The Effects of Using Augmentative Communication Devices on the Communication of a Student with Traumatic Brain Injury

A Proposed Masters Study

Submitted to the School of Education, University of Dayton, in Partial Fulfillment of the Requirements for the Degree Master of Science in Education

By

Lisa Coats

School of Education
University of Dayton
Dayton, Ohio

June 26, 1995
Approved by:

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Official Advisor
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The author of this project would like to thank her advisor, Dr. Rowley, for his time in guiding this project to its completion and his enthusiasm shown throughout the entire process. The author would especially like to thank Carrie and dedicate this project to her for making it all possible. Finally, the author would like to thank her mother, Pauline Coats, for making all things in life possible.
CHAPTER ONE
INTRODUCTION

The effects of a Traumatic Brain Injury and the emotional trauma to victims and others around them never goes away. Because some degree of healing does occur, problems caused by a brain injury often get much better during the first two years, especially during the first six months after the injury. However, many problems will remain with the person for the rest of his/her's life. The key to a possible recovery is to work with abilities that the person does have, instead of trying to make the person the same as he or she was before.

Carrie was 15 years old and just beginning her 9th grade year of high school, when one evening, while riding with a friend on the back of a four wheeler, she was struck from behind by a truck. She was thrown up into the air, landed on the truck head first, and then landed on the street, again hitting her head.

Carrie had sustained a traumatic head injury and was in a coma for almost two months. When she awoke from the coma her first means of communication was blinking her eyes, once for yes and twice for no. Because of the severity of her injury Carrie was unable to communicate verbally and experienced very limited physical movements.

After the accident Carrie received physical therapy, occupational therapy and speech therapy. Soon she started back to school in a modified classroom two days per week.

Now Carrie is attending school three days per week, still in a modified
classroom. She is still nonverbal and has very limited active movements available for function. She can move her arms forward and to the side. Her hands are fisted and difficult to open. She uses her left thumb to communicate by raising it meaning yes and lowering it meaning no. She is also able to extend her thumb beyond her fist so that she may use it to operate an adaptive keyboard, with assistance at the elbow for facilitation.

Carrie is pushed in an electric wheelchair which she is learning to operate herself by using a joystick that she pushes with her fist. She also uses an Apple Powerbook lap top computer for the purpose of communication.

One major goal of everyone involved in working with Carrie has been to find the most effective and efficient means of communication for her. Much time has been spent working with various augmentative communication devices.

The Purpose of the Study

The purpose of this study was to explore, using qualitative methods, the effects of using augmentative communication devices on the communication of a high school student with Traumatic Brain Injury.

The study was conducted over a period of three months. During this time the researcher conducted an extensive case study, in which a journal was kept, recording results and progress the student made using a variety of augmentative communication devices.
Definition of Terms

For the purpose of this study the following operational definitions were used:

Adaptive Equipment: Devices that allow an individual to perform tasks that he/she previously could not carry out because of a disability or disabilities. Examples include adaptive keyboards and other communication devices.

Attention: The ability to focus on one subject or bit of information; being able to filter out the relevant from the irrelevant information in one's environment.

Articulation: Movements of the tongue, lips, teeth and palate into specific patterns for purposes of speech.

Augmentative Communication Devices: An alternative communication device for nonverbal persons or a supplemental communication device to augment whatever verbal skills a person possesses. Examples are an alphabet board on which the individual spells out messages and a computer that can type out sentences entered by the individual, who merely focuses on the letters.

Boardmaker: The Boardmaker is a personal computer software program from Mayer Johnson. It is a "library" of picture symbols which individuals can use on an adaptive keyboard for the purpose of communication (see Appendix A).

Cognition: Knowing, awareness, perceiving objects, thinking, remembering ideas. The learned set of rules on which all thinking is based.
**Coma:** Unconsciousness lasting for more than a brief period of time. A state of unconsciousness during which the person cannot be aroused and/or does not respond.

**Communicative Disorder:** An observed impairment in disorders of hearing, language, and/or the speech process.

**Facilitation:** To make easier, to assist the student in moving his/her arm and hand by holding the arm by the elbow.

**Frustration Tolerance:** The ability to deal with frustrating events in daily life, the point at which a student can no longer control his anger in a situation.

**Head Injury Traumatic:** Damage to living tissue caused by an external, mechanical force. It is usually characterized by a period of altered consciousness (amnesia or coma) that can be very brief (minutes) or exceedingly long (months/indefinitely). Also called TBI.

**Icon:** A letter, number or symbol.

**IntelliKeys:** IntelliKeys is an adaptive keyboard with a number of built-in features especially for people with disabilities. It allows for the adjustment of the responsiveness of the keyboard, the way the shift and other modifier keys work, the repeat settings, the speed of the mouse, and the function of the indicator lights. An individual can further enhance the accessibility of IntelliKeys by using it with other adaptive equipment like switches (see Appendix A).

**Ke:nx:** Ke:nx is the powerful interface that is attached to the computer to connect the alternate keyboards, switches and other devices used to operate the computer (see Appendix A).
Modified Classroom: An enclosed special education classroom in which special educators serve students with disabilities.

Nonverbal: No verbal communication.

Occupational Therapist: Evaluates upper extremity functioning, fine motor skills and cognitive functioning in relation to those every day skills needed for independent living.

Physical Therapist: Evaluates components of movement, including muscle strength, muscle tone, posture, coordination, endurance and general mobility.

Scanning: A computer program that puts the keyboard on the screen, but is accessed through a switch as the keyboard scans.

Speech Therapist: Evaluates the oral expression of language.

Switch: An adaptive device that is used to operate and control scanning on the computer.

Traumatic Brain Injury (TBI): An acquired injury to the brain caused by an external physical force, resulting in total or partial functional disability or psychosocial impairment, or both, that adversely affects a student's educational performance. The term applies to open or closed head injuries resulting in impairments in one or more areas, such as cognition, language, memory, attention, reasoning, abstract thinking, judgment, problem-solving, sensory, perceptual, and motor abilities, psychosocial behavior, physical functions, information processing, and speech. The term does not apply to brain injuries that are congenital or degenerative, or brain injuries induced by birth trauma. This definition was written in
the Individuals with Disabilities Education Act (IDEA) September 29, 1992.

Limitations

The focus of this study was only on augmentative communication devices that would effect and assist in the communication process of one particular student, with a Traumatic Brain Injury. It was not the intent of the researcher to investigate communication devices for any other purpose.

Significance of the Study

The significance of this study was to show that a student with a Traumatic Brain Injury can communicate, learn, and excel in life. The researcher hoped to gain an understanding of the meaning of Traumatic Brain Injury and how it affects the education process of a student. Also the researcher hoped to explore various augmentative communication devices and options available to assist a nonverbal TBI student in communicating.
CHAPTER TWO
REVIEW OF THE LITERATURE

The purpose of this chapter was to review the literature on Traumatic Brain Injury and Augmentative Communication Devices and how they are interrelated. Specifically this chapter was divided into a number of sections, including, Definition of Traumatic Brain Injury, Causes of Traumatic Brain Injury, Effects/Characteristics of Traumatic Brain Injury, Common Problems Following a Traumatic Brain Injury, Definition of Augmentative Communication Devices, Augmentative Communication Devices for Students with TBI, Language Representation/Vocabulary Selection, and Funding for Augmentative Communication Devices.

