental purchases such as micro-switches, film, and conference travel.

Throughout the duration of the program, the administrator can provide certain organizational procedures that will enhance the success of the daily operation.

By placing communiques in written form whenever possible, by directing these communiques to all appropriate administrators, staff, and parents, and by planning frequent team meetings in advance, staff

are better able to meet their additional caseload obligations. Written agendas prepared in advance, as well as a personally identified notebook designed to hold all CE information, can also lend an air of organization to the program.

Regular program documentation using a variety of recording media, i.e., video tape, tape recorder, slides, photographs, Polaroid photographs, movies, anecdotal records, written meeting minutes, individual objectives, and the keeping of a daily log, can provide evidence of progress as well as valuable information for future reference.

The team's morale, attitudes, and understanding toward the program can be uplifted as they are assisted in the realization of the importance of planning for and implementing a "readiness period" allowing for evaluation and experimentation with various input devices and response systems which could last for an extended time, depending on the complexity of the system to be developed.

A team approach can be encouraged and more easily sustained if trips are planned for the entire team to the university research center. A luncheon during the trip or an arranged social gathering can also promote cohesiveness among the team. The team can profit from praise for their innovative ideas, efforts, and progress, as many frustrating times can occur as well.

As staff assumes the responsibility for keeping the lessons varied, interesting, fun, and adaptable, they can also develop an awareness of the CH individual's social and peer relationships as

well as physical, academic, and communication needs, thereby providing the framework for meeting the total needs of the C H.

A sensitivity to the emotional and psychological feelings of the C E candidate may prove essential when experimentation is being carried out over an extended period of time. An additional consideration may also be to realize the necessity of remaining flexible and accepting program disruptions as they occur.

Once the program is established and progress is evident to a certain degree, the district may want to encourage staff members from nearby districts to visit the program. As other districts are ready to initiate similar programs, staff can also be encouraged to assist and offer helpful suggestions.

Program presentations on the state and national levels can assist in the sharing and dissemination of the latest information in the field of C E.

A successful program will most likely be open to expansion to other identified potential C E candidates within the district. As program expansion is being considered, all appropriate staff can be given the "professional advantage" of becoming a member of at least one particular C E team serving one or more C H individual(s). This technique will allow for additional staff to become actively involved, to offer ideas, to become informed, and to disseminate information about the field of C E on a broader basis.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The JCISD, Jackson, Michigan, is mandated by law to provide appropriate special education programs for all students identified as handicapped residing within the JCISD. Technological advances are playing an important role in helping special educators solve the communication and programming needs of the C H. One such pilot research program is the JCISD/MSU C E Program, which was initiated July 1, 1976, and is continuing at the present. This program is focused on one choreo-athetotic cerebral palsied quadriplegic C H boy named Derek.

Prior to the inception of the C E Program, programming efforts for Derek had centered on oral-motor stimulation, increasing muscle tone, range of motion and general motor ability, improved head control, sitting balance, breath control, tongue control, vocalizations, and limited tutorial academically oriented activities.

Derek's winning personality, sensitivity to staff requests, and limited "yes" and "no" responses with his eyes led the majority of staff to believe that Derek possessed normal intellectual potential. This notion was confirmed during an evaluation session conducted by a regional evaluation center.

Because of his intellectual potential, the EPPC determined that Derek should be given the chance to attend school in the POHI classroom which was housed in the least restrictive environment, a regular elementary school building.

Appropriate positioning was necessary in terms of helping Derek to function more effectively in this educational setting. After varied attempts had not accomplished the desired results, effective positioning was achieved for Derek at the Indiana University Medical Center's Cerebral Palsy Clinic, Indianapolis, Indiana.

In 1976, Derek was age nine. It was evident that a communication system was necessary if Derek ever was to become an active participating member of his class.

Various communication systems were explored by the staff and administration at the JCISD. The JCISD/MSU Communication Enhancement Program was agreed upon following a thorough evaluation of the proposed program.

The designated C E Program administrator was responsible for program planning. A multidisciplinary team was selected and a modified MBO administrative approach was implemented.

The program was viewed as one with a long lead time and having a distinct possibility of not succeeding. However, because the program was deemed important enough to make progress in the type of equipment and services available to all C H, it was initiated in a quiet yet sequential manner. Program evaluation was carried out on a regular basis, during regularly scheduled team meetings.

The goal of the program was to develop, for Derek, an efficient and effective computerized communication aid consisting of a micro-processor, TV monitor, printer, and voice synthesizer. This was to be a prototype, designed especially to meet Derek's needs. In order to accomplish this goal, an effective interface had to be developed between the educational and the technological teams.

During the developmental period, Derek's first communication aid was "The Communicator." Various types of input or switching devices were tried. To date, the head and laryngeal switches appear to be the most reliable for Derek. Just prior to the arrival of the computer (Omnicom), Derek used a second communication aid, which was a simple linear scanning device called an Exerciser. The Omnicom arrived in July, 1977. Since that time the programming focus has been on the functional use of the Omnicom, i.e., control of the input device and the development and understanding of language concepts.

Additional C H individuals have since been identified. The C E Program continues with a focus on experimentation to determine the best communication systems for Derek and those newly identified individuals. Work has continued with each student to develop educational components and to improve language concepts and bodily functions.

Findings

As a result of this C E Program research study, the following significant findings have emerged.

1. Administrators can put a team from various professional fields together and be able to (a) introduce them to new technology, (b) introduce them to a new level of cooperation, (c) use the computer as a central focal point for communication and educational purposes, and (d) learn that resentment toward new technology is expected and can be overcome.

2. Although initially the cost seems prohibitive, there are many sources for finance that are available and can be tapped.

3. The administrator's role combined essential skills in program management, personnel management, public relations, budgeting, the understanding and coordination of the new technology of C E, and in defining projected C E Program goals for the district's C E population.

4. The dissemination of information to the public, parents, other school districts, research centers, and other entities was an important obligation.

5. There was a necessity to remain informed through the interaction with other school districts, agencies, and organizations involved in C E.

6. The professional staff selected found it essential to function as a team. By encouraging them to actively partake in the decision-making process and in program planning on a regular basis, they brought to the program a variety of new and innovative ideas. They identified with the student and developed realistic expectations and attitudes. They shared their thoughts, ideas, and frustrations with one another, with the parents, and with administrators, thereby

functioning as a cohesive, progressive unit. They eagerly shared information with other C E centers and openly campaigned for the latest information in C E.

7. An active, interested, participating family was essential. They offered insights, direction, and support to the program. They encouraged Derek and carried out the instruction and use of the equipment in the home setting, thereby bringing to fruition the daily functional coordination and use of the C H individual and the machine. For the first time they realized the potential of their C H child to communicate and encouraged other parents to pursue similar endeavors designed toward the development of independent communication.

8. Community-wide cooperation and support, professionally and financially, was essential to the development of a successful therapeutic and educational C E program component.

Agencies offered financial support for the provision of appropriate medical care and treatment and in meeting the equipment needs of this individual.

Physicians and related professional personnel provided knowledgeable services and encouraged and assisted in the experimentation of devices and methods thought to improve bodily functions.

9. The acquisition and use of the communication system with Derek assisted in the development of improved peer and staff relationships with Derek. As a result of this program, Derek's isolation decreased. It offered a medium for him to relate not only to significant others but to the world around him. It allowed Derek to

participate more independently and to improve through socialization, to develop self-esteem, and to function with greater adaptability.

Conclusions

As a result of the findings, the following conclusions have been drawn:

1. With society's concern surrounding the depersonalization of man through the advancement of science and technology, this C E team has had the good fortune of being involved in a program where science and technology have been subordinate to human purposes.

2. Technology and education are two ingredients essential in providing appropriate surrogate devices and programs for C H individuals. The fields of technology and education can develop a compatible and effective interface.

3. The C H can learn to communicate in a manner acceptable to society using these alternate modes of communication. Programming for these individuals in the least restrictive environment can enhance their first-hand experiences and can provide situations where communication becomes a necessity in their day-to-day existence. The results of this research can lead to the benefit of C H individuals the world over. The development of efficient and effective communication aids and the subsequent ability of the C H to efficiently use these surrogates in a manner acceptable to society would appear to be a giant step toward achieving acceptance as potentially capable, productive citizens.

4. If a C E program is to become successfully operational, it becomes the responsibility of the program administrator to develop effective ways to blend the varied philosophies and this wealth of knowledge held by the technologists and educators into a workable and effective program.

5. Although financing will continue to be a major concern of program planners, it no longer need be a deterrent to program implementation.

6. Intermediate school districts or a consortium of school districts appear to be in the best position to initiate C E programs for their C H populations in concert with their local university research centers.

7. One such C E program can stimulate the inception of other similar programs and assist in the dissemination of information, knowledge, and ideas over a broad geographical area.

8. C E is a young field functioning in many ways as an infant, but growing rapidly as a result of the interface of engineers, linguists, computer scientists, educators, lay people, and the C H themselves.

Recommendations

The writer views the following recommendations as desirable in meeting the needs of the C H.

1. As members of the C E team, researchers and educators should strive to educate the public to the needs and potential of the C H. Children and adults need to realize that direct contact,

along with cooperation in the pursuit of common objectives as functional equals, is of critical importance in improving attitudes between the nonhandicapped and the C H. This can be accomplished and should be pursued through inservice training for parents, students, teachers, and administrators; conferences sponsored at the state or local level; workshop and discussion groups; and grants awarded to institutions of higher education including training in working with C H children, in order to help foster positive attitudes toward the C H.

2. The C H should be identified and evaluated at the earliest age possible. Nearby research centers should be made aware of the need for the establishment of C E programs. Programs should be designed and implemented wherever the C H reside.

3. Parent groups for the C H should affiliate to assist in the gathering and dissemination of information and to assist one another to better meet the needs of their children. These influential groups, i.e., educational centers, research centers, and parent groups, should also emphasize to the federal government the need for continued financial support for research programs throughout the country.

4. Educators need to familiarize themselves with the numerous beneficial uses of computerized technology so they can intelligently interact with the technologists and their equipment.

5. The writer encourages formal documented research in order to support the notion that C H individuals are capable of communicating

in a functional manner with the use of a suitable communication prosthesis.

6. Further documentation of various techniques being tried by multidisciplinary team members should be recorded and published. Only in this way can successful methods and techniques be shared with colleagues working with individuals with similar needs.

7. The documentation and sharing of administrative strategies by special education administrators and research center personnel is also recommended so that other administrators can profit from these successful administrative experiences. As tried and suggested guidelines are followed, administrators can more easily establish C E programs that function with efficiency and effectiveness at both the educational and technological levels.

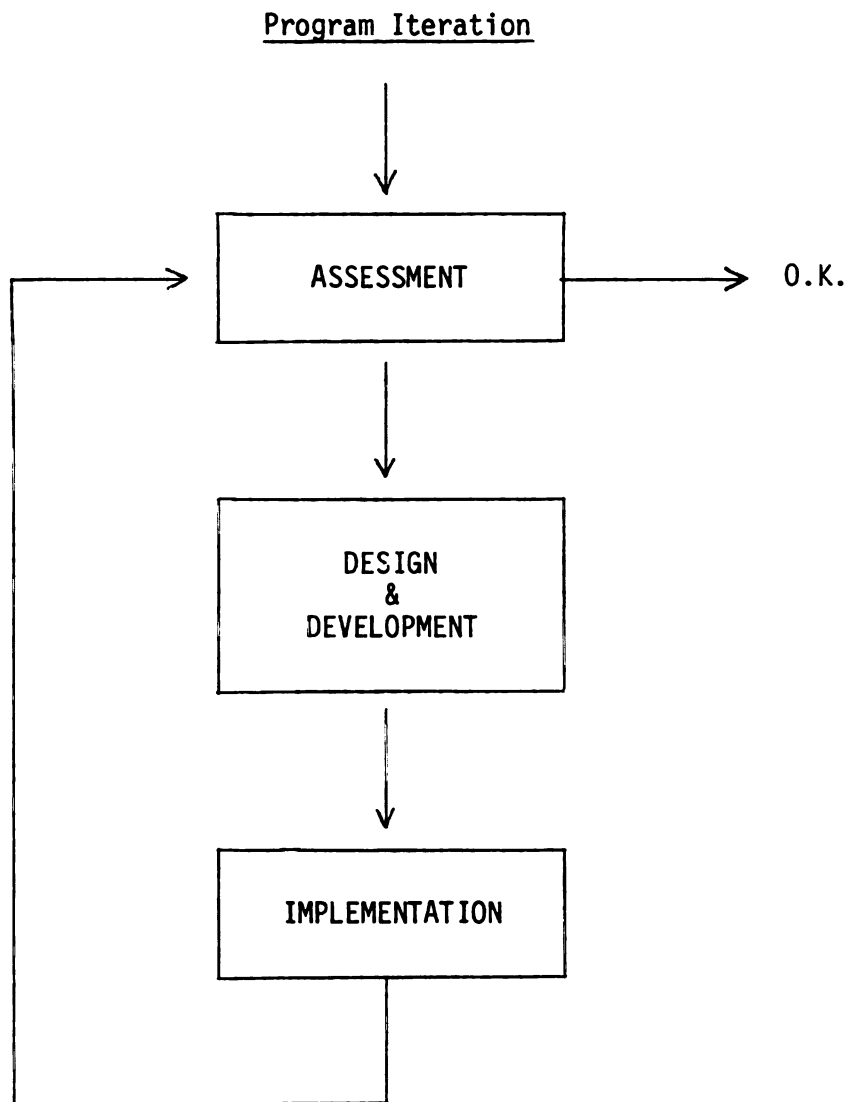
APPENDICES

APPENDIX A

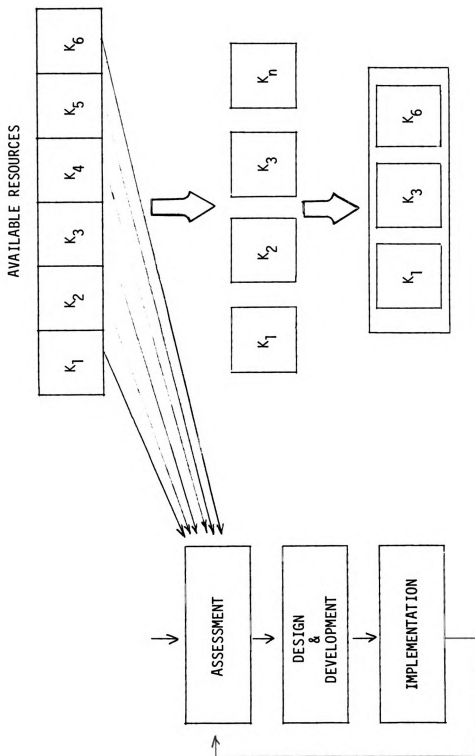
BASIC CONCEPTUAL DESIGN

APPENDIX A

BASIC CONCEPTUAL DESIGN



Utilization of Resources



APPENDIX B

UNIVERSITY COMMITTEE ON RESEARCH INVOLVING

HUMAN SUBJECTS (UCRIHS)

UNIVERSITY COMMITTEE ON RESEARCH INVOLVING
HUMAN SUBJECTS (UCRIHS)

EAST LANSING • MICHIGAN • 48824


Henry E. Bredeck, Ph.D.
Chairman, UCRIHS

APPENDIX C

PREVALENCE OF PEOPLE WHO CAN UTILIZE COMMUNICATION AIDS

APPENDIX C

PREVALENCE OF PEOPLE WHO CAN UTILIZE COMMUNICATION AIDS

Disability Category	Total	Temporary Percent	Non-Writing Percent	Non-Verbal Percent	Non-Vocal Percent
CP	750,000	0%	40%	10%	20%
Quad (Traumatic)	50,000	--	100%	--	--
CVA Aphasic (Total)	1,500,000	0%	--	100%	--
CVA Aphasia (Temporary)	300,000	100%	--	100%	--
Post Operative	*	*	*	*	*
ALS	10,000	100%	--	--	100%
MS	250,000	--	--	--	40%
Parkinson's	700,000	--	20%	--	10%
M. Dystrophy	500,000	--	5%	--	2%
Laryngectomy	40,000	--	--	--	100%
Viral Infection	100,000	x	x	x	x
TOTAL	4,200,000	310,000	515,000	1,975,000	380,000

Note: Total of school-age children is 100,000.

*National Center for Health Statistics may have estimates.
 xLack of information.

APPENDIX D

LETTER TO DR. DUDLEY S. CHILDRESS, Ph.D.

APPENDIX D

LETTER TO DR. DUDLEY S. CHILDRESS, Ph.D.

**JACKSON COUNTY INTERMEDIATE
SCHOOL DISTRICT**

COMMERCIAL EXCHANGE BUILDING
2301 EAST MICHIGAN AVENUE
JACKSON MICHIGAN 49202
TELEPHONE (517) 787-2800

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Deputy Superintendent
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HENRY W. KUEHL
Deputy Superintendent
for Vocational Education

May 27, 1975

Dudley S. Childress, Ph.D.
Prosthetic - Orthotic Center Research Laboratory
Northwestern University Medical School
345 East Superior Street
17th Floor
Chicago, Illinois 60611

Dear Dr. Childress:

I am writing at the recommendation and suggestion of Dick Koch, Orthotics, University of Michigan Medical Center.

He indicates that you are the man most knowledgeable in the area of electronic technology for use in communications for the severely impaired.

Our concerns center around a boy, quadraplegic, cerebral palsy, birthdate, November 7, 1966. He is a severely involved child with total involvement. He has no functional speech, or head and body control.

The child has demonstrated only minimal improvement in body function over the years.

It is indicated that he is of normal intelligence. His only current means of communication is by utilizing eye movements to answer yes and no.

Several communication methods have been tried to no avail. Therefore we realize that we must provide him with a method of communication for his immediate use.

With this brief discription we are hoping that you can realize and appreciate our frustrations as educators, as well as his as a young boy.

We are anxious to utilize your expertise if at all possible.

We are most willing and able to bring the boy to you for an evaluation, or to work out a plan convenient to you. You can contact me by calling 517-787-4833.

Sincerely,

Lucylee Neiswander, Supervisor
Department of Physically Impaired

APPENDIX E

LETTER FROM DR. DUDLEY S. CHILDRESS, Ph.D.

APPENDIX E

LETTER FROM DR. DUDLEY S. CHILDRESS, Ph.D.

NORTHWESTERN UNIVERSITY

CHICAGO, ILLINOIS 60611

REHABILITATION ENGINEERING PROGRAM
ROOM 1441
345 EAST SUPERIOR STREET
AREA CODE 312, 649-8560

June 26, 1975

Ms. Lucylee Neiswander, Supervisor
Department of Physically Impaired
Jackson County Intermediate
School District
Commercial Exchange Building
2301 East Michigan Avenue
Jackson, Michigan 49202

Dear Ms. Neiswander:

I am writing to follow up our phone communication of June 24, 1975, with respect to the severely disabled boy in your district.