Definition of Traumatic Brain Injury
According to the Individuals with Disabilities Education Act, (IDEA, 1992), Traumatic Brain Injury is defined as an acquired injury to the brain caused by an external physical force, resulting in total or partial functional disability or psychosocial impairment, or both, that adversely affects a child's educational performance. The term applies to open or closed head injuries resulting in impairments in one or more areas, such as cognition, language, memory, attention, reasoning, abstract thinking, judgment, problem-solving, sensory, perceptual and motor abilities, psychosocial behavior, physical functions, information processing, and speech. The term does not apply to brain injuries that are congenital or degenerative, or brain injuries induced by birth trauma.
Research has shown that nearly fifteen years ago, most people who had suffered a traumatic brain injury died. Today, almost 95% of persons who are injured will live. However, many "survivors" are left with life-long problems that will affect them as they return to school, work, relationships, and/or their daily routine.

Causes of Traumatic Brain Injury

A brain injury can occur in many different ways. Sometimes a person can be born with a brain injury, for example, a person with cerebral palsy. This type of brain injury may be referred to as a congenital injury, meaning "present at birth." Often however, a brain injury occurs after a person is born, which is referred to as an acquired brain injury.

There are several different causes of acquired brain injury which include stroke, brain infection, brain tumor, exposure to toxic substances, anoxia or lack of oxygen to the brain and of particular interest for the purpose of this study, trauma.

Trauma is the most common way that a brain injury occurs. Traumatic Brain Injury is caused by either an open or closed injury to the head. According to the Virginia Head Injury Foundation, an open, or penetrating injury, occurs when an object, such as a bullet, goes through the scalp and skull and into the brain. This type of injury usually damages a specific area of the brain. A closed injury however, occurs when the head hits another surface, such as a windshield, and often causes damage to the entire brain because the brain moves around inside the skull and gets bruised all over. Swelling of the brain after the injury can cause even
Effects/Characteristics of TBI

There are numerous effects and characteristics of Traumatic Brain Injury depending on what part of the brain has been injured and the degree of damage that has been done to the brain.

If the injury is an open or penetrating injury in which something goes through the head into the brain, such as a gunshot wound, different parts of the brain could be injured. However, if the injury is a closed injury, like a person may suffer from a car accident or when the head hits another surface, then the entire brain may be damage.

According to the Virginia Head Injury Foundation, the two parts of the brain that are most frequently injured in a car accident are the temporal lobes, which are the "memory" parts of the brain, and the frontal lobes, which are the "executive" parts of the brain.

Damage to the temporal lobe part of the brain affects a person's memory and often the ability to remember events or even where he/she is going from one minute to the next. The person may also have difficulty staying on task or understanding conversation.

Damage to the frontal lobe parts of the brain may affect a person's ability to make mature or sensible decisions such as starting and stopping activities and controlling impulses. The person may also have difficulty with problem solving and reasoning.

People who have had a brain injury may also experience a number of medical problems, such as headaches, dizziness, fatigue, seizures, and
changes in appetite. They may go through periods of depression, anger and frustration.

**Common Problems Following a Brain Injury**

After a brain injury a person often has to deal with a great number of changes. Every person and brain injury are different. Therefore, each person who has had a brain injury will experience a unique set of problems. A student for example, may be able to return to school, or an adult to work. However, that doesn't mean that the person is "cured." A brain injury is not like a common injury or illness that will heal itself and go away. Although some healing of the brain does occur, a brain injury causes life-long changes.

A person may experience physical problems that can affect their ability to walk or use their arms and legs, have feeling in parts of their body, have strength and endurance, speak clearly or speak at all, see, hear, taste, swallow, and control bladder or bowel movements.

Problems with thinking skills may affect a person's ability to pay attention and remember, understand others, follow directions, start or carry out a task, think clearly and solve problems, manage time, recognize their own problems, say what they mean, read and write, and handle money.

Problems with behavior and emotional control may cause anxiety, depression, withdrawal, irritability, difficulty controlling temper, and anger and aggression which may result in physical or verbal outburst, poor social skills, and strained family and peer relationships.
A student may face a great number of problems or challenges when returning to school. Among the many physical, behavioral, and emotional problems that a student may face, many students also experience decreased opportunities for social interaction with their peers and have difficulty when attempting such interactions.

Teachers and other professionals may help students returning to school with a Traumatic Brain Injury by learning about the effects that a brain injury can have on a student. They may also help by establishing a routine to make the student feel more secure and comfortable. They should encourage students to talk, if possible, or use gestures, pictures, signs and other visual aids to help them communicate. Teachers can also reduce noise and break tasks into small steps to improve the student's ability to pay attention and stay on task. Most importantly, students should be provided with encouragement to help prevent them from feeling frustrated or discouraged.

If the student is visually impaired, the teacher should identify his/herself and introduce anyone else who is in the classroom. The teacher should also offer assistance to guide the student when walking around the classroom or down the hallway and place the student's hand on the back of a seat or other objects in their pathway.

If a student has difficulty hearing, the teacher should reduce noises in the classroom and always speak clearly. Other students in the classroom should also be encouraged to speak clearly and not to hold their hands in front of their mouths when talking.

If a student is in a wheelchair, the teacher should sit down when
talking to him/her or make sure that the student's head is up so that they are maintaining eye contact. Teachers should always remember not to lean on the student's wheelchair and not to allow other students to lean on the chair as well.

When a student with a Traumatic Brain Injury becomes angry or frustrated in the classroom, the teacher should remember to remain calm and try to redirect the student's attention away from the cause of the frustration. Teachers should try not to dwell on the student's negative behaviors and give the student verbal praise and positive reinforcement whenever possible.

Definition of Augmentative Communication Devices

Augmentative Communication Devices, as defined by the Utah Traumatic Brain Injury Training for School Personnel, are alternative communication devices for nonverbal persons or supplemental communication devices to augment whatever verbal skills a person possesses. Examples are an alphabet board on which an individual spells out messages and a computer that can type out sentences entered by the person, who merely focuses on the letters or icons.

Augmentative Communication Devices for Students with TBI

"Technology for individuals with Traumatic Brain Injury (TBI) and severe expressive communication disabilities has evolved considerably within the last 20 years." (Doyle, & Fried-Oken, 1992)

Augmentative communication devices are available for students who
are nonverbal or have physical disabilities that limit the use of their arms, hands, or fingers, leaving them unable to communicate by using oral or written expression effectively.

Some examples of augmentative communication devices that are available for individuals with Traumatic Brain Injuries include, picture boards illustrating activities, chores, foods, emotions, friends, family, and more, which assist individuals with making decisions, alphabet boards, used for spelling, small, hand-held keypads, with options including screen displays, and voice output, that can be used by direct selection, meaning the individual selects options using a single finger, hand-held picture display devices with voice output, programmable keyboards of various sizes, with and without voice output that can be used with direct selection, or scanning, electronic picture communication books, and user-programmable devices, using direct selection or scanning.

Numerous considerations are involved in the selection process of augmentative communication devices. First of all, the device must accommodate any physical, sensory, or cognitive impairments that the individual using it might have. A second consideration is the level of assistance that the individual will require to operate the device. A third consideration is the message the individual wants to send and the final consideration is how the individual will access, compose, and transmit a message.

For students who are unable to mechanically produce written language due to physical impairments, an augmentative writing system can provide them with a means of communication as well as a way of completing
classroom assignments.

This type of system is usually made up of two components, a base system consisting of a microcomputer and word processing software with adaptive input modifications. Two types of augmentative systems can be created with adaptive input modifications, adaptive keyboards, and switches.

Adaptive keyboards, such as "IntelliKeys," use overlays/set ups, that fit over the keyboard. These overlays may already be produced or created by the teacher/programmer to accommodate the specific needs of the student.

The adaptive keyboard has many features, including, a response rate which slows down the response time of the keyboard, helping to prevent the student from pressing accidental or multiple keys and a key lock that allows locking down keys that normally have to be held down, such as the shift key. The repeat settings, speed of the mouse and the function of the indicator lights may also be adjusted.

The second type of adaptive input device is the switch which is used to operate and control scanning on the computer. Switches may be operated by almost any muscular activity including pressing with the hand, limb, knee, foot, mouth, head, eyebrow movement, and even breathing activity (Horn, Severs, & Shell, University of Nebraska, Lincoln, 1989). Two types of systems can be used with any switch entry, keyboard systems and alternate entry systems.

Keyboard systems function as a standard keyboard with a switch provided for each key on the keyboard. The student activates the switch
for each individual key stroke that would by typed from the keyboard if keyboard operation was being used.

A variety of set ups can be used with scanning, however, the most common set up consists of a row or column of icons.

Language Representation/Vocabulary Selection

"Language representation is a set of signs or symbols that stand for shared concepts and ideas. Language representation and the transfer of information through words and symbols make up a fundamental issue of technology for individuals with TBI." (Doyle & Fried-Oken, 1992) An augmentative communication device must match the student's language to the visual representations that appear on the device and produce appropriate output for functional communication transfer.

Graphic symbols may be used to represent language. Creating overlays/set ups using graphic symbols involves analyzing the student's "internal" cognitive and language systems, evaluating his/her access to language, ensuring that the graphic symbols chosen are appropriate "external" language systems that the student can learn.

Augmentative communication specialist have generally organized symbol selection and word choices according to developmental cognitive and environmental models. Communication devices based on language development, such as the "Play Minspeak Application Program" for the "Touch Talker" (Prentke-Romich Co., Wooster, Ohio), was designed for communication device users.

However, this type of device may work well for individuals with
"normal" cognitive skills or developmental disabilities, but it does not meet the cognitive or language needs of an individual with Traumatic Brain Injury who may have an intact language system but no way to access symbols on an external aid because of cognitive or motor impairments.

According to (Doyle, & Fried-Oken, 1992), the first step of language representation is to map out an individual's internal dictionary and decide what words they should have in front of them. This process involves successfully selecting vocabulary to meet the individual's communication needs. (Beukelman D., 1991), listed several assumptions that are essential to the task of vocabulary selection for all communication device users regardless of their disability:

* Vocabulary selection is a dynamic process.
* Vocabulary items are included in augmentative communication systems to serve different purposes depending on context.
* Individuals who use augmentative communication systems should be involved in the selection and retention of their systems.
* The role of some individuals, such as the individual with a severe brain injury, may be limited.
* Multiple informants including peers should contribute to the vocabulary selection process.
* The size of the vocabulary is often limited by learning, physical access, or technical constraints.
* The selection and retention of vocabulary (and words and more complete messages) is a critical element of each augmentative communication intervention and cannot be ignored because it is difficult or frustrating.

Vocabulary selection for augmentative communication systems of individuals with Traumatic Brain Injury is generally based on clinical
research and experience. Research shows that the most frequently used vocabulary selection techniques include, examining the environment of the individual using the augmentative communication device, lists from the individual, family or friends, lists from professionals who work with the individual, such as a teacher or therapist, and basic needs items.

(DeRuyter & Donoghue, 1989) described long-term treatment for an individual who sustained a severe closed head injury. The individual progressed from a word and alphabet board with basic needs vocabulary and greetings to functional communication through limited speech, a sophisticated gesturing system, an alphabet board, and an electronic communication device.

A second individual who suffered a Traumatic Brain Injury as described by (Light & Collier, 1988), progressed from yes/no communication blocks to an Apple IIe system with an Adaptive Firmware Card (Don Johnston Developmental Equipment, Wauconda, Ill) for writing and natural speech and the Epson Speech Pac (Adaptive Communication Systems, Pittsburgh, Penn) for conversation. This individual's vocabulary requirements increased as she began interacting with a greater number of people. Initially, words were chosen for basic needs and wants. Eventually words were added to express her interest and personality. Categories and messages included family, friends, music, what she wanted to do, and how she felt, and phrases were soon added.

This individual's primary mode of communication resolved to natural speech, and most of the communication devices were discontinued, with the exception of the alphabet board which was used for conversational
purposes only.

**Funding for Augmentative Communication Devices**

Funding for augmentative communication devices is based on the needs of the individual that are established during the evaluation process. In any request for funding, the needs must be clearly stated, including the ways that the assistive technology will be used to help meet those needs. The nature of the need must be addressed to the potential funding source in the language required by that agency.

For example, medical programs must know how the communication device will replace a malfunctioning body part and how it will enable the individual to better communicate their medical needs.

Educational programs will insist on knowing how the communication device will enable the individual to more fully participate in the educational program or classroom.

Vocational programs will want to know how the communication device will be used for the individual to be potentially employable.

The first step is to determine who will be the primary funding advocate. It may be a family member, educator, or friend who is willing to invest the time in investigating the possible options for funding. This person should contact the possible funding source or sources in person. Each source will require separate forms and letters.

Possible agencies that may provide funding include, Medicaid/Insurance, Public schools, Vocational Rehabilitation Agencies, Private Corporations, Trust Funds, Service Clubs, Fundraisers, and Public
Appeals.

Sometimes one agency will provide all of the necessary funding or several agencies may each provide partial funding. All possible contacts should be made, even if it seems an unlikely possibility that they will assist in providing funding. Many times one contact will lead to another possible source. The cost of a communication device should not eliminate the selection of the most appropriate system. It is very important to document reasons for refusal with a letter from the agency whenever possible.
CHAPTER THREE
METHODOLOGY

The purpose of Chapter Three was to describe the methodologies employed in the completion of this study. That description included, Subjects and Settings, Research Design, and Data Collection and Analysis.