Since our talk, I've wondered about the boy's language development. The ETRAN communicator which we discussed assumes a knowledge of language and spelling which he may not have. If he has not developed reading skills, you may wish to investigate symbols as a speech substitute until reading and writing abilities are developed. My background, as you know, relates to technical developments and I would refer you to:

Shirley McNaughton,
Ontario Crippled Children's Centre
350 Rumsey Road
Toronto, Ontario, Canada

for suggestions. She is an expert in the use of Blissymbolics. Of course, the boy in question may be beyond this point developmentally.

I also think it would be well for you to communicate with Gregg Vanderheiden. His address is:

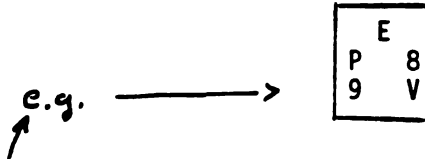
Gregg C. Vanderheiden
Director, Cerebral Palsy Communication
Group
922 ERB, 1500 Johnson Drive
University of Wisconsin-Madison
Madison, Wisconsin 53706
Phone: (608) 262-6966.

Mr. Vanderheiden is an engineer, but has wide experience in communications problems of cerebral-palsied children.

Information on the ETRAN Eye-Signalling System is enclosed. You will want to get instructions for its use and construction directly from Mr. Eichler if you decide to use it. Basically, after eye contact is established, the user looks

Neiswander

June 26, 1975



at the group in which the letter or number he wants is located. For example, if he looks at the group and then looks back, the letter desired is "E". If he looks at this group and then down to the right corner of the board, the letter desired is "V". The person being communicated with then says "V" and the user confirms or rejects the choice with a "yes" or "no" indication.

If you have not used simple letter boards with the boy, you may want to use them before trying the ETRAN communicator. Some of these techniques may be amenable to more sophisticated approaches if they prove useful in the simple state.

I'll be interested to know of your results. This is a difficult case and I suggest you discuss it with sources other than myself.

Best wishes.

Sincerely,



Dudley S. Childress, Ph.D.
Co-Director

DSC/jgw

Enclosures

NAME OF AID

Etran Eye Signaling System

PHYSICAL CONSTRUCTION

Size: 24½" x 20½" x 10"

Weight: Approximately 4½ lbs.

Portability: Fully Portable

Power Requirements: None

GENERAL APPEARANCE

24½" x 20½" x 10" clear plexiglass sheets with 12½" x 12½" hole cut out of center. Letters are printed on plexiglass around perimeter of sheet.

BRIEF DESCRIPTION OF OPERATION

The sender and receiver sit facing each other 4 or 5 feet apart as in normal conversation. The chart, which contains arrangements of 5 letters in 8 distinct areas, stands upright midway between the two people permitting them to view each other through the large aperture at its center. The sender directs his eyes to one of the chart areas and in accordance with the code directs his eyes to the receiver or to one of the four corners and then to the receiver. After eye contact is obtained, the receiver speaks the letter while watching the sender's eyes for confirmation or correction and then writes the letter on the message paper. His gaze is then returned to the sender which indicates he is ready for the next letter. Speed of transmission usually improves up to a letter per second as a receiver gains experience.

ANY OTHER INFORMATION

Mr. Eichler is available on a volunteer basis for consultation, design and development of communication alternatives, if specific requests are presented to him.

COST

Not available. However, a dimensional drawing providing instructions for fabricating the "Etran Chart" (5/23/73) is available to persons requiring the eye signaling system at no cost from Jack H. Eichler. Instructions for use of the Etran Eye signaling system are also available.

ESTIMATED DELIVERY TIME

For plans only--2 weeks

PERSON/INSTITUTION WHO DEVELOPED AID

Jack J. Eichler and Hugh C. Neale

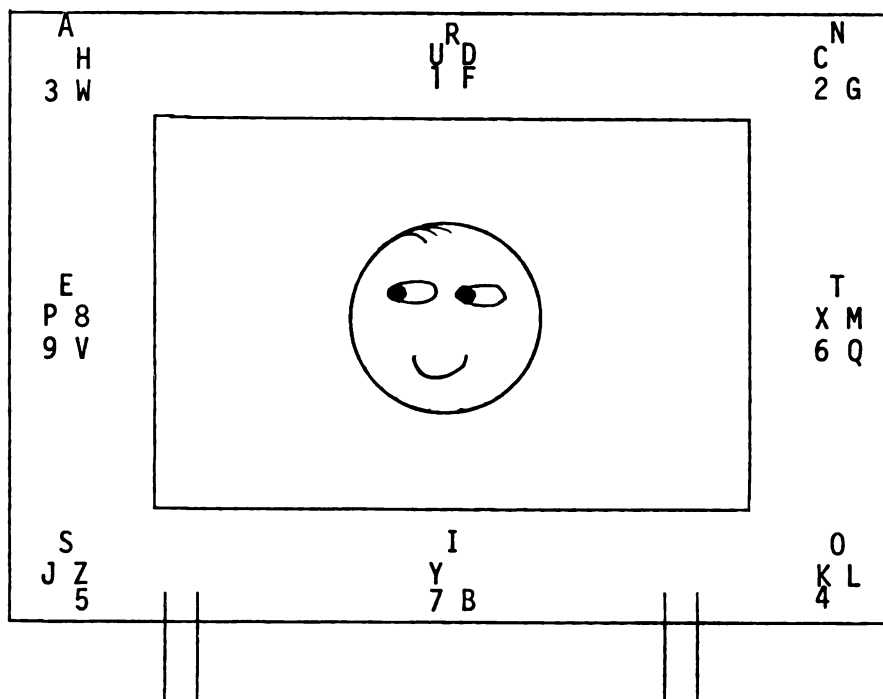
FOR FURTHER INFORMATION

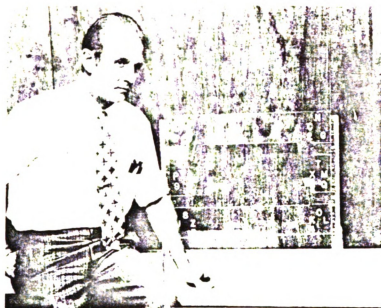
Jack H. Eichler
P.O. Box #685
Westport, Connecticut 06880

or

Jack H. Eichler
5 Beaver Brook Road
Ridgefield, Connecticut 06877

Rough Drawing of ETRAN Communicator





ETRAN EYE SIGNALING SYSTEM
 Courtesy of Jack H. Eichler,
 Ridgefield, Connecticut, U.S.A., 1973.



HEAD STICKS AND HEAD ATTACHMENTS
 Courtesy of The National Institute of Rehabilitation Engineering,
 Pompton Lakes, New Jersey, U.S.A., 1974.

APPENDIX F

LETTER FROM SHIRLEY McNAUGHTON

APPENDIX F

LETTER FROM SHIRLEY McNAUGHTON

ONTARIO CRIPPLED CHILDREN'S CENTRE

350 RUMSEY ROAD • TORONTO, ONTARIO, M4G 1R8 • TEL. 425-6220

INCOME TAX DONATION
REGISTRATION NO. 1103277-10-113

Sept. 14, 1975

Lucylee Neiswander,
Dept. Physical Impaired,
Jackson County,
Intermediate School Dept.,
2301 East Michigan Ave.,
Jackson, Michigan 49202

Dear Ms. Neiswander:

Enclosed are some of the materials I promised when you phoned today. Those requiring payment are being sent under separate cover.

You will receive notice of our Workshop within the next week.

I look forward to hearing from you and hope you will be able to send staff to the Workshop on November 19, 20 and 21. This would provide most comprehensive insight into our Communication programme.

Sincerely,



Shirley McNaughton, Director,
Symbol Communication Programme

SMcN/dm

APPENDIX G

LETTER TO SHIRLEY McNAUGHTON

APPENDIX G

LETTER TO SHIRLEY McNAUGHTON

**JACKSON COUNTY INTERMEDIATE
SCHOOL DISTRICT**

COMMERCIAL EXCHANGE BUILDING
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CASIMIR F. SCHESKY
Deputy Superintendent
for Special Education

HENRY W. KUEHL
Deputy Superintendent
for Vocational Education

October 20, 1975

Shirley McNaughton, Director
Symbol Communication Programme
Ontario Crippled Children's Centre
350 Rumsey Road
Toronto, Ontario, M4G 1R8

Dear Ms. McNaughton:

It was indeed a pleasure to talk with you regarding the Bliss symbolic Communication system.

Our educational team has met and monies have been approved for them to attend your workshop scheduled for November 19, 20 and 21.

We have also planned to take advantage of your suggestion, and have arranged for the team to arrive one day in advance, on Tuesday, November 18th.

Hopefully this will be a convenient time to consult with your staff regarding the specific concerns we have with Derek Moore, the severely involved Cerebral Palsied child we will be teaching to use the Bliss Communication system.

If this time conflicts with your schedule, please call and we will be happy to make other arrangements.

Sincerely,

Lucylee Neiswander

Lucylee Neiswander, Supervisor
Department of Physically Impaired

LN:dr

APPENDIX H

LETTER FROM INDIANA UNIVERSITY MEDICAL CENTER'S
CEREBRAL PALSY CLINIC

APPENDIX H

LETTER FROM INDIANA UNIVERSITY MEDICAL CENTER'S
CEREBRAL PALSY CLINIC
INDIANA UNIVERSITY HOSPITALS

University • Robert W. Long • William H. Coleman • James Whitcomb Riley
1100 WEST MICHIGAN STREET • INDIANAPOLIS, INDIANA 46202

(317) 264- 2131

Oct. 2, 1975

(Mrs.) Mary N. Willy, O.T.R.
Jackson County Intermediate School District
Commercial Exchange Building
2301 East Michigan Ave.
Jackson, Michigan 49202

Dear Mrs. Willy,

The staff at the Cerebral Palsy Center have been attending their annual conference in New Orleans and arrangements for Derek Moore could not be made until their return.

I talked today with Miss Pat Griswold, M.S., O.T.R., Supervisor of Occupational Therapy at the Cerebral Palsy Center. They are willing to have Derek come to Indianapolis for evaluation, positioning, and program development.

They project 2½ to 3 days time required. The room rate at the Union Building is \$16.00 per day for a double room. Evaluation and intensive treatment by PT and OT for 2½ to 3 days will total about \$80 - \$100. Positioning equipment costs would be added to that, depending on what might be needed.

Please contact Miss Griswold by phone to arrange dates, etc. It is best to call her at (317) 264-8667 before 9:30 AM or after 2:00 PM. Please do not call on a Wednesday and keep in mind that Indianapolis is on Eastern Standard Time.

Here's hoping that arrangements can be worked out.

Sincerely,



(Miss) Cel Hamant, M.S., O.T.R.
Associate Professor
Director, Occupational Therapy Service
Riley Hosp. A-593

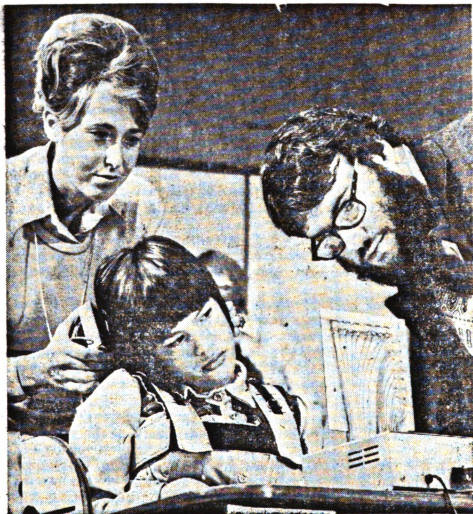
cc: Pat Griswold
CH:cj

APPENDIX I

ARTICLE, DETROIT FREE PRESS

APPENDIX I

ARTICLE, DETROIT FREE PRESS



Free Press Photo by BOB SCOTT

Vicki Karuso (center) activates the computer that lets her hear words of her choosing for the first time in 17 years. Assisting are teacher Marge Easto and Dr. John Eulenberg, who developed the system.

The following article by William Grant, Free Press Education Writer, appeared in the Detroit [Michigan] Free Press, Thursday, October 30, 1975.

HANDICAPPED GIRL SPEAKS FIRST WORDS VIA COMPUTER

"I am Vicki Karuso" is a simple enough four-word phrase. But in 17 years Vicki Karuso has not been able to say those or most other words.

Vicki has had cerebral palsy since birth and is so severely handicapped that she has almost no control over her body and can speak only a few almost unintelligible words.

Wednesday, for the first time in her life, Vicki was able to "speak" by pressing her head against an electronic switch which helped her choose words that were then spoken by a talking computer.

"I am Vicki Karuso," she tapped out with her head.

A smile exploded across her face as she heard the words come out of a speaker, and she quickly tapped out "I want water. I like to talk," from the computer's vocabulary.

"This is fantastic," said Mary Abler, whose 14-year-old daughter, Jane, has been working most of this year with the Michigan State University professor who developed the computer system that Vicki first used Wednesday.

"Just think of the unanswered questions of all of the people who cannot talk. Just think of finding a way for them to communicate," Mrs. Abler said.

Both Vicki and Jane are patients at the Plymouth Center for Human Development, a facility run by the state Department of Mental Health for retarded people who have half or less normal intellectual ability.

The two took part in an equipment demonstration for special education teachers in the Northville school system.

There were other demonstrations--and other victorious results. Jane Abler, who has virtually no control over her body as a result of a delivery room accident in which oxygen was briefly cut off to her brain, was strapped into a special chair and linked up to a series of pulleys which enabled her to move a spoon into her mouth.

This is the first step toward learning to feed herself, and Wednesday was the first time Jane had been able to lift a spoon from a table to her mouth.

The computer "speech synthesis system" which brought the smile to Vicki Karuso's face was developed by John Bryson Eulenberg, a professor of computer science at MSU.

Eulenberg has been working for some time with computers that speak and has even used a computer to order a pizza.

For most of this year he has been working on different systems which let handicapped people who have control over any part of their body--the head or a portion of one limb--operate a switch which selects words a computer can then speak for them.

The system demonstrated Wednesday will be used by Northville teachers in the coming year with a small number of students at the Plymouth center.

This is the most exciting thing to happen in the Northville schools in our whole 100-year history," said school Superintendent Raymond Spear.

"We are only in the world because we can communicate with each other," said Eulenberg. "It is everybody's right to be able to communicate and now the technology makes it possible."

APPENDIX J

LETTER OF INTENT AND START-UP PHASE

APPENDIX J

LETTER OF INTENT AND START-UP PHASE

**JACKSON COUNTY INTERMEDIATE
SCHOOL DISTRICT**

COMMERCIAL EXCHANGE BUILDING
2301 EAST MICHIGAN AVENUE
JACKSON MICHIGAN 49202
TELEPHONE (617) 787-3900

BOARD OF EDUCATION

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MELVIN L. SCHILLING, Vice President
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GORDON G. SMITH
Superintendent

CASIMIR F. SCHESKY
Deputy Superintendent
for Special Education

HENRY W. KUEHL
Deputy Superintendent
for Vocational Education

December 17, 1975

John B. Eulenberg, Ph.D.
Computer Science Department
Michigan State University
East Lansing, Michigan

Dear Dr. Eulenberg:

This letter will affirm the Jackson Intermediate School District's intent to enter into a contractual relationship with the Computer Science Department of Michigan State University for the development of our computerized artificial talking device for certain of our handicapped school children. Five thousand dollars has been committed from one of the federal grants for special education, made available to us through the Michigan State Department of Education, to enable you to initiate the "start-up" phase.

Additional monies required to bring the project to fruition will be committed when a formal budget has been agreed upon. We expect that revenue sources from outside of our district will cause the full budget needs to be met.

Sincerely,



C.F. Schesky, Deputy Superintendent
Jackson County Special Education

CFS:kh

MICHIGAN STATE UNIVERSITY

Cooperative Research Agreement

MEMORANDUM OF AGREEMENT made and entered into as of the 31st day of December, 19 75, by and between The Board of Trustees a Constitutional Corporation operating MICHIGAN STATE UNIVERSITY, hereinafter referred to as the University, and Jackson County Intermediate School District, Commercial Exchange Building, 2301 East Michigan Avenue, Jackson, Michigan 49202

hereinafter referred to as the Company, WITNESSETH:

WHEREAS, the University has personnel and facilities for carrying out the project described in Exhibit A attached hereto; and

WHEREAS the Company is desirous of engaging the said personnel and facilities for carrying out the project described in Exhibit A:

NOW, THEREFORE, in consideration of the premises and the covenants and agreements of the parties as hereinafter set forth, the parties have agreed and do hereby agree with each other as follows:

1. The University, on its part, hereby agrees to carry out the project described in Exhibit A in the manner and with the personnel and facilities set forth therein.

2. The Company, on its part, hereby agrees to pay to the University the sum of five thousand dollars (\$5,000) Dollars, as follows: payable upon execution of

agreement.

3. It is mutually understood and agreed that:

(a) This agreement may be terminated by either party upon giving reasonable notice to that effect to the other party and provided a reasonable adjustment (in relation to the portion of the project which has been completed) is made between the parties as to the funds which have been paid or are to be paid by the Company to the University.

(b) Unless otherwise provided in Exhibit A attached hereto, the University shall have the unrestricted right of publication with reference to its activities and findings in connection with the project described in Exhibit A.

(c) Upon the completion of the project or upon the termination of this agreement, the University shall submit a written report to the Company as to its activities and findings with reference to the project described in Exhibit A; and the Company shall have the right to be advised at all times as to the progress being made in carrying out the project.

(d) Patent rights are the property of the University.

IN TESTIMONY WHEREOF, the parties hereto have caused this instrument to be executed, in duplicate, by their officers thereunto duly authorized, at the places and on the dates set opposite their respective signatures.

BOARD OF TRUSTEES

Signed at East Lansing, Michigan, this _____ day of _____, 19____.

By _____
President
Attest: _____
Secretary

Signed at _____ this _____ day of _____, 19____.

By _____
Attest: _____

INTRODUCTION

Pursuant to discussions held during November and December, 1975, between representatives of Jackson County (Michigan) Intermediate School District (JCISD), Michigan State University's (MSU) Computer Science Department and Division of Engineering Research, it was agreed to establish a cooperative project in communication enhancement for certain of Jackson County's handicapped school children. The broad outline of a comprehensive one year program was agreed upon in principle. In this program, an MSU research team will develop a computer-based system for communication which will provide synthetic speech output for use by the speech impaired. The system will also provide alphanumeric output in the form of paper print-outs and cathode ray tube (CRT) display. A special input system will be designed which could be operated by a person with severe motor impairment. MSU will also provide technical consultative services in support of in-service training for Jackson County personnel.

Currently, representatives from MSU and JCISD are working on the details of such a 1-year project and on the accompanying funding arrangements, which may include monies from sources outside Jackson County. Recognizing that undue delay in starting this project would not serve the interests of the intended beneficiaries, the Jackson County and MSU representatives have concluded that it would be wise to begin a "start-up" phase as soon as possible, so that the time of key personnel might be committed and certain equipment might be ordered and designed before the full program will have been initiated.

Toward this end, JCISD has committed the sum of \$5,000 (Five Thousand Dollars) for an initial program phase (See Appendix I: letter from Casimir Schesky to John Eulenberg). MSU has proposed a budget for allocating this sum during the Winter term, 1976 (January 1 to March 31: See Appendix II: Budget). It is anticipated that funding for the full program will become available in the Winter term, and that a portion of this additional funding will be allocated to activities during the Winter term. In the event that further funding is not available at the end of Winter term 1976, the MSU hardware and

software development will be suspended until such time as a continuation of the research effort can be supported.

DESCRIPTION OF "START-UP PROGRAM"

During Winter term 1976, the MSU research team will work with the designated representatives of JCISD to evaluate the communication potential of one speech-impaired school child and to design appropriate input and output devices for use in school (and, where deemed feasible by the research team and JCISD staff, at home). A computer terminal and acoustic coupler will be set up in a JCISD site for access to the MSU main computer (a Control Data Corporation 6500 computer). Software appropriate to the project will be used at the JCISD site by telephone hook-up. From time to time, the child and his teachers and therapists will visit MSU for evaluation and testing of devices and techniques. At the end of the Winter term 1976, the MSU team will submit a progress report to JCISD describing the work done so far and outlining plans for further work.

The details of this present agreement are subject to modification by future agreements.

Period of grant: January 1, 1976--March 31, 1976

BUDGET

1. Direct Costs

1.1. Salaries and Salary Related Charges

<u>Title</u>	<u>% Time on Research Project</u>	<u>Proposed Grant Charges</u>
1 principal investigator (J. B. Eulenberg, CPS)	10% for one term	\$ 560
1 co-investigator (J. J. Forsyth, CPS)	15% for one term	none
1 student programmer/ hardware technician	hourly	750
other student labor	hourly	<u>346</u>
Total salaries		1,656
Fringe Benefits		84
1.2. Supplies and Services		2,200
Travel (250 trips at \$25/trip)	500	
Computer costs, CDC	6500	
Rental of CRT terminal and acoustic coupler	300	
Miscellaneous electronic and clerical supplies	<u>500</u>	<u> </u>
Total Direct Costs		3,940
2. Indirect Costs (64% of salaries)		<u>1,060</u>
Total Costs		\$5,000

APPENDIX K

FIRST COOPERATIVE RESEARCH AGREEMENT

APPENDIX K

FIRST COOPERATIVE RESEARCH AGREEMENT

MICHIGAN STATE UNIVERSITY

Cooperative Research Agreement

MEMORANDUM OF AGREEMENT made and entered into as of the 3rd day of June, 1976, by and between The Board of Trustees a Constitutional Corporation operating MICHIGAN STATE UNIVERSITY, hereinafter referred to as the University, and Jackson County Intermediate School District, Jackson, Michigan,

hereinafter referred to as the Company, WITNESSETH:

WHEREAS, the University has personnel and facilities for carrying out the project described in Exhibit A attached hereto; and

WHEREAS the Company is desirous of engaging the said personnel and facilities for carrying out the project described in Exhibit A:

NOW, THEREFORE, in consideration of the premises and the covenants and agreements of the parties as hereinafter set forth, the parties have agreed and do hereby agree with each other as follows:

1. The University, on its part, hereby agrees to carry out the project described in Exhibit A in the manner and with the personnel and facilities set forth therein.

2. The JCISD, on its part, hereby agrees to pay to the University the sum of eight thousand five hundred (\$8,500)-----Dollars, as follows: upon execution of the agreement.

3. It is mutually understood and agreed that:

(a) This agreement may be terminated by either party upon giving reasonable notice to that effect to the other party and provided a reasonable adjustment (in relation to the portion of the project which has been completed) is made between the parties as to the funds which have been paid or are to be paid by the Company to the University.

(b) Unless otherwise provided in Exhibit A attached hereto, the University shall have the unrestricted right of publication with reference to its activities and findings in connection with the project described in Exhibit A.

(c) Upon the completion of the project or upon the termination of this agreement, the University shall submit a written report to the Company as to its activities and findings with reference to the project described in Exhibit A; and the Company shall have the right to be advised at all times as to the progress being made in carrying out the project.

(d) Patent rights are the property of the University.

IN TESTIMONY WHEREOF, the parties hereto have caused this instrument to be executed, in duplicate, by their officers thereunto duly authorized, at the places and on the dates set opposite their respective signatures.

Signed at East Lansing, Michigan, this 30th day of July, 1976

Signed at Jackson, Mich this 14th day of June, 1976

BOARD OF TRUSTEES
By C. E. Whelan
Attest: Elliot B. Ballard
Secretary

By Sandra Kay Rishel
Attest: Sandra Kay Rishel
SANDRA KAY RISHEL
Notary Public, Jackson County, Mich.
My commission expires Jul. 2, 1979

1. INTRODUCTION

Pursuant to discussions held during the period November, 1975 to June, 1976 between representatives of Jackson County (Michigan) Intermediate School District (JCISD), Michigan State University's (MSU) Computer Science Department and the Division of Engineering Research, it was agreed to establish a cooperative project in communication enhancement for certain of Jackson County's students who experience communication handicaps.

Initially, the broad outline of a comprehensive one year program was agreed upon in principle. In this program, an MSU research team would develop a computer-based system for communication which would provide synthetic speech output. The system would also provide alphanumeric output in the form of paper print-outs and cathode ray tube (CRT) display. An innovative input system would be designed which could be operated by a person for whom standard keyboards present a problem. MSU would also provide technical consultative services in support of an in-service training for Jackson County personnel.

Currently, representatives from MSU and JCISD are working on the details of such a one year project and on the accompanying funding arrangements, which may include monies from sources outside Jackson County. Recognizing that undue delay in starting this project would not serve the interests of the parties concerned, the Jackson County and MSU representatives have concluded that it would be wise to begin a project of more restricted scope, based upon funds presently available.

Toward this end, JCISD has committed the sum of \$8,500 (Eight Thousand Five Hundred Dollars) for a six-month communication enhancement program for one designated student (the Student). MSU has proposed such a program, whose description is given below. In the event that further funding is not available at the end of the program, the MSU hardware and software development will be suspended until such time as a continuation of the research effort can be supported.

2. OBJECTIVES

The goals of this program shall be the following:

1. To design and implement a communication system which will enable the Student to work on educational tasks independent of constant attention by a teacher or therapist.
2. To facilitate the Student's access to social intercourse with other students and with school staff and faculty.
3. To provide the Student with a means of feedback for practicing language skills.
4. To gain knowledge in the areas of computer science, electrical engineering, systems science, linguistics, audiology and speech science, and education which may be applicable to communication enhancement for persons other than the Student with similar physical and mental abilities.

3. PROGRAM DESIGN

3.1 OPERATIONAL PLAN

The MSU research team will pursue the above goals by the following means:

1. Evaluation of the Student's communicative potential with respect to technological aids to communication.
2. Design and construction of, or when available and deemed preferable, procurement through purchase of, technological aids to communication to be used by the Student during the course of the program.
3. Training for the Student and for other persons designated by Jackson County Intermediate School District for the use of such technological aids.
4. Using MSU-resident computers and computer programs and innovative communication devices to investigate possible communication systems beyond the scope of the present program.
5. Recommendation of proposed designs of home- and school-based communication enhancement systems for future implementation in programs after the termination of the present program.

6. Documentation of progress achieved in the form of a written report and by film, video tape, and other appropriate recording media.

7. Assisting the Jackson County Intermediate School District staff in seeking additional funding for continuing communication enhancement programs for the Student.

3.2 IMPLEMENTATION

The proposed communication enhancement program will be implemented in five principal phases, as follows:

Phase I: Evaluation of the Student's language and motor capabilities, for the purpose of designing appropriate aides and for assessing progress achieved in the program.

Phase II: Design of computer-based system to be used by the Student to perform these functions: 1) Write onto a television screen or other cathode ray tube display, 2) Print on paper using a printing terminal, 3) Produce output suitable for a voice synthesizer.

Although the present proposed budget does not permit the purchase of a voice synthesizer, Michigan State University will occasionally make available the use of a voice synthesizer to the Student for evaluation purposes, subject to the availability of the device. The designed system will be planned so as to incorporate the addition of synthetic voice as a possible mode of output, in anticipation of future funding which would allow for the purchase of a voice synthesizer.

Phase III: Construction and testing of the above system at Michigan State University.

Phase IV: Installation of the communication aid system in Jackson, accompanied by a program of implementation in the school setting to accomplish educational goals.

Phase V: Evaluation of the progress achieved in the program and recommendation of continued work on the design and implementation of communication aids systems for the Student.

4. GENERAL INFORMATION

4.1 PROJECT MANAGEMENT

The present project is a cooperative effort between Michigan State University and Jackson County Intermediate School District. The Michigan State University research effort will be coordinated by Dr. John Bryson Eulenberg, Assistant Professor of Computer Science. The JCISD staff liaison with the MSU research team will be the responsibility of the Deputy Superintendent, Special Education, or his designee.

4.2 PRIVACY AND FREEDOM OF SPEECH

The Michigan State University/Jackson County Intermediate School District research project recognizes that new means of communication are being explored and that accompanying this exploration must be respect for human and civil rights. Privacy from unauthorized access to users' computer files, and other sources of personalized information will be assured. Information obtained during the course of this project, wherever it involves the personal identity of an individual participant, will not be used without his/her permission or that of a legally responsible parent or guardian. Persons expressing an unwillingness to participate in this project for any reason will not be coerced to do so.

5. BUDGET

5.1. Direct Costs

5.1.1. Salaries and Salary Related Charges

Faculty Salary (10% for 6 months)		\$1,000
Hourly Labor (Student)		1,000
Hourly Labor (Non-Student Staff)		<u>500</u>
Total Salaries		2,500
Fringe Benefits		225

5.1.2. Supplies and Services 4,125

Travel (30 trips at \$20/trip for MSU staff)	600	
Rental of computer terminal (5 mo. at \$100/mo.) and acoustic coupler	500	
Computer costs on CDC 6500 computer	500	
Electronic supplies and microcomputer system	2,275	
Miscellaneous supplies and services	<u>250</u>	<u> </u>
Total Direct Costs		6,850

5.2 Indirect Costs (66% of salaries) 1,650

Total Costs for six months (July 1, 1976-December 31, 1976)	\$8,500
--	---------

APPENDIX L

TEAM MEETING NOTIFICATION

APPENDIX L

TEAM MEETING NOTIFICATION

**JACKSON COUNTY INTERMEDIATE
SCHOOL DISTRICT**

COMMERCIAL EXCHANGE BUILDING
2301 EAST MICHIGAN AVENUE
JACKSON MICHIGAN 49202
TELEPHONE (817) 787-2800

BOARD OF EDUCATION

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GORDON G. SMITH
Superintendent

CASIMIR F. SCHESKY
Deputy Superintendent
for Special Education

HENRY W. KUEHL
Deputy Superintendent
for Vocational Education

TO: JCISD/MSU Communication Enhancement Program
Team Members

FROM: Lucylee

DATE: September 16, 1976

RE: The first team meeting has been scheduled for:

Date: Thursday, September 23, 1976
Place: Bennett Elementary, O.T. Room
Time: 3:20 p.m.

APPENDIX M

TEAM MEETING AGENDA

APPENDIX M

TEAM MEETING AGENDA

AGENDA

Thursday, September 25, 1976

- I. Program Objectives--(Research Agreement)
- II. Individual Objectives--written--one week
- III. Team meetings--schedule
- IV. Operational Procedures:
 - A. Notebook
 - 1. Log: phone calls, meetings
 - 2. Individual anecdotal records
Time actually spent with Derek--content.
 - B. Communication
 - 1. Concerns--pertinent information--call CE administrator
 - C. Team approach
 - 1. Materials and equipment--expect carryover--total use by everyone on the team
 - D. Requisitions
 - 1. Supplies, materials, equipment, aids--submit to CE administrator
- V. Priorities
 - A. Behavior Management--fatigue factor
 - B. Parent involvement
 - C. Schedules--individually and as a group
 - D. School and home
- VI. Other

APPENDIX N

OUTLINE--OBJECTIVES FORMAT

APPENDIX N

OUTLINE--OBJECTIVES FORMAT

1. Objective (include approximate time needed to accomplish objective).
2. How I plan to accomplish this objective (delivery system).
3. How degree of accomplishment will be determined.
4. Resources needed to accomplish objective.

Next scheduled conference date:

APPENDIX O

CONTROLLED TV DISPLAY PLAN

APPENDIX 0

CONTROLLED TV DISPLAY PLAN

(Received 11-9-76)

Assume: 700 Instructions (Small Program)
20 Assembly Language Instructions Per Day for FTE
(Complete Thru Revision I and Documentation)

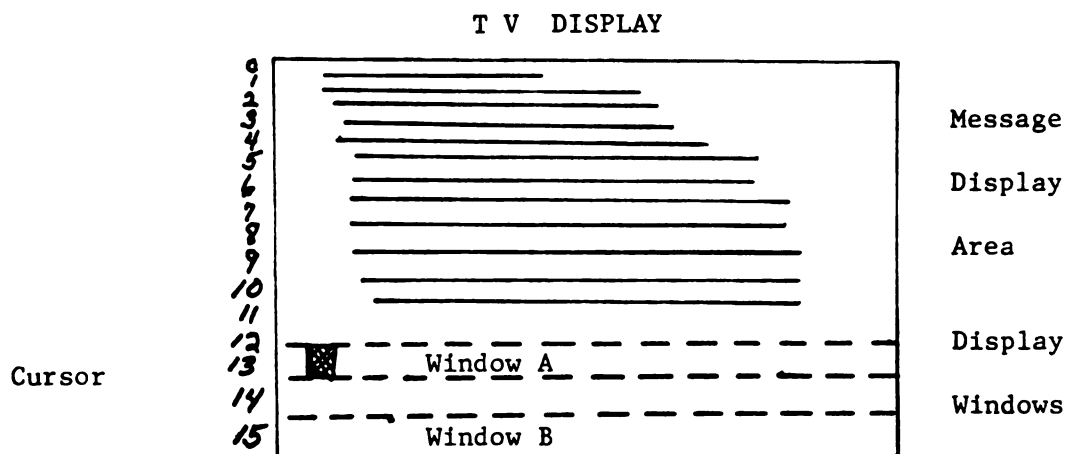
For a half-time person starting November 15:

<u>Phase</u>	<u>Percent</u>	<u>Date Finished</u>
1. Designs	10%	November 23
2. Code	20%	December 15
3. Debug	35%	January 24
4. Use	5%	January 28
5. Revise	10%	February 8
6. Document	20%	February 28

The Scrolling and Binary-Chopping Composing Thing

This is an overall description of a communication aid for speech-impaired individuals who can direct microcomputer-controlled language-composition TV displays with the actuation of a single switch.

The display portion of the system is shown in the Figure below.



By observing the display Windows (A and B), and the cursor position, the user can direct the composition of English text within the Message Display Area. Furthermore, certain control functions can also be effected, such as clearing the screen, backspacing, line advance, directing the TV Message Display to the attached printer, directing the displayed message to be spoken, etc.

The topmost 12 lines of the display are each capable of displaying 32 characters, allowing a maximum of 384 characters displayed at one time. The bottom portion of the screen provides a changing menu that user can select from by activating his switch at the appropriate time. The menu contains both control functions and selectable text. In general, these may be interspersed so as to speed up the communications ability of the individual.

The microprocessor controller takes advantage of recent past selections of the individual and attempts to predict the most likely next selection or control function. Consider that at any given time, based on recent choices, there is a list of possible next choices, ordered by likelihood of selection. This list is presented to the user in the following way. First, assume there are more selections possible than will fit in the combined spaces of Window A and B. In this case, the list can be imagined to exist upon a scroll with the

first two lines displayed in the visible windows. The scroll will roll upwards past the windows with the cursor stationary at the left of Window A. Each line of the scroll will generally contain several elements of the list of possible selections. As the line containing the list element to be selected comes into Window A, the user switch-selects that line. The sub-list on that line is then divided in half, with half displayed in each window. At this time the cursor moves from A to B allowing selection of the appropriate half of this sub-list. Upon further selection, the sub-list is divided in half upon each choice, until the final choice between A and B identifies a single element. The text display or control function selected is then effected, and the process begins again for the likely successors.

An additional feature to provide speed-up is that list elements may be abbreviated during their appearance on the scroll and possibly during their first few appearances on sub-list halves, until there is sufficient space in the two windows to display the non-abbreviated versions of the list elements.

While the binary chopping is the fastest way to identify an element of a list with single switch activations, it does provide entrapment upon a halving trail which is not easy to back out from without going to the end of the trail unless escape or backspace control functions appear repeatedly throughout the sub-lists. Perhaps these controls would be relatively permanent items of display in the windows.

All scrolling actions would be circular, and all cursor movements would likewise repeat to allow indefinitely delayed selections.

APPENDIX P

SECOND COOPERATIVE RESEARCH AGREEMENT

APPENDIX P

SECOND COOPERATIVE RESEARCH AGREEMENT

MICHIGAN STATE UNIVERSITY

Cooperative Research Agreement

MEMORANDUM OF AGREEMENT made and entered into as of the 28th day of January, 1977, by and between The Board of Trustees a Constitutional Corporation operating MICHIGAN STATE UNIVERSITY, hereinafter referred to as the University, and Jackson County Intermediate School District, Commercial Exchange Building, 2301 East Michigan Avenue, Jackson, Michigan 49202

hereinafter referred to as the Company, WITNESSETH:

WHEREAS, the University has personnel and facilities for carrying out the project described in Exhibit A attached hereto; and

WHEREAS the Company is desirous of engaging the said personnel and facilities for carrying out the project described in Exhibit A:

NOW, THEREFORE, in consideration of the premises and the covenants and agreements of the parties as hereinafter set forth, the parties have agreed and do hereby agree with each other as follows:

1. The University, on its part, hereby agrees to carry out the project described in Exhibit A in the manner and with the personnel and facilities set forth therein.

2. The Company, on its part, hereby agrees to pay to the University the sum of ten thousand three hundred dollars (\$10,300) Dollars, as follows: payable upon execution of agreement.

3. It is mutually understood and agreed that:

(a) This agreement may be terminated by either party upon giving reasonable notice to that effect to the other party and provided a reasonable adjustment (in relation to the portion of the project which has been completed) is made between the parties as to the funds which have been paid or are to be paid by the Company to the University.