Subjects and Settings
The single subject in this study was Carrie. The primary focus was on the use of augmentative communication devices for the purpose of communication. Other participants in this study included the speech therapist, an assistive technology consultant, the classroom aide, and the parent. The setting in this study was in a modified classroom and at the subject's home.

Research Design
The design of this study was a single subject case study using qualitative methodologies. This study employed qualitative research methods in an effort to better understand the meaning of Traumatic Brain Injury especially as it relates to communication, and the effects of using augmentative communication devices on the communication of a high school student with TBI. The study was conducted over a period of three months. During this time a journal was kept, recording results and progress the student made using a variety of augmentative communication devices.
Data Collection and Analysis

Given the nature of this study the primary data collection devices were observations and journal entries. The researcher observed Carrie approximately four times per week for a three month period of time. Three days per week Carrie was observed in a modified classroom and one day per week at her home during a two hour home instruction period. Journal entries were recorded after each observation.

To begin the qualitative analysis, the researcher made the following observations regarding Carrie's reading, written, and oral communication.

Reading: Carrie enjoyed being read to and her comprehension and interaction appeared better than when she read silently. The researcher should continue using this method of reading in class in conjunction with some silent reading, with a ruler for tracking, and taped material as Carrie will tolerate.

Written Communication: Carrie's primary mode for written communication had been spelling on a manual alphabet board. This had been utilized for oral communication as well. Since she felt comfortable with this mode, it should still be made available to her even after she begins using the computer system.

The researcher had also utilized teacher made word choice boards related to academic subject matter. This had been a successful mode of communication and should also continue to be used.

Observations made on direct selection (directly placing thumb on desired letter) using an adaptive keyboard vs. scanning on the computer
for spelling and written communication concluded that Carrie's most effective mode was scanning. When her arm was facilitated she could type written words on a larger adaptive keyboard. However, accidental hits on keys and the facilitation reduced her effectiveness with this method.

The researcher decided that direct selection on the alternate keyboard for alphabet spelling and writing would be delayed until a point in time when Carrie felt more comfortable with the scanning.

The speech therapist created an alphabet scanning set up that Carrie utilized in therapy. This was accessed by placing a switch at her right knee.

Oral Communication: As previously stated, spelling on the manual alphabet board had served as Carrie's primary mode of oral communication. It should remain an option for her until she feels successful using the computer as her main mode of communication.

Carrie had also shown a preference for printed words over graphic symbols. This may be due to the fact that she feels printed matter is an indication of more "intelligence." However, graphic based set ups may eventually lead to greater vocabulary expansion. Therefore, she should be reassured by all caregivers that graphics in no way lower her perception of intelligence. The graphic set of picture communication symbols, Boardmaker, will be primarily used.

The researcher also decided that customized on screen communication displays should be created through Ke:nx. Sentence based vocabulary will be used primarily in the initial set ups. The researcher and the parent
should attempt to outline vocabulary that would be included for home and classroom use. These will be grouped according to activity or topic for separate overlays that can be "branched" together.

The researcher noted that vocabulary needed for oral communication should include vocabulary to:

1. Gain attention
2. Greet/extend farewell
3. Express basic needs and wants
4. Make choices
5. Indicate rejection
6. Ask questions
7. Respond to questions on a given topic
8. Relate information about self
9. Relate information about activities (home, school, interests)
10. Express feelings
11. Participate in given activities
12. Joke around

After Carrie received her Powerbook computer, the researcher focused on a single mode of augmentative communication, scanning. Carrie began using her right knee to access the switch used to activate the scanning on her computer. A basic set up, which included an alphabet scanning set up, was used in the beginning.

Carrie started out very slowly. She needed cues and prompting to look up at the screen instead of her knee and most of the time she accessed the
switch either too early or too late, exhibiting mis-hits or passing by the desired letter all together.

Subsequently, additional set ups were programmed onto Carrie's computer and she began using a similar switch that she activated with her right hand.

Carrie increased her speed activating the switch, however, she still produced numerous mis-hits. Her attention span was greater and she held her head up, keeping her eyes focused on the screen, for longer periods of time. She began to access the appropriate responses more frequently, however, she still showed some discrepancies in selecting desired icons and responses.

By the end of the study, Carrie began to see the necessity of accessing the appropriate responses and was aware of using the Powerbook computer for functional communication needs.
CHAPTER FOUR

RESULTS

As the researcher as well as Carrie's teacher, I worked closely with her in a modified multihandicapped classroom and at her home during home instruction sessions. The primary goal of the study was to determine the effects of using augmentative communication devices on the communication of a student with Traumatic Brain Injury. My long term goal was to increase functional communication.

Background

This was Carrie's first year of school since her accident and my first year as a multihandicapped teacher. At the beginning of the school year Carrie's physical movements were very limited. She was pushed in a manual wheelchair for mobility. She was able to assist in weight-bearing on her lower extremities during transfers, but for the most part, transferring her out of the wheelchair was difficult.

Her head positioning was usually down. However, she could hold it upright for five-six minute intervals if her attention was focused on an activity and she was reminded to do so. She could move her arms forward and to the side. However, her hands were fisted and difficult to open. She was able to move and extend her thumbs outward.

Carrie had much difficulty with drooling and needed her mouth and chin wiped frequently. When the drooling was excessive I encouraged her to close her mouth and swallow to help control it.
Carrie could move her lips and was able to open and close her mouth. Swallowing was more difficult for her to do. She could articulate a few words such as bye and fine, however, she was nonverbal. At this time, for the purpose of communication, Carrie used her left thumb by raising it to answer yes and lowering it to answer no. Since she was able to extend her thumb beyond her fist she could also use an adaptive keyboard, but because her shoulder was dislocated she needed assistance at the elbow for facilitation.

Carrie's main mode of communication was a manual communication board that I made using a 9X12 file folder cut in half and IntelliKeys. Using IntelliKeys, I printed enlarged letters of the alphabet, numbers zero-nine, and a picture to symbolize the bathroom. I cut these icons out and glued them, evenly spaced, onto the file folder. Using the method of direct selection, Carrie pointed to the icons with her left thumb spelling out what she wanted to say. Again, facilitation at the elbow was often needed.

The disadvantage of using the manual communication board was that Carrie had to spell out every word she wanted to say letter by letter which was very time consuming and often frustrating for her. She had not yet recognized that she could end word spelling when the listener interpreted mid process.

Carrie also used facial expressions as a form of communication. She used smiling as a form of greeting and to demonstrate comprehension and eye gazing to gain attention.

Carrie communicated her basic needs and wants by spelling them on her
manual communication board or by responding to yes/no questions. For example, if she needed to go to the bathroom she had to point to the picture symbolizing bathroom or spell out I need to go to the bathroom on her board. Instead, most often she just cried telling me that something was wrong but I didn't know for sure what it was or what she needed.