(b) Unless otherwise provided in Exhibit A attached hereto, the University shall have the unrestricted right of publication with reference to its activities and findings in connection with the project described in Exhibit A.

(c) Upon the completion of the project or upon the termination of this agreement, the University shall submit a written report to the Company as to its activities and findings with reference to the project described in Exhibit A; and the Company shall have the right to be advised at all times as to the progress being made in carrying out the project.

(d) Patent rights are the property of the University.

IN TESTIMONY WHEREOF, the parties hereto have caused this instrument to be executed, in duplicate, by their officers thereunto duly authorized, at the places and on the dates set opposite their respective signatures.

Signed at East Lansing, Michigan, this 25th day of March, 1977

Jackson County Intermediate School District

2301 EAST MICHIGAN AVENUE

JACKSON, MICHIGAN 49202

Signed at Jackson, Michigan this 7th day of February, 1977

BOARD OF TRUSTEES

By E. R. Whitman
Attest: W. B. Ballard

By O. F. Husky, Deputy
Attest: Kathleen E. Burrows

1. INTRODUCTION

This is a supplementary agreement which continues the Communication Enhancement Pilot Program initiated by Jackson County (Michigan) Intermediate School (JCISD) and Michigan State University under a Cooperative Research Agreement dated 3 June 1976 ("the original agreement"). The term of the original project was July 1, 1976 to December 31, 1976. Under this supplementary agreement, the project is to be extended until June 30, 1977, and additional services and equipment are to be provided by Michigan State University.

2. OBJECTIVES

The objectives set forth in the original agreement will remain the objectives of the project as extended by this supplementary agreement. These objectives are:

- a. To design and implement a communication system which will enable the Student to work on educational tasks independent of constant attention by a teacher or therapist.
- b. To facilitate the Student's access to social intercourse with other students and with school staff and faculty.
- c. To provide the Student with a means of feedback for practicing language skills.
- d. To gain knowledge in the areas of computer science, electrical engineering, systems science, linguistics, audiology and speech science, and education which may be applicable to communication enhancement for persons other than the Student with similar physical and mental abilities.

This supplementary agreement will support the implementation of parts of the design of the communication system which were set forth in the original agreement and which have awaited the funding provided herein.

3.0 IMPLEMENTATION

As set forth in the original agreement, the communication enhancement program has five principal phases as follows:

Phase I: Evaluation of the Student's language and motor capabilities, for the purpose of designing appropriate aids and for assessing progress achieved in the program.

Phase II: Design of computer-based system to be used by the Student to perform these functions: 1) Write onto a television screen or other cathode ray tube display, 2) Print on paper using a printing terminal, 3) Produce output suitable for a voice synthesizer.

Although the present proposed budget does not permit the purchase of a voice synthesizer, Michigan State University will occasionally make available the use of a voice synthesizer to the Student for evaluation purposes, subject to the availability of the device. The designed system will be planned so as to incorporate the addition of synthetic voice as a possible mode of output, in anticipation of future funding which would allow for the purchase of a voice synthesizer.

Phase III: Construction and testing of the above system at Michigan State University.

Phase IV: Installation of the communication aid system in Jackson, accompanied by a program of implementation in the school setting to accomplish educational goals.

Phase V: Evaluation of the progress achieved in the program and recommendation of continued work on the design and implementation of communication aids systems for the Student.

During the period covered by the original agreement the following was accomplished:

1. Student evaluation. In cooperation with the staff of Jackson (Michigan) Public School District, the student and his family, and JCISD, the MSU research team has compiled information concerning physical and cognitive abilities. This information has formed the basis of the initial design of the student communication aid system.

2. System design. The MSU research team has completed the design of a microprocessor-based communication system with adaptive input and synthesized voice output capability. The system is based

on a Motorola M6800 microprocessor and utilizes a video output controller developed by the MSU Artificial Language Laboratory.

3. Hardware construction. The following prototype items were constructed and tested:

- (a) Video output controller with Alpha-numeric and special graphic output.
- (b) Several bioactive input switches were constructed and adapted for use by the Student.
- (c) The bioactive switches were configured with an audio feedback device and a ROTOCOM communication aid. This provides the Student and his teachers and therapists with a means of communication and is being used to help the student develop skills he would need in operating the communication system.

During the period of the present supplementary agreement, the following will be accomplished.

1. Hardware construction. MSU will construct and package a microprocessor-based communication aid with bioactive switch input and video and pointer output. The system will also provide an I/O port for eventual addition of a digitally controlled voice synthesizer.

2. Software and firmware. MSU will write, encode, and debug the software and firmware necessary to implement the following functions.

- (a) Scanning input of alphanumeric symbols
- (b) Video display of user-generated text
- (c) Limited text editing capability
- (d) Interactive system to allow the user to construct line graphic figures
- (e) Printer control routines for alphanumeric output

3. Installation and maintenance. MSU will deliver and set up the communication aid equipment in a location in Jackson County, Michigan designated by JCISD. MSU will maintain this equipment and help supervise its operation during the tenure of this agreement.

4. Evaluation. MSU will evaluate the functional adequacy of the communication aid system and will modify the system design to incorporate the results of this evaluation.

4.0 GENERAL INFORMATION

4.1 PROJECT MANAGEMENT

The Michigan State University research and development effort will be coordinated by Dr. John B. Eulenberg, Assistant Professor and Dr. Mort A. Rahimi, Associate Professor of Computer Science. The JCISD staff liaison with the MSU team will be the responsibility of the Deputy Superintendent, Special Education, or his designee.

4.2 PRIVACY AND FREEDOM OF SPEECH

The Michigan State University/Jackson County Intermediate School District research project recognizes that new means of communication are being explored and that accompanying this exploration must be respect for human and civil rights. Privacy from unauthorized access to users' computer files, and other sources of personalized information will be assured. Information obtained during the course of this project, wherever it involves the personal identity of an individual participant, will not be used without his/her permission or that of a legally responsible parent or guardian. Persons expressing an unwillingness to participate in this project for any reason will not be coerced to do so.

4.3 IMPLEMENTATION SCHEDULE

The construction and delivery of equipment developed by MSU under this agreement is subject to the delivery schedules of supplies of electronic components. MSU will keep JCISD informed of its implementation schedule.

4.4 DISPOSITION OF MATERIAL

In addition to the communication aid equipment described above, all Program software and associated documentation developed on this project shall be supplied to JCISD. This agreement does not

preclude the use for other research purpose of any material, instrumentation, or designs developed or acquired by MSU in connection with this project.

All instrumentation and equipment acquired by MSU to facilitate the development and construction of the communication system provided under this agreement will be the property of MSU.

5.0 BUDGET

5.1 BUDGET ALLOCATION

Due to the nature of the research and development conducted under this agreement, the projected budget set forth below is subject to reallocation of funds among the categories at the discretion of the MSU research coordinators.

5.1 ITEMIZED BUDGET

The original agreement figure of \$8,500 is to be increased in the amount of \$10,300 for a total of \$18,800 as follows (see next page):

5.2.1. Salaries and Salary Related Charges

Professional Staff Salary	\$ 900.000
Hourly Labor (Student)	500.00
Graduate Assistant	<u>1,600.00</u>
Total Salaries	<u>3,000.00</u>
Fringe Benefits	144.00

5.2.2. Supplies and Services

Travel (20 trips at \$25/trip for MSU staff)	500.00
Computer costs on CDC 6500 computer	500.00
Electronic and computer supplies	4,000.00
Miscellaneous supplies and services	<u>176.00</u>
Total Supplies and Services	<u>5,176.00</u>
Total Direct Costs	8,320.00

5.3. Indirect Costs (66% of salaries) 1,980.00

Total Costs for Six Months (January 1, 1977-June 30, 1977)	<u>\$10,300.00</u>
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APPENDIX Q

THIRD COOPERATIVE RESEARCH AGREEMENT

APPENDIX Q

THIRD COOPERATIVE RESEARCH AGREEMENT

MICHIGAN STATE UNIVERSITY

Cooperative Research Agreement

MEMORANDUM OF AGREEMENT made and entered into as of the 10th day of May,
1977, by and between The Board of Trustees a Constitutional Corporation operating MICHIGAN STATE
UNIVERSITY, hereinafter referred to as the University, and Jackson County Intermediate
School District, Commercial Exchange Building, 2301 East Michigan Avenue, Jackson,

Michigan 49202

hereinafter referred to as the Company, WITNESSETH:

WHEREAS, the University has personnel and facilities for carrying out the project described in Exhibit
A attached hereto; and

WHEREAS the Company is desirous of engaging the said personnel and facilities for carrying out the
project described in Exhibit A:

NOW, THEREFORE, in consideration of the premises and the covenants and agreements of the parties
as hereinafter set forth, the parties have agreed and do hereby agree with each other as follows:

1. The University, on its part, hereby agrees to carry out the project described in Exhibit A in the
manner and with the personnel and facilities set forth therein.

2. The Company, on its part, hereby agrees to pay to the University the sum of eleven thousand
two hundred dollars (\$11,200) Dollars, as follows: payable upon execution of
agreement.

3. It is mutually understood and agreed that:

(a) This agreement may be terminated by either party upon giving reasonable notice to that effect to
the other party and provided a reasonable adjustment (in relation to the portion of the project which has
been completed) is made between the parties as to the funds which have been paid or are to be paid by
the Company to the University.

(b) Unless otherwise provided in Exhibit A attached hereto, the University shall have the unrestricted
right of publication with reference to its activities and findings in connection with the project described in
Exhibit A.

(c) Upon the completion of the project or upon the termination of this agreement, the University shall
submit a written report to the Company as to its activities and findings with reference to the project de-
scribed in Exhibit A; and the Company shall have the right to be advised at all times as to the progress
being made in carrying out the project.

(d) Patent rights are the property of the University.

IN TESTIMONY WHEREOF, the parties hereto have caused this instrument to be executed, in duplicate,
by their officers thereunto duly authorized, at the places and on the dates set opposite their respective
signatures.

Signed at East Lansing, Michigan, this 13th
day of July, 1977

JACKSON COUNTY INTERMEDIATE SCHOOL DISTRICT
2301 EAST MICHIGAN AVENUE
JACKSON, MICHIGAN 49202

Signed at _____
this 27 day of June, 1977

BOARD OF TRUSTEES
By Edward S. Ballard *ms*
Attest: Ornel Hopkins

By C. F. Schuck
Attest: J. J. K. Johnson

Introduction

This is a second supplementary agreement which continues the Communication Enhancement Pilot Program initiated by Jackson County (Michigan) Intermediate School (JCISD) and Michigan State University under a Cooperative Research Agreement dated 3 June 1976 ("the original agreement"). The term of the original project was July 1, 1976 to December 31, 1976. Under the first supplementary agreement, the project was extended until June 30, 1977. The present agreement will extend the project to December 31, 1977 to provide additional services and equipment as specified below.

Objectives

The objectives set forth in the previous agreements will remain the objectives of the project as extended by this supplementary agreement. These objectives are:

- a. To design and implement a communication system which will enable the Student to work on educational tasks independent of constant attention by a teacher or therapist.
- b. To facilitate the Student's access to social intercourse with other students and with school staff and faculty.
- c. To provide the Student with a means of feedback for practicing language skills.
- d. To gain knowledge in the areas of computer science, electrical engineering, systems science, linguistics, audiology and speech science, and education which may be applicable to communication enhancement for persons other than the Student with similar physical and mental abilities.

This supplementary agreement will support the addition of a voice synthesizer and the necessary support software to the presently implemented communication system.

Implementation

As set forth in the previous agreements, the communication enhancement program has five principal phases as follows:

Phase I: Evaluation of the Student's language and motor capabilities, for the purpose of designing appropriate aids and for assessing progress achieved in the program.

Phase II: Design of computer-based system to be used by the Student to perform these functions: 1) Write onto a television screen or other cathode ray tube display, 2) Print on paper using a printing terminal, 3) Produce output suitable for a voice synthesizer.

Phase III: Construction and testing of the above system at Michigan State University.

Phase IV: Installation of the communication aid system in Jackson, accompanied by a program of implementation in the school setting to accomplish educational goals.

Phase V: Evaluation of the progress achieved in the program and recommendation of continued work on the design and implementation of communication aids systems for the Student.

During the period covered by the previous agreements the following was accomplished:

1. Student evaluation. In cooperation with the staff of Jackson (Michigan) Public School District, the student and his family, and JCISD, the MSU research team has compiled information concerning physical and cognitive abilities. This information has formed the basis of the initial design of the student communication aid system.

2. System design. The MSU research team has completed the design of a microprocessor-based communication system with adaptive input and synthesized voice output capability. The system is based on a Motorola M6800 microprocessor and utilizes a video output controller developed by the MSU Artificial Language Laboratory.

3. Hardware construction. The following prototype items were constructed and tested:

- (a) Video output controller with Alpha-numeric and special graphic output.

- (b) Several bioactive input switches were constructed and adapted for use by the Student.

- (c) The bioactive switches were configured with an audio feedback device and a TOROCOM communication aid. This provides the Student and his teachers and therapists with a means of communication and is being used to help the student develop skills he would need in operating the communication system.

- (d) A microprocessor-based communication aid with bioactive switch input and video and pointer output were constructed. The system provides an I/O port for addition of a digitally controlled voice synthesizer.

4. Software and firmware. MSU has written, encoded, and debugged the software and firmware necessary to implement the following functions.

- (a) Scanning input of alphanumeric symbols

- (b) Video display of user-generated text

- (c) Limited text editing capability

- (d) Interactive system to allow the user to construct line graphic figures
- (e) Printer control routines for alphanumeric output

During the period of the present supplementary agreement, the following will be accomplished.

1. Addition of a digitally controlled voice synthesizer to the hardware configuration of the system.
2. Development of software for the proper integration of the synthesizer into the overall instructional program.
3. Continued consultation with the Jackson County Communication Enhancement team.

Project Management

The Michigan State University research and development effort will be coordinated by Dr. John B. Eulenberg, Assistant Professor and Dr. Mort A. Rahimi, Associate Professor of Computer Science. The JCISD staff liaison with the MSU team will be the responsibility of the Deputy Superintendent, Special Education, or his designee.

Privacy and Freedom of Speech

The Michigan State University/Jackson County Intermediate School District research project recognizes that new means of communication are being explored and that accompanying this exploration must be respect for human and civil rights. Privacy from unauthorized access to users' computer files, and other sources of personalized information will be assured. Information obtained during the course of this project, wherever it involves the personal identity of an individual participant, will not be used without his/her permission or that of a legally responsible parent or guardian. Persons expressing an unwillingness to participate in this project for any reason will not be coerced to do so.

Implementation Schedule

The construction and delivery of equipment developed by MSU under this agreement is subject to the delivery schedules of supplies of electronic components. MSU will keep JCISD informed of its implementation schedule.

Disposition of Material

In addition to the communication aid equipment described above, all Program software and associated documentation developed on this project shall be supplied to JCISD. This agreement does not preclude the use for other research purpose of any material,

instrumentation, or designs developed or acquired by MSU in connection with this project.

All instrumentation and equipment acquired by MSU to facilitate the development and construction of the communication system provided under this agreement will be the property of MSU.

Budget
Allocation

Due to the nature of the research and development conducted under this agreement, the project budget set forth below is subject to reallocation of funds among the categories at the discretion of the MSU research coordinators.

Itemized
Budget

The funding to date of \$18,800 shall be increased by \$11,200 bringing the total to \$30,000 as follows:

Salaries and Salary Related Charges

Professional Staff Salary	\$3,000.00
Fringe Benefits (17% of salaries)	510.00
Subtotal salaries	<u>3,510.00</u>

Supplies and Services

Travel (20 trips at \$25/trip for MSU staff)	500.00
Electronic and computer supplies	1,000.00
Votrax VS-VI voice synthesizer	4,000.00
Miscellaneous supplies and services	210.00
Subtotal Supplies and Services	<u>5,710.00</u>
Total Direct Costs	<u>9,220.00</u>

<u>Indirect Costs (66% of Salaries)</u>	1,980.00
---	----------

Total Costs for Period	\$11,200.00
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APPENDIX R

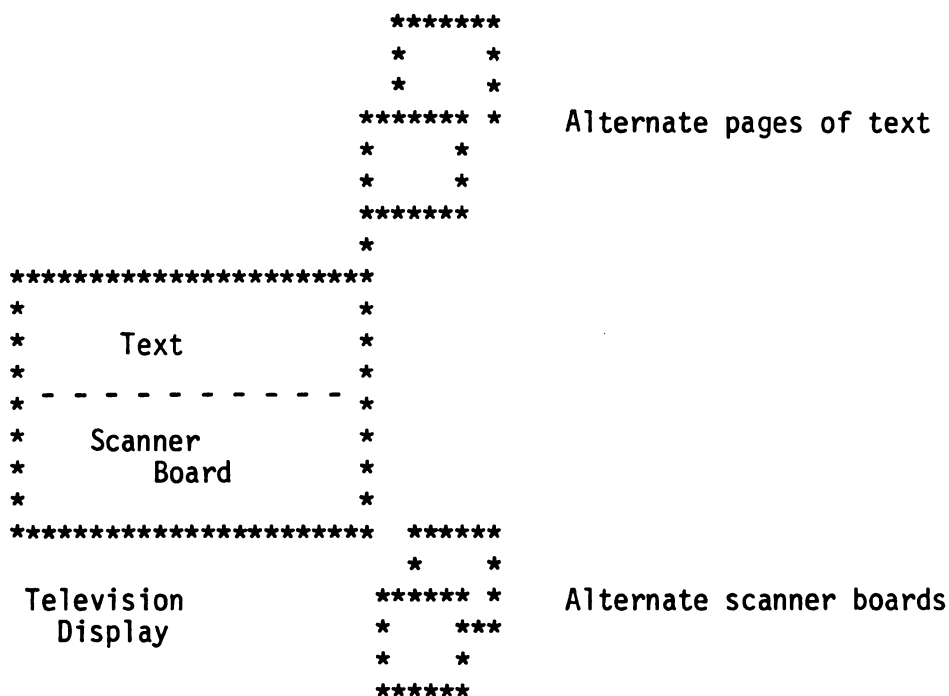
OMNICOM--DESCRIPTION

APPENDIX R

OMNICOM--DESCRIPTION

This experimental communications system consists of a television display and a selection switch as a minimum system. The attachment of a printing device and a sound output device is also possible.

The display is divided into a text area on the top, and a scanner board on the bottom of the display.



As the scanner moves over the board, the switch may be depressed indicating a selection. A switch selection may be an entry into the text area of a letter or word, a command for editing or control purposes, a change in mode of the operation, or a selection of a new scanner board that is to replace the current board.

Scanner Boards. A number of scanner boards are available and these may be selected to replace the current board by the selection of the >Boardname. The boards are all equivalent in their ability to make entries in the text area, to change modes and effect commands; however, not all commands and mode controls are on every scanner board.