When this happened I reinforced what she should have done using her communication board. If she needed to go to the bathroom I would take her left thumb and point to the picture of the bathroom on her board, demonstrating the quickest and easiest way for her to communicate this need. Still, this was not working and she cried almost every time she had to go to the bathroom or when something was wrong. It was as though crying was the only way she was able to communicate a basic need or discomfort. This was one of our greatest obstacles to overcome.

Next I tried using an adaptive keyboard with Carrie to communicate her needs and wants. I determined Carrie's basic needs to be going to the bathroom, being repositioned in her wheelchair, taking her shoes off, changing her bib (tie), or taking a break. Again, using IntelliKeys, I created an overlay with picture symbols that Carrie could use to communicate these needs. The biggest problem with the adaptive keyboard was that she had to be sitting in front of the computer to use it. Another problem was that if her arm was not facilitated she would drag her hand across the keyboard accidently hitting more than one icon. So I tried using the adaptive keyboard with facilitation, but then there was no way to be certain that I was not directing her hand to make the selection.

As the school year progressed we continued to work a great deal on
communication skills. Carrie fluctuated a great deal from day to day in her cooperation. She often cried and became easily frustrated, especially as we continued working with the adaptive keyboard. She showed an inconsistent ability to augment her communication with her communication board as well as the computer. She was able to use the board and the computer, with facilitation, more successfully for concrete answers to questions, but not to express her needs or for the purpose of basic communication skills.

On October 20 and 21, 1994, I attended an inservice on adaptive technology sponsored by the Special Education Resource Center in Wapakoneta, Ohio. At this inservice I learned the basic operations of Boardmaker and other augmentative communication devices that I had not yet worked with. I created IntelliKeys overlays and set ups that were applicable for verbal as well as written communication alternatives and learned more about Ke:nx and other ways to utilize scanning set ups as a communication device.

The presenter of this inservice was Kathy Staugler, an Assistive Technology Consultant, who was later hired by our school system as a consultant to work with Carrie and myself. She came to school for the first time on November 3, 1994. Her next visit was not until December 14, 1994. During these visits she observed and worked with Carrie, experimenting with some of the augmentative communication devices that we had been using at school.

During the months of November, December, and part of January, Carrie and I spent a great deal of time on formal assessments. Because of her
physical limitations no testing had been done prior to this time. Therefore, we were unsure exactly what level she was at cognitively.

The testing we did was not very helpful. It took an extremely long period of time to administer and Carrie did not tolerate it well. Again she often cried and became easily frustrated. I tried to make some adaptations to make the testing more tolerable for her without changing the reliability of the results. When I felt that Carrie had completed as much of the testing as she could we stopped on January 10, 1995.

After the testing Carrie's parents had become increasingly concerned with academics. Still unsure where Carrie was cognitively, I borrowed textbooks in every subject that I thought would be appropriate and began thinking about ways of adapting lessons. Shortly after that time I also began focusing on my study.

February

For the purpose of my study I kept a journal in which I recorded Carrie's lesson plans, schedules, frustrations and other feelings, cooperation, motivation, progress, successes, absentees, new equipment she received, special meetings, and whatever else I felt was of importance.

In early February Carrie and I began working more intensely on academics such as U.S. Government, Math, Literature, and Spanish. The Government book that I borrowed from another special educator worked out well. The chapters were short and concise and throughout each chapter there were several activities which consisted of five to ten
comprehension questions.

Early on, I discovered that if I asked Carrie to read silently she immediately became frustrated and started crying. However, if I read the material to her she was attentive and seemed to enjoy it. So, I put the textbooks up on a wooden easel and used a ruler for tracking, making it easier for her to follow along as I read the material aloud.

Using Carrie's Government book I enlarged the activity pages on the copier to make them easier for her to see. Then I altered the directions as necessary, making each lesson a multiple choice activity and typed corresponding answer keys in large print on the computer. I read each question aloud to her then I read the choices. She had to point to the correct answer using her left thumb (direct selection). I often had to go back and reread sentences or paragraphs where the answers were located before she could find the correct answer.

Carrie was doing very well. She seemed much happier and was starting to show improved motivation and cooperation. As noted in my journal on February 8, 1995, during a two hour home instruction session, Carrie spelled out on her manual communication board, "I love you." I pointed to myself. She smiled and held her thumb up meaning yes. At that point I really knew that Carrie understood how important she was to me and how much I was trying to help her. I felt the rapport that we had shared since the beginning of the school year build even more and I knew that my efforts were truly being appreciated.

We continued to work on Government daily as well as other subjects. In Math we worked on addition, subtraction, and multiplication. For each
problem I read the numbers aloud as Carrie pointed to the answers on a manual number board that I made. The numbers on the board were very large and went from zero-nine. Carrie knew that if the answer was a two digit number, for example 25, that she had to point to the two first and then to the five. As she pointed to the answers I wrote them down.

Again, I discovered that if I read the problems to Carrie and we did each problem step by step together she was successful. However, if I gave her problems to do without reading them aloud and without assistance except for writing down the answers, she just cried and hardly attempted to do them.

As time went by and the Math became easier for Carrie to do, she often smiled when she knew the correct answers, especially when she thought the problems were easy. Carrie also started to articulate some of the answers instead of pointing to them on her board. From then on I reinforced that she had two ways of answering the problems and encouraged her to tell me the answers with her mouth whenever possible.

Before the accident Carrie had taken Spanish so I thought that she might enjoy working on it again. However, I knew very little Spanish myself. So I found a book of basic Spanish that included the pronunciation of each word as well as the English spelling. Our first lesson consisted of saying the numbers from one-ten in Spanish. I said each number aloud as Carrie listened and smiled or held her thumb up if I pronounced it correctly. If she laughed, I knew that I mispronounced the number. She enjoyed this a great deal so we continued with greetings in Spanish too.

On February 9, 1995, Carrie received her power wheelchair. The
school physical therapist, occupational therapist, and myself began working with her on wheelchair operation and maneuverability.

On February 16, 1995, Kathy Staugler came to our classroom again to work with Carrie on the computer, experimenting with different augmentative communication devices. As noted in my journal, after working with Kathy for about 45 minutes, Carrie became very frustrated and cried vigorously. When Kathy asked her what was wrong, she spelled out on her communication board, "go away." Kathy explained to her that she was only trying to help but still Carrie would not cooperate.

On February 24, 1995 a collaborative meeting was held to outline specific communication issues for Carrie. Attending this meeting were myself, Kathy, the school speech therapist, a private therapist, and Carrie's mother. It was emphasized that efforts to implement an augmentative communication system with Carrie should be agreed on by all persons and consistent training should be conducted.

I pointed out that Carrie enjoys being read to and comprehension and interaction appears to be better than when she reads silently. Therefore, it was decided that I would continue this method of reading in class in conjunction with some silent reading, using a ruler for tracking, and taped material as Carrie would tolerate.