Modes of Operation. There are four modes of operation of the device:

1. Normal entry by scanner selection.
2. Morse Code reception mode.
3. Insert mode.
4. Hangman mode.

Letter and Word Entry. The scanner display may consist of single characters, words or abbreviations. Upon selection the corresponding entry will be placed in the text area starting at the current position of the cursor.

Morse Code Reception. In this mode, the switch depressions represent sequences of short and long intervals that are interpreted as international Morse Code characters. When this mode is entered from the startup condition, the reception rate is adaptive, and will follow an increase in rate to a very high speed. Although the adaptation is made to slower speeds as well, the turn on condition is within about 25 percent of the slowest boundary.

Insert Mode. This mode allows the insertion of selected entries just to the left of the current cursor position in the text area. The text beginning at the cursor is displaced to the right as the insertions are made. The insert mode can be recognized by the flash of the screen as the characters from the cursor on are displaced to the right upon each selection.

Hangman Mode. This mode selection causes the text information to be sent to the buffer, and to be replaced in the text area of the display by a set of dashes in place of each non-blank character. Subsequent selections by the scanner result in the text area replacing the dashes representing the selected character. The hangman control may be selected at any time and will restore the original text from the buffer. Even though the play of hangman may have resulted in every dash being replaced, the control must be exercised to restore the normal non-hangman mode.

Commands. There are a number of commands distributed throughout the scanner boards. These are:

- | | |
|----|---|
| AD | Add the two integers to the left of the cursor in the text area, and display the sum in the text area. |
| BK | Move the cursor to the left (backwards) in the text area. This selection is repeating; i.e., if the switch is held depressed, the cursor will continue to step backwards. |
| CL | Clear the text area and restore the cursor to its original position. |
| DL | Delete the character pointed to by the cursor. This selection is repeating. |
| FS | Increase the scanner stepping rate by about 30 percent. |

FW	Move the text area cursor forward. This selection is repeating.
HM	Enter or leave the hangman mode of operation.
IN	Enter or leave the insert mode of operation.
PG	Rotate the text to the buffer and bring the next page back to the display. This is a repeating function.
PL	The text is interpreted as a musical score, and the corresponding sound pattern is emitted.
PR	Print the text area from the beginning to the cursor position on the printer.
RE	Enter the receive Morse Code mode of operation. This suspends scanning until the Morse Code character end-of-message is sent via the switch (.-.-.).
SE	Send the Morse Code message in the text area.
SL	There are two SL commands. The SL command on the Morse Code board pertains to slowing the rate at which Morse Code is sent, while all other SL commands pertain to the slowing of the scanner by approximately 30 percent.
ST	Say the text. Transmits the phonemes in the text area, to the speech device.
SW	Say the last word before the cursor.
TS	Immediate say. As each word is completed by the trailing blank space, the phonemes for the word are sent to the speech output device.

Musical Score. The entries in the text area must correspond to a musical score in the following sequence: <repetition><note><octave><duration><repetition><note><octave><duration>.

where:

<repetition> is optional, default is one, and it represents the repetitions of the following note.
 <octave> is optional, default is 3 (middle C octave) at the outset and remains at the octave most recently specified thereafter.
 <duration> is optional, and is defaulted to a quarter note.

If a <repetition> is to be specified it must be immediately preceded by either a <duration>, an <octave> or both; otherwise it cannot be interpreted as a repetition, but will be interpreted as an <octave> specification instead.

Text interpretation. The information in the text will be subject to interpretation by the hangman player, by the music player, by the Morse Code sender, and possibly by other functions. The original source of the text is immaterial, i.e., music can be composed using the Morse Code scanner or numbers to be added could have originated from the music scanner board, etc. Once they are in the text area, their origins are lost.

APPENDIX S

ORIGINAL TEAM MEETING AGENDA, MINUTES

APPENDIX S

ORIGINAL TEAM MEETING AGENDA, MINUTES

JACKSON COUNTY INTERMEDIATE SCHOOL DISTRICT

COMMERCIAL EXCHANGE BUILDING
2301 EAST MICHIGAN AVENUE
JACKSON MICHIGAN 49202
TELEPHONE (517) 787-2800

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Deputy Superintendent
for Special Education

HENRY W. KUEHL
Deputy Superintendent
for Vocational Education

To: Communication Enhancement Team
Dr. John Eulenberg, Dr. Mort Rahimi, Cash Schesky, Dave Barrett,
Betsy Mark, Ann Walmsley, Jeanne Hissong, Mary Willy, Ken Lauterwasser,
Rita Forsyth, B.J. VanSchoick

From: Lucylee

Re: Meetings: Planning and Programming For The 1977-78 School Year

Date: Tuesday, September 20, 1977 and every other Tuesday there after.

Time: 11:55 A.M.

Place: Ridgeway Elementary
4200 Lowe Rd.
Jackson, Michigan 49203
Telephone: 784-0393

Room: 10

Because Drs. Eulenberg and Rahimi have found Tuesdays to be most convenient as their meeting day for the Jackson Communication Enhancement Program, we will plan to meet as a team every other Tuesday at the same place and same time.

You will be notified if the meetings are cancelled or changed.

So--please mark your calendar in advance.

Since we will again be meeting during the lunch hour, to better enable everyone to attend, we will have Eunice make her super salads for this first session. Please call Debbie Weirich (787-2800) if you wish to order a salad.

LN:dsw
8-25-77

JACKSON COUNTY INTERMEDIATE SCHOOL DISTRICT

COMMERCIAL EXCHANGE BUILDING
2301 EAST MICHIGAN AVENUE
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Deputy Superintendent
for Special Education

HENRY W. KUEHL
Deputy Superintendent
for Vocational Education

COMMUNICATION ENHANCEMENT PROGRAM

AGENDA

1. Establish team meeting procedures.
2. Reports from various team members on current program status - Paper - AACPDM.
3. Looking ahead - goals and objectives of Research Project Installment III.
4. Discussion and plans for possible expansion of C.E. program.
5. UCP monies - other financial support.
6. Other

JACKSON COUNTY INTERMEDIATE SCHOOL DISTRICT

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Superintendent
CASIMIR F. SCHESKY
Deputy Superintendent
for Special Education
HENRY W. KUEHL
Deputy Superintendent
for Vocational Education

TO: Communication Enhancement Team

From: Lucylee

Re: Minutes - meeting - Tuesday, September 20, 1977 - Ridgeway School

Present: Dr. John Eulenberg, Dr. Mort Rahimi, Dave Barrett, Mary Willy,
Ken Lauterwasser, Chris Southwell, Ann Heath Walmsley,
B. J. VanSchoick, Jeanne Hissong, Rita Forsyth, Betsy Mark,
Barb McCollough, Kay Gimesley

Absent: Cash Schesky

The team decided to meet on the 1st and 3rd Tuesday of each month at 11:55 at Ridgeway. A calendar of those dates is attached. Drs. Eulenberg and Rahimi will plan to be at Ridgeway on those meeting days by 10 or 10:30 A.M. The same procedure as last year will be followed.

A demonstration of the Computer Program equipment was presented by Ann Heath Walmsley.

Reports of progress made with Derek over the summer were presented by Jeanne Hissong, and Ann Heath Walmsley.

Lucylee will investigate the possible use of a Polaroid camera and film to be placed at Ridgeway, which can be used for CE program documentation purposes.

Drs. Eulenberg and Rahimi, and Lucylee Neiswander will present a paper on the Communication Enhancement program at the American Academy for Cerebral Palsy and Developmental Medicine, in Atlanta, Georgia, on October 7, 1977.

Research program (Installment III) are attached for Chris Southwell and Betsy Mark.

By the next team meeting we will plan to share the program goals and objectives, along with each team member's individual objectives, as each member views them at this time.

We will look forward to a demonstration of E.M.G.

We will also plan to arrange for meeting dates to evaluate the students we are considering as potential CE program candidates.

Communication Enhancement Team Minutes

-2-

We will also be attempting to set up a time when we can present our CE program to the United Cerebral Palsy Association of Jackson, to gain their support, both morally and financially in the expansion of our CE program.

Please find copies of the Communication Outlook application attached. Don't forget to complete the form and mail it to the address indicated.

Ann Heath Walmsley reported that she spoke to the Civitan Service Club about the Communication Enhancement program.

Drs. Eulenberg and Rahimi, along with Ann Heath Walmsley and Lucylee Neiswander will report on the Communication Enhancement Program to the JCISD Board of Education meeting on Wednesday, September 21, 1977.

If you have any agenda items for the next meeting, please contact Deb Weirich, or Lucylee.

I was pleased with our first meeting. I think we are off to a good start!

LN:dsw

APPENDIX T

ABSTRACT, FOREIGN CORRESPONDENCE

APPENDIX T

ABSTRACT, FOREIGN CORRESPONDENCE

By

Lucylee Neiswander, John B. Eulenberg, Morteza A. Rahimi
(Michigan State University, Computer Science Dept.,
East Lansing, MI 48824)

Recent developments in computer technology and digital electronics have given rise to a new component in the education of the non-vocal cerebral-palsied child--the communication enhancement program. Through the use of minicomputers and microcomputers, adaptive input devices, voice synthesizers, and interactive graphic displays, people who have been severely handicapped by the conventional learning environment can begin to have access to the educational experiences of their peers and can engage in social interactions on a level previously thought to be unattainable.

The paper described a communication enhancement program established in the Jackson County, Michigan, schools in co-operation with the Artificial Language Laboratory of Michigan State University. The successful integration of communication aids technology into a student's life requires a multidisciplinary approach, including a speech pathologist, occupational and physical therapists, teachers, aides, and a medical social worker, co-ordinated by a special-education supervisor. The university's research team consists of faculty and students in the fields of computer science, electrical engineering, linguistics, audiology and speech science, and psychology.

With the continuing implementation of mandatory special-education legislation and the proliferation of communication aids, a general model for planning, implementation, and operation of communication enhancement programs may be desirable.

UNION MUTUALISTE DU MORBIHAN

CENTRE DE KERPAPÉ

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C. E. S. de Rééducation et de Réadaptation Fonctionnelles

Médecin-Directeur : Docteur Michel BUSNEL

Médecins-Chefs de Service

Docteur Roger BERNARD
Docteur Michel CONVENANT
Docteur Alain CORMERAIS
Docteur Michel GAZEAU
Docteur Nicole LAITER
Docteur Jacques LION
Docteur Bernard POTIER

Kerpapé, le 7. 06. 78

Monsieur André SYLVESTRE
Psychologue
B. P. 241
56321 LORIENT (FRANCE)

à

Mrs Lycylee NEISWANDER
Michigan State University
Computer Science Dept.
EAST LANSING, MI. 48824
U. S. A.

Dear Mrs Neiswander,

Psychologist in a french rehabilitation Center, I work with physically handicapped children. Some of which are paralysed as the results of cerebral motor disorders (cerebral palsy), viable of talking intelligently enough, and most of them show marked deficiency in the field of intelligence.

For two years, we have a electronic equipment (CARBA LINGUADUC) with a computer that allows the aphasics and severely cerebral-palsied children to get in communication with other people, and thus to facilitate their approach of the acquisition of language processes, but the methods were not adapted, at least in Europe.

Furthermore, we have researched into different methods of learning (reading and writing), particularly the non-speech language imitation programs. We have contacted american laboratories or research centers, which experiment the more recent practice applications of the learning of human language to apes (PREMACK'S, GARDNER'S, FOUTS', RUMBAUGH'S Works). So, the Kansas center for research in mental retardation and human development at PARSONS and the Mental Retardation Center of GEORGIA at ATLANTA have taken its inspiration from these works for mentally retarded children and aphasics.

Now, we are in contact with Mrs Shirley MC NAUGHTON for the BLISSYMBOLICS (at TORONTO), Mrs Dorothy PARKEL for the YERKES TECHNOLOGY (GEORGIA), Mr J. K. CARRIER Jr and Mr J. E. MC LEAN for the NON SPEECH LANGUAGE INITIATION PROGRAM (KANSAS), Mrs C. D. HEINER for the SI/COMM (at LOS ANGELES), Mr Howard GARDNER for the VISUAL COMMUNICATION (at BOSTON), Mr Gregg C. VANDERDEIDEN for the AUTO-MONITORING COMMUNICATION BOARD - (Trace-Center University of WISCONSIN), etc...

I have just come back from a trip to the North America, particularly to CANADA, to collect some information about the works done on language learning in apes and the different implications of these studies for non-verbal handicapped children.

Actually, we apply BLISS and others non-verbal systems with cerebral-palsied children and aphasics. I have read a abstract of your conference "Administrative and Management of a Computer-based communication Enforcement Program", by L. NEISWANDER, J. B. EULENBERG, M. A. RAHIMI, at the Annual Meeting of the American Academy for C. P. and Developmental Medicine at Atlanta (GEORGIA), 5. 9. Octobre 1977. I should appreciate to have a copy of your speech, and informations and suggestions about this field to help me to organize a complete communication program.

With many thanks for your kindness in advance.

Yours sincerely.

A. SYLVESTRE, Psychologist



P. S. : I join a subscription order for issues of COMMUNICATION OUT LOOK

Nottinghamshire Area Health Authority (Teaching)

NORTH NOTTINGHAM TEACHING DISTRICT

City Hospital
Hucknall Road
Nottingham NG5 1PB

Telephone 0602 608111

FROM
DEPT Paediatric Assessment Unit
EXT 2750
OUR REF
YOUR REF



11th May 1978.

Ms. L. Neiswander,
Michigan State University,
Computer Science Department,
East Lansing,
Mi. 48824.

Dear Ms. Neiswander,

I was interested to read an abstract on your paper 'Administration and Management of a Computer-based Communication Enhancement Program'. I have been contemplating trying to use a word processor for the use of non-vocal cerebral palsied children and possibly adult dysphasics as well. I would be most grateful for any information you can give me on the use of mini and micro computers and a copy of your above mentioned paper. It would be nice to have references to other papers or articles on the subject. Thank you for any help you can give me.

Yours sincerely,

Alison Courtice

Alison Courtice (Miss)
Speech Therapist.

APPENDIX U

CALENDAR--MEETING DATES

APPENDIX U

CALENDAR--MEETING DATES

First Semester								Second Semester							
Week	M	T	W	Th	F	No. Days Student Staff		Week	M	T	W	Th	F	No. Days Student Staff	
Sept.								Feb.							
1	5	6	7	8	9	3	4	20	30	31	1	2	3	5	5
2	12	13	14	15	16	5	5	21	6	7	8	9	10	5	5
3	19	20	21	22	23	5	5	22	13	14	15	16	17	5	5
4	26	27	28	29	30	5	5	23	20	21	22	23	24	5	5
Oct.								March							
5	3	4	5	6	7	5	5	24	27	28	1	2	3	5	5
6	10	11	12	13	14	5	5	25	6	7	8	9	10	5	5
7	17	18	19	20	21	5	5	26	13	14	15	16	17	5	5
8	24	25	26	27	28	5	5	27	20	21	22	23	24*	5	5
Nov.															
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								April							
10	7	8	9	10	11	5	5	28	3	4	5	6	7	5	5
11	14	15	16	17	18	5	5	29	10	11	12	13	14	5	5
12	21	22	23	24	25	3	3	30	17	18	19	20	21	5	5
Dec.															
13	28	29	30	1	2	5	5	31	24	25	26	27	28	5	5
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14	5	6	7	8	9	5	5	32	1	2	3	4	5	5	5
15	12	13	14	15	16	5	5	33	8	9	10	11	12	5	5
	19	20	21	22	23	0	0	34	15	16	17	18	19	5	5
	26	27	28	29	30	0	0	35	22	23	24	25	26	5	5
Jan.								June							
16	2	3	4	5	6	4	4	36	29	30	31	1	2	4	4
17	9	10	11	12	13	5	5	37	5	6	7	8	9	5	5
18	16	17	18	19	20	5	5	38	12	13	14	15	16	5	5
19	23	24	25	26	27	4	5								
TOTALS						89	91	TOTALS						93	94

○ Staff only^a □ Staff & student vacation *Good Friday △ Meeting date

^aSubject to individual adjustment depending on calendar of school(s) served.

APPENDIX V

NOTIFICATION, AGENDA, VISITORS TO JCISD

APPENDIX V

NOTIFICATION, AGENDA, VISITORS TO JCISD

**JACKSON COUNTY INTERMEDIATE
SCHOOL DISTRICT**

COMMERCIAL EXCHANGE BUILDING
2301 EAST MICHIGAN AVENUE
JACKSON MICHIGAN 48202
TELEPHONE (517) 787-2800

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TO: Betsy, Ken, Ann, Rita, Chris Date: October 27, 1977
FROM: Lucylee
RE: We will be having visitors to the C.E. Program on November 8th.

They are from Rackham, Ypsilanti: Joanne Bowe, RPT
Carolyn Navarre, RPT
Alice Fell, Speech Therapist
Ann Laboda, OTR

They will arrive at Ridgeway at 10:30 A.M. and will plan to stay
for our team meeting at noon.

Please plan to arrange your schedule so you can be at Ridgeway
by no later than 10:30.

I think each of you should be there to talk with them about your
role as they are interested in establishing just such a program.

Thanks.

LN/dsw

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Deputy Superintendent
for Vocational Education

HAPPY BIRTHDAY DEREK!

HAPPY 2ND ANNIVERSARY

COMMUNICATION ENHANCEMENT PROGRAM

Welcome to our guests from Rackham, Ypsilanti

Agenda

1. Individual team member reports on current status of program.
2. Discuss inclusion of other candidates.
3. CEC presentation format.
4. Logo for JCISD/MSU program.
5. EMG or voice input demonstration.
6. Other?
7. Next meeting date:

APPENDIX W

COMMUNICATION OUTLOOK

COMMUNICATION OUTLOOK



Photo by Don Swerdlow

James Rensuk, a student at Michigan State University who cannot command his speech organs to produce speech understandable to most people, uses a language board to chat with John Campbell. See story on page 5.



Photo by Don Swerdlow

Leigh Campbell, a student at Frost Junior High School in Jackson, Mich., tries out the AUTOCOM-VERSIOM, an aid developed by the TRACE Center at the University of Wisconsin. See item on page 7.

Communication Outlook

Focusing on Communication Aids and Techniques

Volume 1, Number 1

Spring 1978

A Publication of the International Action Group for Communication Enhancement

WE ARE A COMMUNITY

Communication Outlook is, itself, a communication aid. It has come into existence in response to the needs of the growing community of individuals throughout the world who are concerned with technological aids to communication.

We who make up this community come from many diverse backgrounds. We are users and potential users of communication aids: we are parents, family members and friends. We are physicians, psychologists, speech pathologists, occupational and physical therapists, and social workers. We are computer scientists and speech scientists, electronic engineers and mechanical engineers. We are inventors, manufacturers and distributors. We are teachers and aides, educational administrators and supervisors. We are government officials and staff members of private foundations.

Until now, there has been no regular forum on a national or international scale where we could exchange views and establish contacts. Groups of us have met at conferences or have corresponded through the mail. Some of us have been fortunate to be able to visit centers of communication aids activity throughout the world. We have been impressed with the energy and dedication which are being applied in so many places to realizing the dream of truly accessible communication for all humans. We also are humbled by the enormous task before us.

As impressive as have been the advances in communication aids technology in recent years, the impact of this technology has yet to be felt in the lives of the majority of human beings it can potentially serve. As great as the engineering and scientific problems which face us may be, the major problem remains one of social engineering.

The main challenge which faces us is that of the transfer of technology. Whether we are dealing with Blissymbolics or talking computers or more accessible typewriters, the existing technology is still beyond the reach of most people.

We just now are groping toward an adequate delivery system

for providing appropriate state-of-the-art communication aids to those who need them. In order to make this delivery system a reality, we must work for these goals:

1. Identify all agencies, public and private, whose charge is to help guarantee the human right to equal social, educational and vocational opportunity and to basic health; and help them recognize the role they can play in providing communication aids.
2. Make sure that our colleges and universities provide a background in communication aids for students in the health care professions and in education.
3. Encourage the funding of research and development in the communication aids field at appropriate levels and encourage talented individuals to apply their energy and imagination to this work.
4. Give manufacturers sufficient incentive to produce and to market the devices which are needed, while at the same time insuring that cost itself does not prevent individuals from obtaining the systems they need.
5. Foster the rapid dissemination of information about communication aids technology and encourage discussion about the social and political implications thereof.
6. Emphasize that a communication/interaction system for an individual consists of much more than the physical aid and provide information on techniques and programs for developing the other components of the individual's communication system.

It is our hope that *Communication Outlook* will help us to achieve these goals. This will only happen if it becomes, literally, an organ of our community. This is your newsletter. We look forward to your contribution.

John Bryson Eulenberg
Gregg C. Vanderheiden

COMMUNICATION OUTLOOK

Focusing on Communication Aids and Techniques

Volume 1, Number 1

Spring 1978

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All correspondence regarding subscriptions, contributions and advertising should be addressed to:

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Communication Outlook is a quarterly newsletter addressed to the community of individuals interested in the application of technology to the needs of persons who experience communication handicaps due to neurological or neuromuscular conditions. *Communication Outlook* is edited and published jointly by the Artificial Language Laboratory, Michigan State University and the TRACE Center for the Severely Communicatively Handicapped, University of Wisconsin. It is the principal publication of the International Action Group for Communication Enhancement.

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FROM OUR READERS

ALS Registry Urged

Amyotrophic Lateral Sclerosis (ALS) patients, especially those with bulbar palsy, experience speech loss and complete frustration from their inability to communicate. ALS patients who also become quadriplegic have the additional problem of being unable to activate communication devices unless they have an additional switch operating capability, such as an "eye switch," eye blink or some residual voluntary muscle function which can be harnessed to activate a switch which will start a motor which will perform a motion.

Existing communication devices and systems are not readily available, are often too expensive and lack a needed equipment acquisition and delivery system which provides a modular approach for progressive motor loss and increasing disability. Also, there is no good service component, no training component and no reclaiming/refurbishing component for reissue of this expensive equipment once the initial user no longer needs the equipment.

ALSSOA, together with another local non-profit service agency, has applied to the Department of Rehabilitation for a grant to demonstrate such a program for equipment acquisition and delivery.

We would appreciate the newsletter informing ALS patients and families of our National ALS Case Registry and urging them to register with us. Together, we believe we can find the medical research solution to ALS. To register or for further information, contact Amyotrophic Lateral Sclerosis Society of America, 15300 Ventura Blvd., Suite 315, Sherman Oaks, CA 91403, (213) 990-2151.

Robert G. Dicus, Chairman, Board of Trustees, ALSSOA

Associates Desired

Hetero-Sapiens, Inc., has a VOTRAX VSK connected to a versatile micro-computer system; nearby associates are desired for product application. Contact Owen Thomas, 1949 Hypatia Way, La Jolla, CA 92037 (714) 459-2143.

Owen Thomas, La Jolla, CA

ANYBODY KNOW?

Questions from readers to readers. Please respond % this newspaper.

■ We are looking for a commercially available reading series which we can easily adapt to suit the needs of 5- to 13-year-old non-vocal children. Slow introduction of words, stress on reading comprehension and no motor activities are desired features.

■ Does anyone know of any tests for learning disabilities which can be given to a non-verbal child with poor motor control?

■ A little off topic area, but does anyone know of any toilet training programs which have been successful with CP children? Have had success at school but does not carry over to home.

Ellen Sawyer, Peoria, IL

■ Does anybody have any references on communication through art, music, drama, dance or creative expression for the cerebral palsied?

Margaret Grodhaus, San Jose, CA

■ Does anybody know of any aids or techniques which work well for ambulatory children? Especially ones for children who are on crutches.

■ Does anybody have any good ideas for how to mount a switch to a bedframe for a bedridden client? The mounting would have to be rigid since the client would have to press firmly to activate the switch but the switch should not move away on him/her.

TRACE Center, University of Wisconsin, Madison, WI

■ Does anybody know of a light which can be used as a head light pointer which will project a small point or arrow used to point to a square which is 1½" in diameter at a distance of 12-20 inches? Looking for something about the size of a pen light. The only projector light available to us now is 6"-8" long which is too long to fit the student's head appropriately. Any information would be greatly appreciated.

Tamara Anderson, Muskegon, MI

COMPUTER NETWORK LINKS USERS, DEVELOPERS

Members of the rehabilitation community met Feb. 3, 1978, in Philadelphia, Pa., to inaugurate a one-year project utilizing an electronic information exchange system (EIE). This computer network now links representatives from basic research and development, rehabilitation engineering, information sciences, manufacturing, special education and consumers.

The EIE project, funded by the National Science Foundation and led by Jane McCarroll of Innovative Systems Research, Inc., 103 Cooper River Plaza East, Pennsauken, N.J. 08109, will attempt to bridge the time and distance gap between professionals and users who need to coordinate closely in their related efforts.

STRUGGLING TO COMMUNICATE

James Renuk, 24, is a 4th-year student at Michigan State University. He has cerebral palsy and cannot command his speech organs to produce speech understandable to most people. The following article is excerpted from a longer one which appeared in the Washington Post. For reprints of the original article, please send a self-addressed, stamped envelope, c/o this newsletter.

I go to Michigan State University. Sometimes people come up to my Dad and ask questions about me. "Can he understand what I am saying to him?" Dad says, "I just told you he goes to MSU and takes classes." A beautiful woman will come up and start talking, but when she sees that I cannot respond to her as other men do, she just walks away. Stoned because I cannot speak the language of my society. But these stonings hurt the most.

I get kicked about by society because I am a handicapper and a wheelchair user. Most of the kicks I have to take are because I cannot speak the language or any language, so one of my dreams is to be able to speak languages. Now a team of scientists and engineers is working with me on a system that will enable a person who cannot speak the language of his or her society to do so.

With this system, I will be able to communicate with anyone, even with people who cannot hear. The system will print things out on a small television type screen I will have with me. I will be able to speak as high class people do or the hardcore street talk.

I hope to have my own system someday. The decision is up to my society and Michigan State University. They will decide if I can have my own system. I have been waiting for 24 years. I hope they make the right decision soon.

I want to ask Dr. Hamilton why the carbon in CC1-4 is in the SP3 state, in the middle of his lecture.

To tell her how good she makes me feel when I am with her; then maybe she will stay with me.

To be able to use the telephone.

To tell society I am an intelligent man.

James M. Renuk

HIGHLIGHTS IN OUR NEXT ISSUE

- A Roundup of Funding Sources
- "An Educational Administrator in Scienceland" by Dr. Leonard Reznierski, Director, Institution Special Education Program, Northville (Mich.) Public Schools
- "Shopping for Systems and Devices for the Disabled" by Maurice LeBlanc, Chief, Rehabilitation Engineering Center, Children's Hospital at Stanford

TECHNICALLY SPEAKING

With the advent of so many new aids, and with the prospect of still more aids in the near future, it has come time (or is past time) to begin serious discussion of standardization. Many of us are aware of how hard it is to change things once people have begun to do it one way or another. Firms have to think about tooling costs and compatibility with past aids. Others have ways that have worked best for them in the past or ways they prefer. The problem, of course, is that the parent, teacher or clinician in the field is the one who has to try to sort it all out. Moreover, the children suffer when compatible accessories are not available for their aids. A school may be willing to purchase an aid for a classroom if it could be used by many or all of the children. However, if each child needs a different accessory or a different version of the same accessory because of incompatibility, then we have created an unfortunate problem.

The problem of interfaces is probably the most serious one, because it can bar a child from receiving the proper aid. Interfaces are expensive to develop and to keep in stock in any great variety. Some work well with many children, but others are designed for the hard-to-fit child. Standardization can make a wider variety of interfaces available to the individual who experiences handicaps by allowing different interfaces manufactured by different companies to be used with a particular aid.

Now, the question of standardization is always a tough one and is fraught with difficulties and considerations. But this field has been characterized by an unusual amount of communication and cooperation between developers, and it is the belief of many of the developers in this area that such a standard can be reached. Obviously, it is important to do this as soon as possible.

Some developers have already begun discussions on this topic. To facilitate the process, we have organized a standardization committee. You are welcome to join. If you have any ideas, considerations or problems, please let us know by writing to us in care of this newsletter. Members of the standardization committee at the present time are John Eulenberg, Rick Foulds, Geoff Iles, Mort Rahimi, Barry Romich and Gregg Vanderheiden (Acting Coordinator).

Gregg C. Vanderheiden

EDUCATIONAL TECHNOLOGY FOR THE HANDICAPPED CHILD

In order to assist individuals working with children in school settings who experience handicaps, and to acquaint them with the range of equipment available, Castle Priory is offering, Oct. 2-6, 1978, the fourth of its courses in association with Mr. Roger Jefcoate, Consultant Assessor and Lecturer on Electronic Equipment for the Severely Disabled.

The program offers an opportunity to see technical and electronic aids in action and to share experiences with British rehabilitation teams. Ample opportunity will be given for discussion and to try equipment. Participants from many countries and disciplines attend, thus offering a unique chance to meet and discuss mutual problems. If sufficient interest is shown, special arrangements may be made for overseas visitors, including lectures and day visits to Special Schools. For those wishing to stay longer, it may be possible to make arrangements to spend up to 2 weeks working directly with handicapped children in a Special School of the applicant's choice.

Since enrollment will be limited, early application is advised. Applications, together with a non-returnable deposit of £5 or its equivalent, should be made to the Principal, Castle Priory College, Thames Street, Wallingford, Oxfordshire OX10 0HE, as soon as possible. Tuition: £29, Residence: £33.

WHERE THE ACTION IS

A roundup of reports from our readers about centers and groups working on various aspects of communication enhancement, including device development, dissemination, funding and advocacy.

FUNDING AWARD FOR RESEARCH IN NON-VOCAL COMMUNICATION DEVICES

The Biomedical Engineering Center (BMEC) of Tufts-New England Medical Center was awarded a five-year Rehabilitation Engineering Program Grant to continue and expand its efforts in developing devices for non-vocal individuals who experience severe handicaps. The BMEC has been engaged in the development of such devices through its major funding source, the Regional Rehabilitation Research and Training Center at Tufts (RT-7). This program is sponsored by the Rehabilitation Services Administration (RSA). The recent award represents a substantial augmentation of the RT-7 effort by the Office of Rehabilitation Engineering of RSA. The additional funding will be applied to the development of long-range projects that involve, among other areas, the use of syllables as basic units of communication, the effectiveness of auditory feedback on expressive language development and the conversion from phonetic to orthographic English.

This funding coincides with the establishment of a new department within the BMEC which is devoted to the fabrication and ultimate utilization of the results of research projects. This department will provide devices on a non-profit basis. The combined effort will give the opportunity for measured field usage and more feedback.

For more information on these projects, contact Richard Foulds, Director, BMEC, Tufts-New England Medical Center, 171 Harrison Ave., Box 1014, Boston, MA 02111, (617) 956-5036.

ASSISTIVE DEVICE CENTER AT CAL STATE

Members of the faculty in the disciplines of biomedical engineering, psychology and speech pathology have established an Assistive Device Center at California State University, Sacramento. They plan to assess clients abilities and needs in the areas of aids to daily living, communication and learning. Recommendations will be made for commercial assistive devices when they are available. In cases of unmet needs, the interdisciplinary team will develop or research and develop the needed aids. The contact for the Assistive Device Center is A. M. Cook, Department of Electrical and Electronic Engineering, California State University, 6000 J St., Sacramento, CA 95819.

NON-VOCAL COMMUNICATION GROUP

An interdisciplinary non-vocal communication group has formed in the Pacific Northwest. Goal of the members in this first year is to educate themselves in the area of non-vocal communication and to become aware of non-vocal resources already existing. To begin accomplishing this goal, the group will have its first "All Day Workshop," Saturday, Apr. 29. It will be held at The Children's Orthopedic Hospital and Medical Center in Seattle, Wash. The workshop will accommodate 350 participants.

Further goals of the organization are information and experience-sharing and development of financial resources for support of devices for individual users.

For further information, contact Bruce M. Gans, M.D., Director, Rehabilitation Medicine, Children's Orthopedic Hospital and Medical Center, 4800 Sand Point Way NE, P.O. Box C-5371, Seattle, WA 98105.

FLRS SERVING FLORIDA

Florida Learning Resources System/Suncoast Associate Center is one of 18 Associate Centers located throughout the state. This network provides support services to district exceptional student education programs. The Florida Learning Resource System (FLRS) is federally funded by Title VI-B monies, Education for the Handicapped Act. FLRS/Suncoast is a member of the Southeast Learning Resource Center (SLRC), located at Auburn University in Montgomery, Ala. For further information, contact Kit Carson, Director, FLRS/Suncoast Associate Center, 3550 Wilkinson Road, Sarasota, FL 35581.

BLISSYMBOLICS AND TECHNOLOGY IN BRITAIN

Nigel Ring has supplied us with this information about activities in Great Britain.

The Blissymbolics Communication Resource Center was established during the Spring of 1977. Its purpose is to promote the use of Bliss Symbols for the handicapped population in Great Britain by organizing workshops, publishing literature and coordinating effort. Three workshops were held during 1977 and there are an estimated 700 symbol users. A sub-committee on Technology for Bliss Symbols coordinates technological effort and has held a seminar (February 1978) to bring together interested parties.

The Rehabilitation Engineering Unit also supports the Bliss Symbol program at Chailey, a long-stay hospital and school for 200 physically handicapped children, by providing appropriate hardware. To date, this has included many interfaces, a 100 LED display and a moving-light X-Y display. This work is not funded, but it is anticipated that funds will be sought early in 1978.

For more information, contact Rehabilitation Engineering Unit, Chailey Heritage (School & Hospital), North Chailey, Lewes, East Sussex, U.K. BN6 4EF.

MICRO COMPUTER INTEREST GROUP FORMED

A group has been formed to "facilitate the application of microprocessors in helping the handicapped." Under the initial leadership of Dr. Robert Suding, president of the Digital Group, a Denver-based manufacturer of microprocessor systems, the group is to act "as a clearinghouse for software, hardware and ideas that might be useful to the handicapped." They also are soliciting ideas from persons who experience handicaps and from rehabilitation centers as to how microcomputers might help. For further information, or if you would like to contribute, contact either Dick Moberg, Department of Neurosurgery, Jefferson Medical College, Philadelphia, PA 19107, (215) 829-6745, or Warren Dunning, 5939 Woodbine Ave., Philadelphia, PA 19131, (215) 879-9383.

NON-ORAL COMMUNICATION IN SAN DIEGO

The San Diego County Non-Oral Advocacy Group evolved from a small gathering of individuals interested in meeting some of the needs of the non-oral in their area. They offered a course titled "Techniques for Developing Communication Systems for Non-Oral Individuals" through the community college system at San Diego State University and have recently held a Communication Fair to demonstrate various communication devices. They are also investigating possible funding sources for other projects.

For further information about the Non-Oral Advocacy Group, contact Nancy Oro, United Cerebral Palsy Center, 7947 Birmingham Drive, San Diego, CA 92123.

NON-ORAL COMMUNICATION CENTER

The Non-Oral Communication Center is a demonstration/service project of Title IV-C, Fountain Valley School District, California. It is designed to serve the communication needs of children who are unable to use oral speech because of neurological or neuromuscular conditions. The children are trained to use alternatives to speech in the form of mechanical, electronic or computerized communication devices.

There are two main objectives of this project: to conduct a therapy program and research model to determine if such alternatives to oral speech facilitate intellectual, social-emotional and academic growth, and to provide an assessment center for all referred children who may benefit from training in the use of non-oral communication. The parents and rehabilitation team working with the child maintain contact with the center for on-going consultation.

All services of the project, including an audio-visual in-service program, are without charge to public agencies, schools or individuals. To receive further information, contact Ms. Judy Montgomery, Project Coordinator-Title IV-C, Plavan School, 9675 Warner Ave., Fountain Valley, CA 92708, (714) 964-2014.

SOUTHERN CALIFORNIA COMMUNICATION GROUP

The SCCG is a group in the Los Angeles area whose members are involved in all aspects of communication aids. The group publishes a newsletter, *Speakeasy*, has sponsored two Communication Aids Fairs and is developing a library of materials (written and/or visual) pertaining to developments in the area of communication. Persons interested in SCCG may wish to contact them at: Southern California Communication Group, 834 22nd Street, Santa Monica, CA 90403.

THE ARTIFICIAL LANGUAGE LAB COMMUNICATION ENHANCEMENT PROGRAMS

The Artificial Language Laboratory in Michigan State University's Computer Science Department has undertaken several programs for communication enhancement in coordination with various intermediate school districts and public school systems in Michigan. These include projects in Wayne, Jackson, Ingham and Kent counties.

The largest of these is currently in its third year in Wayne County, involving schools in the Wayne County Intermediate School District and the Northville Public School District. The project has been supported in part by federal funds and is presently "going into the field" with mini/micro computer systems, speech synthesizers and other peripherals targeted for location at two sites: special classrooms at Riley School, Allen Park, and Moraine School in Northville. Students in the classrooms are speech handicappers with cerebral palsy. The computer-based aids involve adaptive keyboard and single-switch interfaces, by which the user controls the display of video terminals and accesses linguistic constructs. Output is in the form of voice and print. In addition to facilitating basic communication needs, the aids also have been configured to perform educational functions and to allow musical and graphic arts compositions.

The focus of the Artificial Language Laboratory has been on the development of software packages and special electronic devices and the training of school district professional staff. Some of the software packages include a Bliss Symbol display and scanner, a letter-word-sentence scanner and NIL, a computer-assisted instruction programming language designed for teachers and therapists. Electronics developments include a Morse Code interpreter and myoelectric (muscle potential) input switches.