I also addressed the fact that Carrie's primary mode of written and oral communication had been spelling on the manual communication board. It was decided that since Carrie felt comfortable using this mode, that it should remain available for her use even after she began training on the computer system.
Discussion on direct selection vs. scanning on the computer for oral and written communication concluded that Carrie's most effective mode at that time was scanning. The private speech therapist that worked with Carrie had created an alphabet scanning set up that she utilized during therapy sessions. This set up was shared with myself and Carrie's mother to be programmed on our computers and used with Carrie as well. To operate this program Carrie used a switch placed at her right knee.

Finally, it was noted that Carrie had shown a preference for printed words over graphic symbols. We felt that she may have associated the printed matter with greater "intelligence." It was agreed by everyone present that graphic based set ups would eventually lead to greater vocabulary expansion. However, to make Carrie feel more comfortable, printed words would be used above all graphics which could serve as a cue to her on the meaning of the graphic symbols.

Customized on screen communication displays would be created through Ke:nx. Sentence based vocabulary would be used primarily in the initial set ups. Myself and Carrie's mother would attempt to outline vocabulary that would be included for use in the classroom and at home. The vocabulary would be grouped according to activity or topic for separate overlays that could be "branched" together.

March

On March 2, 1995, Carrie received her new Apple Powerbook computer. I had been inserviced on the functions of the Powerbook and other adaptive equipment at a second inservice earlier in the year. Immediately after
Carrie received her new computer, we started to work on scanning using her computer, Ke:nx, and a large switch placed at knee level.

As defined in chapter one, scanning is a computer program that puts the keyboard on the screen, but is accessed through a switch as the keyboard scans. Ke:nx is a small box shaped device that is attached to the computer to connect the switch which is used to operate and control the scanning on the computer.

We started out by using a basic set up which included an alphabet scanning set up. We called this set up "Carrie Basics." Carrie went very slowly at first which was to be expected since this was so new to her. She needed cues and prompting to look up at the screen and not at her knee. As noted in my journal on March 9, 1995, after working one and one half hours on scanning, Carrie only scanned four letters correctly. However, she also deleted several mistakes that she had made which is done in the same manner using scanning and the switch. During this time, her mood was very positive.

On the following Monday, March 13, 1995, Carrie and I continued working on scanning during home instruction. This time our goal was to scan the number words from one to ten in Spanish. After one hour and several mistakes, Carrie correctly scanned uno. We took a short break then began to work for another half hour. During this time Carrie's sister came home and Carrie scanned hi. Afterwards, she became extremely frustrated and would not stop crying so we stopped working.

The next day at school we continued working on number two in Spanish. We worked for a half hour then stopped to take a break. Then we worked
for an additional 50 minutes. During this time Carrie completed dos, and tres. Again, Carrie needed prompting to keep her eyes on the screen. She still made many mistakes or mis-hits that she had to delete. It helped when I told her each letter to scan even though she could see the words on an easel beside her. I also reminded her to move her knee to access the switch and to release her knee by bringing it back towards me.

On March 15, 1995, Carrie completed cuatro while working for 50 minutes on her computer at school. That evening during home instruction she scanned the words nice and cat after working for a half hour. Then we took a break from the computer and read a chapter aloud from a historical novel that we had been reading. Finally, we worked on multiplication with carrying using her manual number board and the method direct selection.

Each day that Carrie came to school we continued to practice scanning on her computer and worked on the numbers from one to ten in Spanish until she completed uno-diez on April 5, 1995.

Overall, Carrie was progressing slowly. She was maintaining her head in an upright position and keeping her eyes on the screen more frequently. She was also more successful in synchronizing the switch with the appropriate icon and anticipating when she needed to move her leg. However, a great deal of the time, she was still accessing the switch either too early or too late exhibiting mis-hits and at times passing by the desired letter.

April

At the beginning of this month Carrie was fitted for a brace that went
over her upper torso with extensions that stretched up and over her shoulders. Her power wheelchair was modified to accommodate this brace with minor adjustments made in the back of the seat.

We continued to work on Carrie's mobility in her power chair at school. With minimal support given at her right elbow, she was able to control the joystick with greater success and she could go about 10-15 feet before stopping. She was aware of obstacles in her pathway and tried to avoid them, although, she was not always successful. Carrie still needed to be reminded occasionally to keep her head up instead of looking at the joystick. Overall, she was showing improvement and her mood was positive except when her brace caused her discomfort.

We also continued to work on scanning on the computer, programming additional set ups. The first set up that appeared on Carrie's computer screen included the following choices: Hello, I need......, School work, Comments, Alphabet board, Don't want......, and I have something to say......

If Carrie scanned "Hello," the next set up that appeared on the screen included the following greetings: Hola, How are you?, What's new?, Let's go, O.K., Not much, and Goodbye. Then she was able to scan the greeting of her choice and the computer would vocalize it. To get back to the initial set up, she needed to scan "Goodbye." Then she was ready to make another selection.

If Carrie's next choice was "I need......," the next set up to appear on the screen included the following basic needs: Bathroom, Tie, Reposition, and Clothes. Again, she was able to scan what she needed and the computer would vocalize it. This time to go back to the initial set up Carrie had to
scan the arrow icon.

If Carrie scanned "School work," the next set up that emerged on the screen included the following subjects: Computer, Reading, Math, Science, Spanish, and Government. The icon Spanish, branched to another set up, Numbers, which branched to uno-diez. The computer vocalized the numbers in Spanish as well as printed them. Again, to return to the initial set up Carrie had to scan the arrow icon.

The Alphabet board icon branched to an alphabet scanning set up that Carrie used for written expression. The I have something to say icon branched to a set up which included T.V., School, and Home. Messages could be recorded on the School and Home icons relating what Carrie was doing at both places. Finally, the T.V. icon branched to the following comments: 90210, Good show, Yuck, Melrose Place, Change, and Turn it up. Again, the computer vocalized a statement or command for each icon and returned to the initial set up when the arrow icon was scanned.

Each day before we began working on written expression, using the alphabet scanning set up, I greeted Carrie and asked her questions that she could answer using the computer set ups described above. Sometimes she needed prompting but overall, she did very well. I also encouraged the other students in the room to talk to Carrie in the same manner.

On April 3, 1995, as noted in my journal, Carrie started participating in cooking lessons with the rest of the class. On this day she helped make bran muffins. The students were divided into two groups. One group worked with our classroom aide and the other group, which included Carrie, worked with myself.
First of all, Carrie helped identify the correct measuring cups and spoons that were used. The student who was doing the measuring, asked her before measuring each ingredient, if he had selected the correct one. Carrie responded yes/no by holding her thumb up or down.

Carrie's second job was to stir the mixture. I helped open her fingers and placed the mixing spoon in her hand. Then I put my hand around hers and helped her stir. Finally, I helped her pour some of the mixture into the muffing pans.