For further information, contact Ms. Linda Chadderdon, Manager of Information Services, Artificial Language Laboratory, Computer Science Department, Michigan State University, East Lansing, MI 48824.

CROSS REFERENCE

A central summary point for references to articles from all journals and other sources of material related to non-vocal communication enhancement.

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- Schiefelbusch, Richard, *Language Intervention Strategies*, University Park Press, Baltimore, Maryland 1977.
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- Telescher, Erwin S., "Eye Motion Operable Key Board Accessory", Roslyn, NY, Oct. 12, 1976, U.S. Patent 3, 986, 030.
- Vanderheiden, G. C. and K. Grilley, *Non-Vocal Communication Techniques and Aids for the Severely Physically Handicapped*, University Park Press, Chamber of Commerce Building, Baltimore, Maryland 21202.
- Zweiban, Sue Topper, "Indicators of Success in Learning a Manual Communication Mode", *Mental Retardation*, 15 (2) April 1977, page 47.

CLASSIFIED ADVERTISING

Classified advertising is accepted free of charge from subscribers for used equipment and for positions offered or positions wanted. Ads may be placed with a response number for individuals or firms who do not wish to have their names listed. In these cases, responses should be addressed to Communication Outlook and include the response number on the envelope. All such correspondence will be forwarded by Communication Outlook.

Positions Wanted

Speech and Language Pathologist, M.S., C.C.C.Sp. 4 years experience with cerebral palsy population developing communication boards, adapting seating and other equipment; has Bliss elementary certificate, seeks position with involvement in research and development of communication boards, vocabulary selection, and training and operation of aids. Response No. 100.

NEWS ON AIDS

To introduce readers to available aids and to announce new aids or significant improvements on existing ones. This information is provided solely as a guide to the existence and availability of aids. Communication Outlook assumes no responsibility for the effectiveness, safety, or quality of any item.

COMMERCIALLY AVAILABLE

The **PHONIC MIRROR HandiVoice**, VOTRAX, a division of Federal Screw Works, and HC Electronics, Inc., a subsidiary of American Hospital Supply Corp., have jointly announced their plans to introduce a new portable, battery-operated, prosthetic device for the verbally impaired under the trademark **PHONIC MIRROR HandiVoice**. The device, a hand-held, synthesized speech aid for non-verbal/non-vocal populations, simulates the human voice and can produce complete sentences. Two models are in production: Model HC 120 operates like a calculator with word storage and recall capability; the other, HC 110, is a graphically illustrated instrument for pre-language or developmentally disabled persons. The Model HC 120 instrument has 900 words, the alphabet and a phonemic capability which allows the user to create words not present in the aid's prestored vocabulary. Model HC 110 contains 500 words and phrases and a phonemic capability.

VOTRAX, developer of the products, will be responsible for manufacturing and HC Electronics, Inc., will be the worldwide distributor. The **PHONIC MIRROR HandiVoice** is available for private purchase upon the professional recommendation of a speech clinician, physical therapist or other rehabilitation personnel. Third-party payments by certain government, civic and charitable agencies also are being approved. The distributor is currently accepting orders for early April delivery. Cost is \$1995.00.

For further information, contact:

USA	Canada	Europe
HC Electronics, Inc. 250 Camino Alto Mill Valley, CA 94941	Phonic Ear Ltd. 2688 Slough St. Mississauga, Ont. L4T 1G3	Phonic Ear International A/S Formervangen 34 DK 2600 Glostrup Copenhagen, Denmark



The **Canon Communicator**. The Canon Communicator was introduced into the United States and Canada on Feb. 1, 1978. Conceived of in the Netherlands and developed in Japan, the Communicator is an aid for people who do not have verbal or written communication available to them. The device has a 55-function keyboard configured in a matrix format, with 26 keys representing the letters of the alphabet and a shift key that accesses the numbers 0-9, special purpose notation and punctuation. The keys activate a printer which produces characters on a paper tape. Each roll of paper tape is 50 meters long and can accommodate 12,500 characters. The Communicator measures 131x85x30 m.m. (5.1x3.3x1.2 inches) and weighs 280 grams (10 ounces). Its power source is a separate, rechargeable NiCd battery pack which can be worn in an inside pocket or on a belt. A fully charged battery lasts 7 hours at a typing speed of one character per second, which would use 2 tape rolls. The Communicator is packaged and shipped with a full complement of accessories, including the battery pack,

battery charger, 20 tape rolls, 2 different keyboard overlays for use by motor-impaired persons, an arm belt with extension belts, a battery pack case neck strap, rain cover and soft case.

For further information, contact: Telesensory Systems, Inc., 3408 Hillview Avenue, P.O. Box 10099, Palo Alto, CA 94304, (415) 493-2626. The cost including accessories is \$549.00.

ZYGO Communications Systems. Everest & Jennings, Inc., a major wheelchair manufacturer, is now the exclusive marketing organization for ZYGO Communication Systems. According to Everest & Jennings, these products, as well as other special products for the M.R., C.P., and special education markets, are being handled by a select group of trained field specialists. Distribution is at a local level, so that hundreds of dealers will be on call for immediate access to needed merchandise. In the area of communication, Everest & Jennings says that systems are available on a trial basis, and that physical assessment and adaptation of interface mechanisms is routine.

For further information, contact Robert Smith, Everest & Jennings, Inc., 1803 Pontius Avenue, Los Angeles, CA 90025, (213) 478-1057.

Prentke-Romich Company. Among the electronic aids which the Prentke-Romich Company builds and designs is a line of non-verbal communication aids. Aids of the scanning type include a message selector, alphabet-message scanner, scanning strip printer and Bliss symbol scanners. Additionally, the Prentke-Romich Co. has developed an assortment of functional modules that can be assembled to provide a variety of row-column scanning communication aids. They have also designed an Encoding Strip Printer and the ELKOMI 2, a small calculator-style aid with a 9 character lighted display. Prentke-Romich offers a number of standard control switches and can provide ideas and technical assistance if special switches are required.

For further information, contact: Prentke-Romich Company, R.D. 2, Box 191, Shreve, OH 44676, (216) 567-2906.

The **Lightwriter**. The Lightwriter is a portable unit consisting of a keyboard and luminous display. As the keys are depressed, characters enter the right-hand end of the display, moving those previously entered to the left. Corrections may be made by using the Backspace or Erase keys, and there is a bleeper for calling attention. The keyboard consists of a key-guard over a slash-proof membrane and uses the familiar typewriter layout with a full range of letters, numerals and punctuation. Keyboards are available in French, German, Italian, Scandinavian or Spanish layouts, as well as English, or in an alphabetic layout for those with no typing experience. The display is removable, for placing either way round in the base unit or standing separately and shows the last 32 characters entered.

For further information, contact: Toby Churchill Limited, Designers of Equipment for the Disabled, 20 Pantom Street, Cambridge, England, CB2 1HP.

Emotional Moods and Needs Chart G 3 & 4. This visual-aud chart is introduced by Carol Niemi Green, RN, CRNA, BSN, designer of the **HELP ME TO HELP MYSELF** communication aids. Patients with problems in speech, hearing, sight, learning or language use the **HELP ME TO HELP MYSELF** handbooks and the ICU-G 1&2 charts to indicate their basic physical needs to others. These materials are useful in hospitals, nursing homes, rehabilitation centers, clinics, schools and private homes. Now, psychosocial moods and needs may be expressed using the G 3&4 chart which has 50 combinations of words printed in 48-point bold black letters on 11"x14" pastel index cards. Examples of messages include: "I feel lonely. I feel encouraged. Are you worried? Are you pleased? I love you. Please hold me." The **SPELL IT** alphabet permits the communication of more intimate and special thoughts.

The chart is 60¢ and quantity discounts are available. Order from **HELP ME TO HELP MYSELF** Communication Aids, 324 Acre Avenue, Brownsburg, IN 46112.

Tufts Interactive Communicator (TIC). The Tufts Interactive Communicator is the result of five years of applied research at the Biomedical Engineering Center at Tufts-New England Medical Center. The TIC is designed to enhance the communication skills of those severely disabled individuals who cannot express themselves due to motoric impairment. The TIC utilizes a single, grossly controllable muscular movement to activate its electronically scanned keyboard, thus allowing the user complete access to all typewriter functions. The TIC presents its typed output on both a 1000-character video display and a paper strip printer. The operation of the TIC requires that the user be capable of operating a single switch with a reasonable degree of accuracy. Staff engineers have developed various "standard" switches which include simple mechanical devices which require varying degrees of applied force, puff and sip controls and capacitance operated inputs. Other custom switches have been designed where special considerations warrant their use. The basic TIC unit costs \$2500 and requires about four months for delivery. Other versions of the TIC are under development. At present, they include a personalized dictionary option and a predictive scanning option. Also under development are symbol scanning and symbol printing devices suitable for teaching systems.

such as the Peabody Rebus Reading Program or for alternative language programs like Bliss Symbols. Another device under development is an electronic letterboard with a custom designed surface which can operate printing devices used in the standard TIC.

For more information contact the Biomedical Engineering Center, Tufts-New England Medical Center, 171 Harrison Ave., Box 1014, Boston, MA 02111.

CYBERCOM. The Cybernetics Research Institute, a non-profit organization located in Washington, D.C., has developed a family of man-machine communications and control systems. The systems may be used by persons in educational, rehabilitation or vocational environments who cannot write or type, but who have language comprehension and a knowledge of language structure. Through use of their remaining sensory and motor capabilities, these individuals can operate one of a wide variety of keyboards or interfaces. The CYBERCOM family of aids include: CYBERTYPE (typing system); WHISPER-TYPE (typing and display system for diagnostic testing, instruction and communications); the CYBERLEX and CYBERLAMP (visual feedback systems); the CYBERPHONE and CYBER-TONE (telephone terminal systems for persons who are deaf and/or speech-impaired); the CYBER-BRAILLER (a combined braille and print writer for sighted and visually-impaired persons for use in libraries, schools and offices); CYBER-SPEAK (a speech synthesizer system for use by persons who have speech and physical disabilities and are precluded from using standard keyboards); and CYBER-GO-ROUND, an automated visual display system. A simple program based on dual-input coding which most students learn in less than 10 weeks is common to all the CYBERCOM systems. The feature of a single dual-input code permits the exchange of keyboards or interfaces depending on the specific performance capabilities of the user. This feature also eliminates the need for the teacher to learn a "new" typing or control procedure for each student or user. Should either an improvement or deterioration in a person's physical capability take place, the user or teacher is not compelled to learn new codes. In addition, the use of the code permits communication in most cases in the event the equipment is not available. The CYBERCOM also facilitates interconnection via computer, telephone, radio, or other subsystems with the CYBERCOM interface and systems. CRI is also developing a system known as DEBLICOM (DEaf-BLind COMMUNICATIONS System). The system will be programmed to receive signals from an electric keyboard. Anyone will be able to communicate with the deaf-blind by typing a message on the keyboard. The keyboard will signal coded vibrations on the user's body. The user feels the message and replies by typing an answer on the keyboard. The answer can be either viewed on a small screen or can trigger a second machine which will convert the code into an audible message.

For further information, contact: Dr. Haig Kafasian, Llewellyn Park, West Orange, NJ 07052.

UNDER DEVELOPMENT

The Optical Pointer. The Optical Pointer is a device which has been designed for the non-verbal individual who does not have functional use of the upper limbs. The head-mounted device allows head movement to control the direction of a light beam, permitting direct selection of characters on a communication board. The light or optical pointer can be detached from the headgear and replaced by a rod to allow participation in graphic activities. The optical pointer with accessories is presently undergoing field testing in a limited number of clinical settings. Results should be available in the Fall of 1978. This device has been developed by the Design Clinic, Faculty of Environmental Design at the University of Montreal and by the Mackay Center for Deaf and Crippled Children.

For further information, contact: Ronald Levy, Ph.D., Clinique de Design, Faculté de l'Aménagement, Université de Montréal, Case Postale

6128, succursale 'A', Montréal, P.Q. H3C 3J7, Canada.

AUTOCOM and VERSICOM. Linc Services Inc., Westerville, Ohio, in cooperation with the TRACE Center and the Bureau for the Education of the Handicapped is currently in the process of accepting bids or proposals for the manufacturing of the AUTOCOM and VERSICOM communication aids developed at the TRACE Center at the University of Wisconsin. The process, which is due to be completed in April 1978, will result in the release to commercial manufacture of the two aids. This is the first communication aid of this type to be released from a university research group to an independent manufacturer/distributor. The program through which the aids are being released is a component of the Bureau for the Education of the Handicapped's marketing program and reflects an increasing awareness and concern for the problem of moving materials and devices developed as a part of research efforts into the public sector.

For further information, contact: TRACE Center, 1500 Highland Ave., University of Wisconsin, Madison, WI 53706, (608) 262-6966.

LOOKING AHEAD

Previews and perspectives on current research and future developments.

Canada has announced a \$642,000 contract which has been awarded to Bell Northern Research as a result of an unsolicited proposal for the development of a device which could help to enable the use of telephones by individuals who experience hearing and speech handicaps. Bell Northern will be working on a device called the Visual Ear which it hopes to have developed within 18 months. The pocket-size device will be a combination of a keyboard and display attachment for telephones. The messages will be displayed electronically much the same as news is spelled out on cable TV sets. The device is being designed to be compatible with existing teletypewriter networks now being used by the deaf and will also have the capability of interfacing with computers. Initial work on the Visual Ear was done by Prof. Ernest Douglass and associates at the University of Toronto and Waterloo University.

In addition to this device, we can expect to see more small communication aids of various types. Technology is involved in the development of small alphanumeric displays at costs which used to be reserved for only numeric displays. We also are seeing a trend toward the use of alphanumerics in hand-held calculators. Toshiba, for instance, has announced an electronic notebook calculator (model number LC-836 MN) which is capable of storing up to 30 6-letter words. These words can be called out sequentially. Moreover, this calculator is less than half an inch thick and runs for 9,000 hours on a set of three miniature batteries.

Evaluation of this electronic notebook calculator will be necessary in order to determine its effectiveness as a communicator. A report will be forthcoming in a future issue of *Communication Outlook*. With a price tag of \$79.00, however, it is clear that technology being developed for the mass population is moving in directions which will be providing either direct or indirect benefits to the non-speaking individual in the very near future.

Gregg C. Vanderheiden

ORDER FORM

TO: Communication Outlook, Artificial Language Laboratory, Computer Science Department, Michigan State University, East Lansing, MI 48824

— Please enroll me as a member of the International Action Group for Communication Enhancement.

I enclose a check for \$10.00 (\$12.00 outside of North America) payable to

Michigan State University

This covers dues for one year and 4 issues of Communication Outlook.

NAME: _____

Address: _____

Circle one: You ^{may} _{may not} release my name and address for use in other mailing lists.

OCCUPATION: _____

COMING UP

Calendar of events of regional, national, or international interest

April 24-28, 1978. Interagency Conference on Rehabilitation Engineering. Washington, D.C.

Contact: C. J. McConnell, 6881 Tamarind Circle, Orlando, FL.

May 11-13, 1978. Language and Communication Disorders in Children. Toronto, Ontario.

Contact: The Ontario Institute for Studies in Education, 252 Bloor Street West, Toronto, Ontario, Canada M5S 1V6

May 17-19, 1978. International Conference on Human Factors in Clinical Medicine Design and Clinical Use of Sensory and Motor Prosthetics. Brooklyn College, New York City.

Contact: Prof. Gerald Leisman, Dept. of Health Sciences, Brooklyn College, Brooklyn, NY 11210.

June 7-9, 1978. Fifth Annual Conference on Systems and Devices for the Handicapped. Baylor College of Medicine, Texas Institute for Rehabilitation Medicine.

Contact: Texas Institute for Rehabilitation and Research, 1333 Mour-sund, Houston, TX 77030.

Sept. 18-21, 1978. European Conference of Rehabilitation International at the Brighton Center and Hotel Metropole, Brighton, England.

Contact: Naides Conventions Limited, Temple House, 36 High Street, Sevenoaks, Kent, England, TN13 1JG.

Sept. 24-29, 1978. American Academy for Cerebral Palsy and Developmental Medicine. Royal York Hotel, Toronto, Ontario, Canada.

Contact: United Cerebral Palsy Association, 66 East 34th St., New York, NY 10016.

June 22-27, 1980. World Congress of Rehabilitation International. Winnipeg Convention Centre.

Contact: Canadian Rehabilitation Council for the Disabled, P.O. Box 1980, Winnipeg, Manitoba, Canada R3C 3R3

TRACE Center National Workshop Series. "Where Do We Begin?" 13 workshops will be held across the United States. For information on the series in general, contact Debra Harris, Director of Training and Communication Processes Research, TRACE Center, 314 Waisman Center, 1500 Highland Ave., Madison, WI 53706. For individual workshop information, contact the area workshop sponsor as shown below:

April 28-29, 1978. California.

Sponsor: Judy Montgomery (714) 964-2014, Fountain Valley School District, Number One Lighthouse Lane, Fountain Valley, CA 92708.

May 12-13, 1978. New York.

Sponsor: Ellie Kaufman (914) 592-7555, Blythedale Children's Hospital, Valhalla, NY 10595.

June 9-10, 1978. Louisiana, Alabama, Arkansas, South Carolina, Florida.

Sponsor: Rhonda S. Work (904) 487-2840, Bureau of Exceptional Students, Department of Education, 213 Knott Bldg., Tallahassee, FL 32304.

INTERFACES AND ACCESSORIES

Information and hints on interfacing and augmenting communication aids to better meet the full needs and capabilities of individuals.

A simple typing stick for use with electric typewriters is available from Therafin Corporation, 513 North Street, Crete, IL 60417. It is a 12-inch, plastic-covered rod with a plastisol no-slip tip. It has an adjustable hand loop that can be raised or lowered or shortened to suit the individual's needs. The cost is \$2.17.

NEW MATERIALS

New resource or application information of general interest and available either commercially or privately.

Zygo Communication Board Training Kit for the Multi-Handicapped by S. Hall, L. Talkington, and R. O'Grady. Developed at Fairview Hospital and Training Center. Available from Zygo Industries, P.O. Box 1008, Portland, Oregon 97207.

"**The High Risk Infant, a Multi-Agency Approach for Follow-Up Action**" is a 40-minute color videotape presenting methods for identifying the problems of high risk infants. \$5.00 rental. Write Department of Community Health, University of Wisconsin-Extension, 929 North 6th Street, Milwaukee, Wisconsin 53203.

The Matrix Communicator Idea Book presents simple yet interesting adaptations of many activities for children using communication aids. Available from DUFCO, 901 Iva Court, Cambria, CA 93428.