Carrie really seemed to enjoy cooking. After each lesson, I highlighted the steps on the recipe that she helped complete and sent it home along with a taste of what we made. When her friends and therapist came into our classroom I bragged about what she made and encouraged her to offer them some. Carrie loved the attention and seemed to be proud of her accomplishments.

We also used an Able Net device in the kitchen which aloud Carrie to turn equipment, such as an electric mixer and can opener, on and off. This device plugged into an outlet and the appliances and Carrie's switch, that she used for scanning on her computer, plugged into it. Using her switch she was able to turn the appliances on and off, giving her a feeling of control.

Carrie's attitude and tolerance level varied from day to day during the month of April. The brace that she began wearing at the beginning of the month often bothered her and had to be readjusted a number of times. She was also sick a great deal of time during the month which added to her frustrations. As noted in my journal the week of April 24, 1995, Carrie
often cried and became fussy. When her mother came to school one day that week to work on transfers again, she was extremely fussy and uncooperative.

On April 26, 1995, Kathy Staugler made a visit to our classroom to see how Carrie was coming along with her scanning. She brought a different switch with her that Carrie could activate with her hand instead of using her knee. After practicing with this switch, I asked Carrie which one she liked using the best and which one she would like to continue to use. She choose the switch that she activated with her hand. Soon afterwards, this switch was mounted onto her wheelchair.

Carrie continued to increase her speed activating the switch, however, she still made a lot of double hits and mis-hits.

Present Time

Throughout the month of may until the end of the school year, Carrie practiced operating her power wheelchair and worked on scanning using the switch that she activated with her hand and the set ups that were described in this chapter. Additional needs were programmed on the "I need....." set up and the computer was programmed to vocalize all set ups using a female voice. As Carrie became faster at activating her switch, I increased the scanning speed on her computer.

Carrie's attention span is greater and she is able to keep her head up and eyes focused on the computer screen, as choices are being scanned, for longer periods of time. She is doing better at accessing the appropriate responses, such as "Hello" when someone greets her. However, she still
shows some discrepancies in selecting the desired icons and she sometimes needs more than three passes in order to correctly access the desired responses. Inconsistently, she still needs prompting as well, in order to bring up the desired responses.

She is beginning to see the necessity of accessing the appropriate responses and she is becoming more aware of using her Powerbook computer for functional communication needs as well. My long term goal for her is still to increase functional communication abilities. Right now I would like for her to select a desired icon using a scanning mode of communication within three passes with at least an 80-90% success rate.

Carrie also continues to practice operating her power wheelchair. The most improvement seen so far is in her mobility, however, the major limitation is still ensuring that her right shoulder is in the proper position and assisting her in hand placement onto the joystick. Once this is assumed, Carrie maneuvers the wheelchair quite well and needs only minimal assistance to help guide her when she approaches obstacles too closely. She is able to go a straight distance for up to 30 feet. She is also able to make her own adjustments approximately 50% of the time when she is maneuvering herself to the left or right incorrectly.

Carrie will continue to work on wheelchair operation and scanning on her computer over the summer during speech and physical therapy sessions. I look forward to seeing the progress that she will make during this time when she returns to school in the fall.
CHAPTER FIVE
SUMMARY, CONCLUSIONS, AND IMPLICATIONS FOR PRACTICE

In Chapter One, the researcher stated the purpose of the study as exploring, using qualitative methods, the effects of using augmentative communication devices on the communication of a high school student with Traumatic Brain Injury. The researcher also defined the terms that were relevant to the study, determined the limitations, and described the significance of the study.

In Chapter Two, the researcher conducted a review of the literature relative to the study on communication devices and Traumatic Brain Injury.

The focus of Chapter Three was to provide a description of the qualitative methodologies employed in the study. The researcher described the subjects and settings in detail, reviewed the design of the research, and how the data was collected and analyzed.

Chapter Four included the results that the researcher discovered from the data analysis. The results in this study were developed over a period of three months. During this time the researcher observed the subject closely as she utilized a variety of augmentative communication devices, documenting her frustrations, difficulties, progress and accomplishments.

Conclusions

The analysis of the data suggested that the subject in this study progressed in her ability to use increasingly sophisticated augmentative
communication devices. For example, in the beginning of the study Carrie used augmentative communication devices, such as, a teacher made manual communication board and gestures, such as, thumbs up/down, indicating yes/no. By the end of the study she was using a complex computer system activated by scanning.

It is important to note, however, that even after Carrie began using the computer, the communication devices that she had previously used and became familiar with, were still made available for her use. The researcher discovered that Carrie seemed happiest after she became familiar with a communication device and felt successful using it. She appeared most unhappy and frustrated when she was introduced to something new or overwhelming.

For example, as noted in Chapter Four, when the assistive technology consultant, hired by the school system, worked with Carrie at school on February 16, 1995, she presented a variety of communication devices and set ups all at once, invoking extreme frustrations within Carrie. Carrie may not have reacted in such a manner if she was introduced to only one device or set up and given a substantial amount of time to become familiar with it before additional ones were introduced.

It was also noted in Chapter Four that a collaborative effort was made to implement an augmentative communication system with Carrie and consistent training was conducted. This may have been one of the most important factors in determining Carrie's success.

Another important factor contributing to Carrie's success may have been the opportunities that she was given to make her own choices. When
it was determined that she had shown a preference for printed words over graphic symbols, even though everyone involved agreed that graphic based set ups would lead to greater vocabulary expansion, to make Carrie feel more comfortable, printed words were used above all graphics. When a decision was to be made regarding which type of switch Carrie would use, again, she was part of the decision making process.

Finally, the most important factor in determining Carrie's success, may have been the amount of time that she had to practice and work on using the communication devices, the amount of patience the researcher and others who worked with her demonstrated, and the persistence of everyone involved.

Implications for Practice

As stated in Chapter Two, every person and brain injury are different, so, each person who has had a brain injury will experience a unique set of problems. Therefore, an augmentative communication device that worked well for Carrie may not work as well with other students who have a Traumatic Brain Injury.

The first step in finding an appropriate augmentative communication system for a student with Traumatic Brain Injury is to evaluate and work with the abilities the student has. This evaluation process may require some pre-assessing, which should consist of the student's personal information, a detailed description of the student, including, his/her medical diagnosis, present mode of communication, and any augmentative communication devices that may have been attempted or utilized. The
teacher may also want to determine if there is a computer system available in the classroom, the classroom setting, and the involvement, if any, that the student may have in regular education.

Formal test results and/or observational data may be used to determine the student's cognitive level of functioning, language level, academic skills, and motor functioning, such as, if the student is ambulatory, uses a wheel-chair, has functional use of his/her hands, and other physical movements the student has available for functioning.

The teacher may want to consult the parents, occupational therapist, physical therapist, and speech therapist for their input as well, establishing a team of persons who share concerns about the student.

The next step may be to consider the pros and cons of the assistive technology options available for the student, including their costs, and obtain trial devices if possible. The teacher may want to outline possible funding sources as well.

Finally, the teacher may begin implementing the augmentative communication system, including, technical training and application.

The researcher hopes that in some small way this thesis may aspire or provide assistance to other educators, parents or professionals who have the opportunity to work with a special student with a Traumatic Brain Injury.
APPENDIX A

Boardmaker - "How to........"

The Boardmaker is a "library" of picture symbols. (PCS from Mayer Johnson.) You may go into the Boardmaker library, select any picture from the files and copy it. When you have made a copy, you must have a place to put it for use. This is your drawing program--MacDraw, Super Paint, or Expert Draw. You will paste the picture onto your drawing program. You may then return to the library and select another picture, copy it, go back to your drawing program, and paste it on. Within the drawing program you may arrange the pictures in any manner.

1. Open your Boardmaker Library

   *Double click your Boardmaker Folder on the Mac hard drive screen
   *Double click the "silly" icon face

   Your Boardmaker library is now open

2. Open your Drawing Program

   *Go back to the Mac hard drive screen (by clicking your arrow any place that you see the Hard screen)
   *Locate the drawing program folder

   For your convenience, the Boardmaker program has included a folder called "Pre made Grids". This has many grid sizes for Wolf, Unicorn boards, etc. You may open this folder and locate the folder with the name of the drawing program you have on your computer. (These grids will not open if you do not have the drawing program on your computer--ie, Super Paint grids will not work if you have the MacDraw program. You must open the folder of the drawing program you have.)

   This is an example of how to use a Wolf 3x3 grid with MacDraw II:

   *Double click the Pre Made Grids folder
   *Double click the MacDraw II folder
   *Double click the Wolf folder
   *Double click the Blank 3x3 icon
The blank 3x3 page will now come up on your screen. Remember—if you want to resize the screen to see the whole page, click the small mountain icon at the left bottom corner of your screen.

You now are ready to take pictures from the Boardmaker and place them on the blank 3x3 grid. You will be moving back and forth from the Boardmaker screen to the blank 3x3 screen.

3. Selecting your Boardmaker picture

Click the arrow anywhere on the Boardmaker screen which is now behind your blank 3x3 page. (You can usually find this at the very top below the menu bar.) You will now see the Boardmaker screen.

*Select the size of picture that you want
   For Wolf overlays the following are recommended:
   - 100% for 3x3 grids
   - 50% for 6x6 grids
   - 200% for 2x2 grids

*Type in the name of the picture you want to find. Click Find First or Return (ie, apple).
*If this is not the selection you want, click Find Next. Continue until you have the picture you want.
*Click Copy (This saves the picture into a safe place)

4. Putting your picture on the Grid

Click the arrow anywhere on the drawing grid—this is located behind the library. You can usually see it below or to the right side of the Boardmaker screen. Click to bring the grid screen to the top.

*Click the arrow on the grid in about the location where you want the picture
*Pull down the Edit menu from the Menu bar
*Drag down to paste. Release and the picture from Copy will appear.
*Arrange the picture as you want on the page by dragging
5. Continue to add more pictures by going back to the Boardmaker screen and repeating steps 3 and 4

6. When you are satisfied with your picture grid, go under File and Print your page

7. Save to Disk

   *Put your data disk in the drive. (If it is a new disk, you will need to format by following the directions.)
   *Put your grid on the top screen
   *Under File in the Menu bar pull down to Save As...
   *A screen will appear. Click Desktop in the right column. Locate the name of the disk you have put in the drive. Highlight the name of your data disk. Click Open.
   *Type in the name of your grid (ie, food 3x3) of the line below Save As...
   *Click Save

Your grid is now saved to disk. If you wish to use it again, you need only put in the data disk and open the icon with the name of this grid on it. You may make changes to it and Save it as another name if you want.
Boardmaker: Quick Reference

1. Open the Boardmaker program

2. Open the Drawing Program (or Pre Made Grid)

3. Go to the Boardmaker screen
   
   Size as desired
   Type in the Name of the picture
   
   Click: Find First
   
   Click: Find Next if needed
   
   Click: Copy

4. Go to the Drawing program screen (or Pre made grid)
   
   Under Edit: Go to Paste
   
   Arrange picture as desired

5. Repeat steps 3 and 4

6. Under File: Select Print

7. Save to Disk
IntelliKeys:

Turn off the computer before plugging in the IntelliKeys board. Plug the IntelliKeys into the ABD port (where your keyboard is now plugged in). Plug the keyboard cable into the other part of the IntelliKeys cable.

Overlay Maker:

1. Double click the Overlay Maker folder

2. Double click the Overlay maker icon

3. Select the grid square

   Drag squares on the board. Change the shape if desired.

4. Put the pictures or words on the board

   a. Under "Keys" select "Picture Library"
      Highlight the word for the picture you want
      Copy
      Under Edit, select "Paste"
      or
   b. Select "A" (text) and type a word
      or
   c. Bring a picture from the Boardmaker

5. Double click on one space

   a. Type in a word or add special commands
   b. Click "Add one"
   c. Click OK
(Under "other" add non-repeating)

6. Repeat step 5 for all spaces on the overlay

7. Under File, Select Print. You must have long sheets of paper to print the overlay.

8. Under "File" select Save as...

   The overlay must be saved in the Overlay maker folder

9. Double click the Overlay Sender to chose your setup
Making a Ke:nx Set up: Start Here

General directions for any type of set up:

1. Open the Ke:nx folder (double click)

2. Launch Ke:nx Create (double click)

3. Select the input method (double click)

4. Select the layout from the Menu Bar (for Unicorn boards) 
   .....or drag the spaces (for Unicorns or on screen/scanning)
Creating a Unicorn Setup:

1. Follow the first five general steps. Select a layout or custom.

2. Double click the square to program

3. User Sees:
   a. Character (letter, number of other text characters) or
   b. Graphics (icon/picture)
   c. Label (words/sentences)

4. User Hears:
   a. MacinTalk (computer speech) or
   b. Digitized Speech (recorded)

5. Computer Receives: (The action the key performs)
   a. Type letters or words
   b. Script
   c. Mouse
   d. Special
   e. Branch

6. Save As........
All set ups must be the Ke:nx folder

Making the setup work:

Go to the Ke:nx name in the Menu bar at the top. Go to the set up you want and click "Load Setup."
Creating a Scanning Setup:

1. Follow the first five general steps
   Select scanning

2. Size the screen

3. Click and drag squares

4. Double click to open the square to program

5. User Sees:
   a. Character (letters, numbers, etc.)
   b. Graphics (from Ke:nx or Boardmaker)
   c. Label (words/sentence)

6. User Hears:
   MacinTalk (Computer speech)
   Digitized (recorded)

Make choices on Item feedback, item cues, group cues

7. Computer Receives: What the computer will do
   (Letters, word, script, mouse functions, special functions, branch)

8. Save As.....

9. Load the setup from the Menu bar

10. Change the Options—scanning speed, etc.

11. All set ups must be in the Ke:nx folder. (Setups that branch must be in the same folder.)
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