Non-Vocal Communication Resource Book, edited by G. Vanderheiden, provides a comprehensive summary of aids, materials, and accessories available around the world. It is published in a three ring binder for easy updating and is available from either University Park Press, Chamber of Commerce Bldg., Baltimore, MD 21202 or from the TRACE Center, 314 Waisman Center, 1500 Highland Ave., University of Wisconsin, Madison, WI 53706. This publication replaces the Annotated Bibliography of Communication Aids, the Master Chart, and several other documents previously available from the TRACE Center.

Communication Resources for the Developmentally Disabled: A Guide for Parents, Paraprofessionals, and Professionals is a text that describes screening and assessment instruments, therapy resources, communication alternatives and devices, sourcebooks and services for speech and language development appropriate for use with developmentally disabled persons. Write to the Job Development Laboratory, George Washington University, 2300 Eye Street NW, Room 714, Washington, D.C. 20037. The first copy to individuals within Region III is free of charge. Copies to other areas are \$6.00 per copy. Make checks payable to George Washington University. (Submitted by Kali Mallik)

Copies of the article, "**Rehabilitative Speech and Language Pathology and Non-Oral Communication**" are available free of charge from Everest & Jennings as part of its *Resources* series for the physical medicine professional. The author, Carol L. Nugent, M.A., C.C.C., is the director of the Speech and Language Department at Good Samaritan Hospital and Medical Center, Portland, Oregon. Send your name and address, including affiliation and title, to Everest & Jennings, 1803 Pontius Avenue, Los Angeles, CA 90025. (Submitted by Larry Weiss)

RECREATIVITY

Techniques, aids, accessories to facilitate recreation and independent activity/creativity.

Dr. Tony Cartwright of the Mechanical Engineering Department of Surrey University, U.K., has invented a cross between a toy and a teaching aid to enable children with spasticity to play games, including Noughts and Crosses (Tic-Tac-Toe) and Snakes and Ladders. These games have been designed so that they can be played with children who do not experience physical handicaps as well as with those who do by using electronically controlled boards. No news yet on whether there are any commercial plans for these devices which are microprocessor based.

Therafin Corporation, 513 North Street, Crete, IL 60417 has developed a "game" designed to provide exercise and encourage development of range of motion in the upper extremities. The Jux-A-Cisor consists of a plastic handle with a very irregularly bent wire which has approximately 25 corners. By tipping the handle in various directions, a plastic disc can be made to move along the wire path. The cost is \$9.79. Also available from Therafin is a four level card holder for \$4.23.

Communication Outlook

Artificial Language Laboratory
Computer Science Department
Michigan State University
East Lansing, MI 48824

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APPENDIX X

FOURTH COOPERATIVE RESEARCH AGREEMENT

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FOURTH COOPERATIVE RESEARCH AGREEMENT

MICHIGAN STATE UNIVERSITY

Cooperative Research Agreement

MEMORANDUM OF AGREEMENT made and entered into as of the 15th day of December, 1977, by and between The Board of Trustees a Constitutional Corporation operating MICHIGAN STATE UNIVERSITY, hereinafter referred to as the University, and Jackson County Intermediate School District, Commercial Exchange Building, 2301 East Michigan Avenue, Jackson, Michigan 49202

hereinafter referred to as the Company, WITNESSETH:

WHEREAS, the University has personnel and facilities for carrying out the project described in Exhibit A attached hereto; and

WHEREAS the Company is desirous of engaging the said personnel and facilities for carrying out the project described in Exhibit A:

NOW, THEREFORE, in consideration of the premises and the covenants and agreements of the parties as hereinafter set forth, the parties have agreed and do hereby agree with each other as follows:

1. The University, on its part, hereby agrees to carry out the project described in Exhibit A in the manner and with the personnel and facilities set forth therein.

2. The Company, on its part, hereby agrees to pay to the University the sum of five thousand (\$5,000) Dollars, as follows: payable upon execution of agreement

3. It is mutually understood and agreed that:

(a) This agreement may be terminated by either party upon giving reasonable notice to that effect to the other party and provided a reasonable adjustment (in relation to the portion of the project which has been completed) is made between the parties as to the funds which have been paid or are to be paid by the Company to the University.

(b) Unless otherwise provided in Exhibit A attached hereto, the University shall have the unrestricted right of publication with reference to its activities and findings in connection with the project described in Exhibit A.

(c) Upon the completion of the project or upon the termination of this agreement, the University shall submit a written report to the Company as to its activities and findings with reference to the project described in Exhibit A; and the Company shall have the right to be advised at all times as to the progress being made in carrying out the project.

(d) Patent rights are the property of the University.

IN TESTIMONY WHEREOF, the parties hereto have caused this instrument to be executed, in duplicate, by their officers thereunto duly authorized, at the places and on the dates set opposite their respective signatures.

Signed at East Lansing, Michigan, this _____ day of _____, 19____

By Stephen H. Perry BOARD OF TRUSTEES
President
Attest: STEPHEN H. PERRY
Assistant Vice President for Finance

Signed at _____ this _____ day of _____, 19____

By Mark K. Anderson
Attest: Mark K. Anderson

Introduction

This is a third supplementary agreement which continues the Communication Enhancement Pilot Program initiated by Jackson County (Michigan) Intermediate School (JCISD) and Michigan State University under a Cooperative Research Agreement date 3 June 1976 ("the original agreement"). The term of the original project was July 1, 1976 to December 31, 1976. Under the first supplementary agreement, the project was extended until June 30, 1977. The second supplementary extended the project to December 31, 1977. The present agreement will extend the project to June 30, 1978 to provide additional services and equipment as specified below.

Objectives

The objectives set forth in the previous agreements will remain the objectives of the project as extended by this supplementary agreement. These objectives are:

- a. To design and implement a communication system which will enable the Student to work on educational tasks independent of constant attention by a teacher or therapist.
- b. To facilitate the Student's access to social intercourse with other students and with school staff and faculty.
- c. To provide the Student with a means of feedback for practicing language skills.
- d. To gain knowledge in the areas of computer science, electrical engineering, systems science, linguistics, audiology and speech science, and education which may be applicable to communication enhancement for persons other than the Student with similar physical and mental abilities.

Additionally, this supplementary agreement will support the study required to determine the design of a centralized facility for computer-based communication enhancement and training.

Implementation

As set forth in the previous agreements, the communication enhancement program has five principal phases as follows:

Phase I: Evaluation of the Student's language and motor capabilities, for the purpose of designing appropriate aids and for assessing progress achieved in the program.

Phase II: Design of computer-based system to be used by the Student to perform these functions: 1) Write onto a television screen or other cathode ray tube display, 2) Print on paper using a printing

terminal, 3) Product output suitable for a voice synthesizer.

Phase III: Construction and testing of the above system at Michigan State University.

Phase IV: Installation of the communication aid system in Jackson, accompanied by a program of implementation in the school setting to accomplish educational goals.

Phase V: Evaluation of the progress achieved in the program and recommendation of continued work on the design and implementation of communication aids systems for the Student.

During the period covered by the original agreement and first supplement the following was accomplished:

1. Student evaluation. In cooperation with the staff of Jackson (Michigan) Public School District, the student and his family, and JCISD, the MSU research team has compiled information concerning physical and cognitive abilities. This information has formed the basis of the initial design of the student communication aid system.

2. System design. The MSU research team has completed the design of a microprocessor-based communication system with adaptive input and synthesized voice output capability. The system is based on a Motorola M6800 microprocessor and utilizes a video output controller developed by the MSU Artificial Language Laboratory.

3. Hardware construction. The following prototype items were constructed and tested:

- (a) Video output controller with alphanumeric and special graphic output.

- (b) Several bioactive input switches were constructed and adapted for use by the student.

- (c) The bioactive switches were configured with an audio feedback device and a ROTOCOM communication aid. This provides the student and his teachers and therapists with a means of communication and is being used to help the student develop skills he would need in operating the communication system.

- (d) A microprocessor-based communication aid with bioactive switch input and video and pointer output were constructed. The system provides an I/O port for addition of a digitally controlled voice synthesizer.

4. Software and firmware. MSU has written, encoded, and debugged the software and firmware necessary to implement the following functions.

- (a) Scanning input of alphanumeric symbols
- (b) Video display of user-generated text
- (c) Limited text editing capability
- (d) Interactive system to allow the user to construct line graphic figures
- (e) Printer control routines for alphanumeric output

During the period of the second supplementary agreement, the following was accomplished.

1. Addition of a digitally controlled voice synthesizer to the hardware configuration of the system.
2. Development of software for the proper integration of the synthesizer into the overall instructional program.

Under the present supplementary agreement, the following will be accomplished:

1. Continued consultation with the Jackson County Communication Enhancement team.
2. Evaluation of other students in Jackson County in order to make recommendations about their involvement in the Communication Enhancement Program.
3. Undertake studies to determine the design of a centralized facility for computer-based communication enhancement and training.

Project Management

The Michigan State University research and development effort will be coordinated by Dr. John B. Eulenberg, Associate Professor and Dr. Mort A. Rahimi, Associate Professor of Computer Science. The JCISD staff liaison with the MSU team will be the responsibility of the Deputy Superintendent, Special Education, or his designee.

Privacy and Freedom of Speech

The Michigan State University/Jackson County Intermediate School District research project recognizes that new means of communication are being explored and that accompanying this exploration must be respect for human and civil rights. Privacy from unauthorized access to users' computer files, and other sources of personalized information will be assured. Information obtained during the course of this project, wherever it involves the personal identity of an individual participant, will not be used without his/her permission or that of a legally responsible parent or guardian. Persons expressing an unwillingness to participate in this project for any reason will not be coerced to do so.

**Implementation
Schedule**

The construction and delivery of equipment developed by MSU under this agreement is subject to the delivery schedules of supplies of electronic components. MSU will keep JCISD informed of its implementation schedule.

**Disposition
of Material**

In addition to the communication aid equipment described above, all Program software and associated documentation developed on this project shall be supplied to JCISD. This agreement does not preclude the use for other research purposes of any material, instrumentation, or designs developed or acquired by MSU in connection with this project.

All instrumentation and equipment acquired by MSU to facilitate the development and construction of the communication system provided under this agreement will be the property of MSU.

Due to the nature of the research and development conducted under this agreement, the projected budget set forth below is subject to reallocation of funds among the categories at the discretion of the MSU research coordinators.

REVISED BUDGET

Salaries and Salary-Related Charges

Graduate Assistant (1/2 FTE Winter Term 1/4 FTE Spring Term)	\$1,689.00 844.50
Hourly Labor	368.31
Indirect Cost (47% of Salary)	<u>1,363.85</u>
Total Salaries and Salary-Related Charges	4,265.66

Supplies and Services

Travel (20 trips at \$25/trip for MSU staff)	500.00
Miscellaneous Supplies and Services	<u>234.34</u>
Total Supplies and Services	734.34

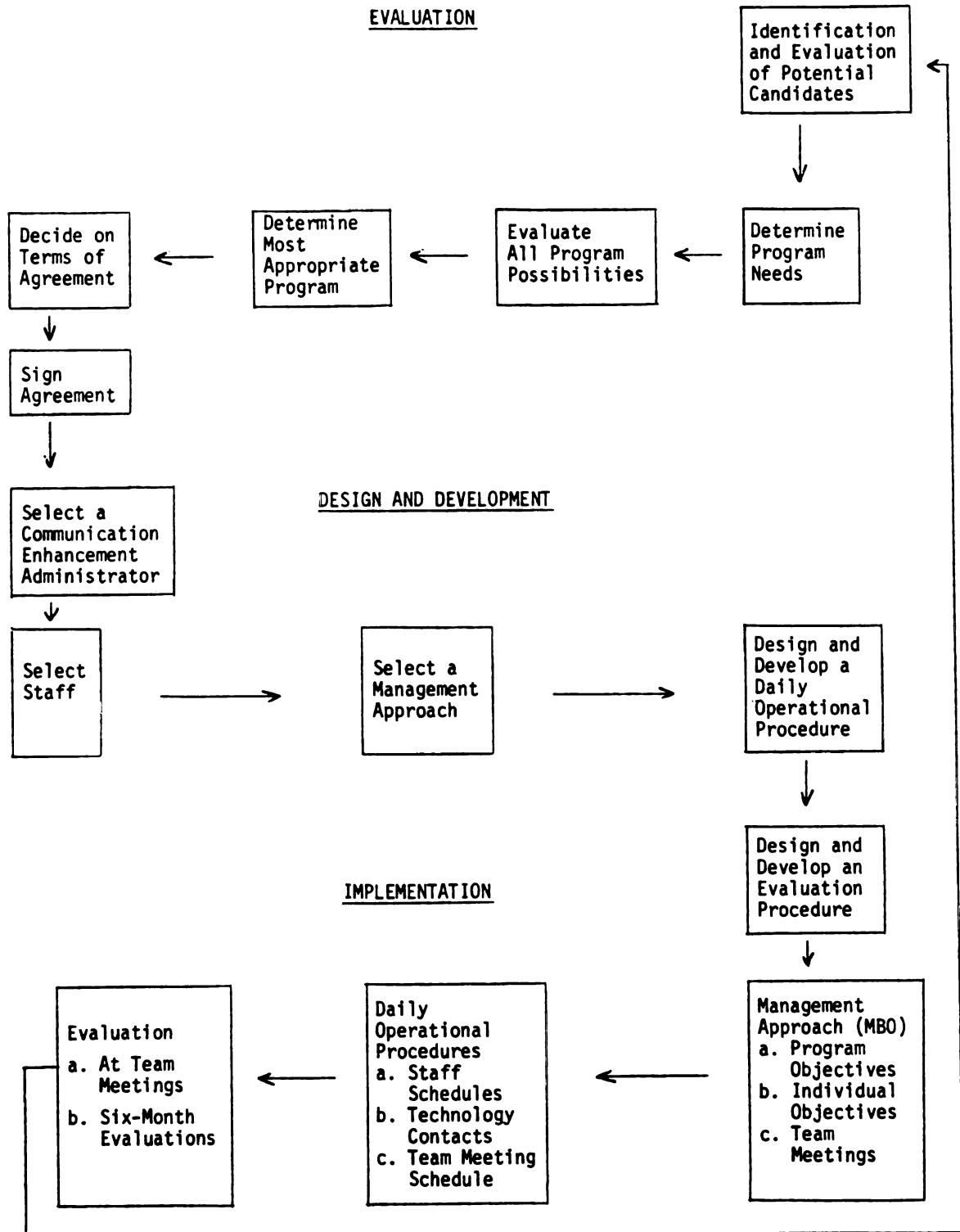
TOTAL	<u><u>\$5,000.00</u></u>
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APPENDIX Y

C E PROGRAM ITERATION

APPENDIX Y

C E PROGRAM ITERATION



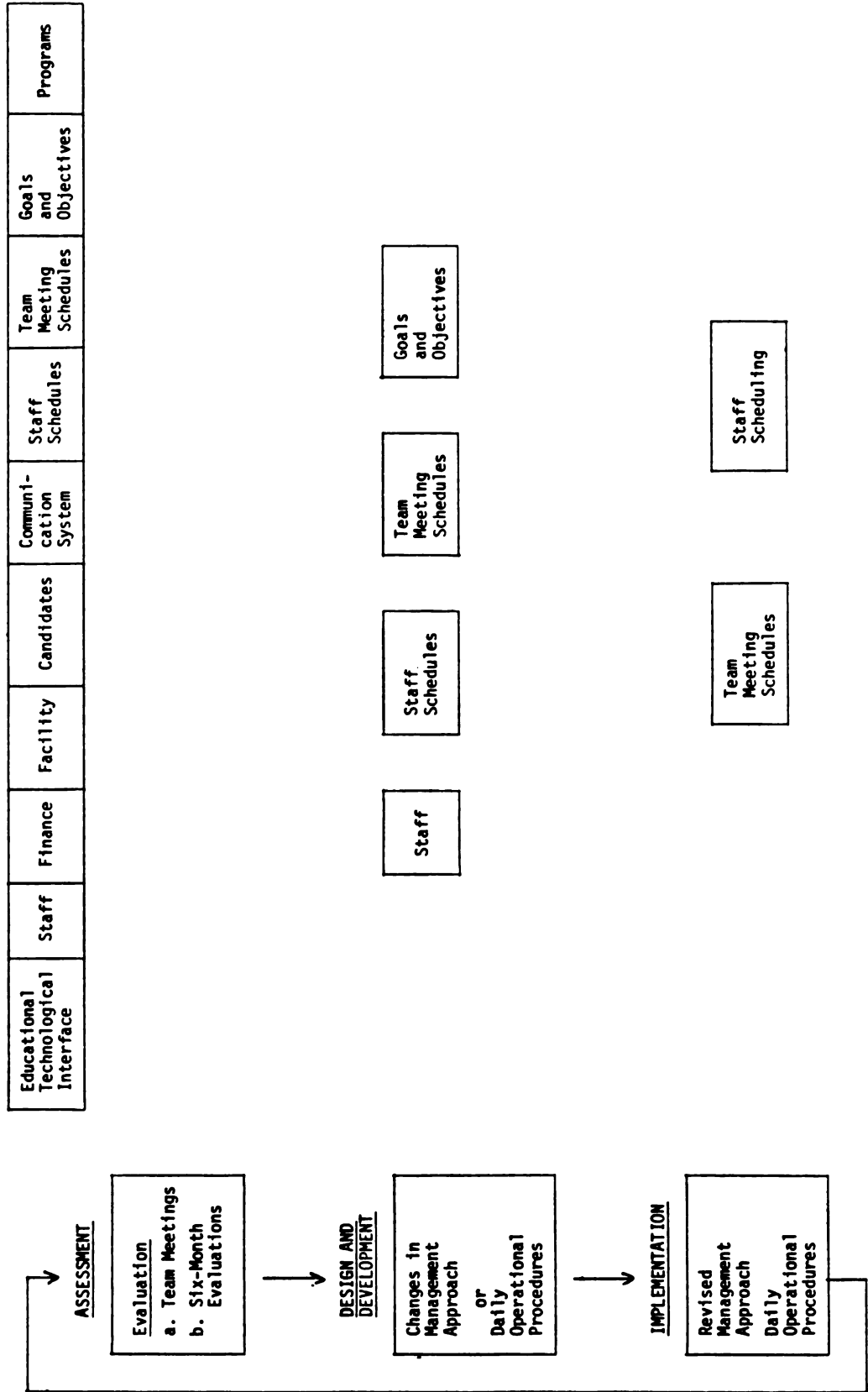
APPENDIX Z

AVAILABLE RESOURCES--ASSESSMENT, DESIGN AND DEVELOPMENT, AND IMPLEMENTATION

APPENDIX Z

AVAILABLE RESOURCES--ASSESSMENT, DESIGN AND DEVELOPMENT, AND IMPLEMENTATION

AVAILABLE RESOURCES



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BIBLIOGRAPHY

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