Summary of work on Stefan Carmien's Masters Project

The work I did in the spring semester of 2000 was basic research exploration for a master's project/thesis. This was combined with helping the launch of the "The Coleman Intelligence Augmentation Project". Below is a table listing the areas I have researched:

Part	Item	Comment
1	Collecting bibliographic data & helping setup the Ciap web site	Worked on site design and mission statement, did library & web research
2	Reading cognitive Psychology material on cognitive disability	I read many books and put excerpts /reviews of 4 of them into Sources – in the 'CIAP' collection
2	Inventorying current technological prosthesis's (i.e. ACM material)	Web research, BVSD tour, Read several books on autism & dyslexia
2	Interviewing users & practioners	See interviews in appendix (Richardson interview still to go)
3	Coming up with a Project	See attached copy of e-mail project proposal

Areas that I need to further cover:

Part	Item
4	Researching cog & CS parts of the project
5	Learn Palm Pilot Programming
6	Building & documenting it
7	Testing & evaluating it
8	Turn in as thesis

Highlights of research:
- All cog. Handicap problems have a universe of one
- Design for cog. Handicaps needs to run from very specific to general

- Cognitive handicap augmentation design is built on tools for sensory handicap
- Impaired intellectual function design must refrain from abstract notation (i.e. visions)
- Tools are not useful if they cannot be easily implemented, tools that are too easily implemented are not deep enough to be useful
- Sometimes design is for reduced ability sometimes for ability based on a different (paradigm?), modality?
- Start from specific problem, then generalize
- Design with domain experts (symmetry of ignorance)
- Best designs do one thing simply and well (Unix principle)
- Keep space effect in background
- Incorporate logging & feedback & adaptation
- Personalize-able but not too complex
- Build on existing economy of scale (hardware)
- Consider configuration and training as important as actual function WRT wide use
- There are very distinct two UIs – the user and the configurerer/administrator – and each is equally important
  -

Appendix with results:

Book reviews and excerpts in Sources

Computer Resources For People With Disabilities
The Alliance For Technology Access, Hunter House, Alameda,CA, 1994.
Reference Type: Book

Overall Rating: 4.0 average over 1 person
Keywords:
Collections: CIAP

Contributed by: Carmien (3/2/00, Last Modified 3/13/00)
Contributor's Rating: 4

Book: Computer Resources for people with disabilities

Author: The alliance for Technology Access

Review:

This book is specifically written for the handicapped user and his/her support team. It is divided into three sections: an overview, a set of tools for specific problems and lists of resources of different types. Most useful to the researcher/designer would be the section on tools, called the 'Technology toolbox'. In the first part of this tools section are grids with column headings 'ability', 'difficulty' 'approach' and 'tool'. These grids give multiple solutions to handicaps at a fine grained level; for example in the keyboard section under 'use two hands' they provide possible solutions for: 'task is tiring', 'typing goes slowly', 'keys too close together' and 'keys too far apart'.

As with any text not focused on theory but existing technology, this will become dated, as the book "Adaptive Technologies for Learning and Work Environments" (Lazzaro 1993) is. However there is enough of a toolbox approach mixed with theory to make this a useful resource.

Sample Quotes:
From the Forward:
The main problem of communicating without being able to speak is what is called the baud rate, the rate at which information can be conveyed. Normal speech is between 120 and 180 words a minute. By contrast, a reasonable typist can produce 40 to 60 words a minute. Thus, if people were equipped with keyboards to communicate, they could do so at half to a quarter of the speech rate.
 However, many people like me who cannot speak also have other disabilities. They cannot use a keyboard. Instead, they can use one or more switches, operated by a head or hand movement. This is where a person is really confronted with the rate of information flow. If you take an average word to be five characters and assume that any character can follow any other character, normal speech has an information flow rate of between 50 and 75 bits a second. By contrast, a person might be able to operate a switch at two or three bits a second.
The real information flow in human communication however is much less than this. (In the case of political speeches, it is practically zero.) This is because spelling out a sentence letter by letter is inefficient. Most sequences of letters don't make recognizable words, let alone meaningful sentences. It takes a handful of these bits of information (letters) to create meaningful communication (a word.) So, communicating by specifying every letter is a lot of redundant effort.
For someone who can use a switch to communicate, it is much more efficient to pick words or even whole phrases from a list of likely ones. And computer technology makes this possible. ... With the Equalizer program that I use, I manage about fifteen

words a minute. That is not too bad, since an information flow rate of three bits a second corresponds to 25 to 30 words a minute.

The process I have just described is what this book is all about. I hope others find in this book the inspiration and the technology, hardware software, that can help them to communicate better to express their human-ness.

Stephen Hawking   Cambridge University

We find that approach restrictive and inappropriate, and prefer to focus on a functional look at a person's needs rather than looking at deficits. If she goal is to have a screen display large letters, doesn't really matter if you need it because you have a visual impairment, a learning disability, or some other requirement. The question is not what does a person with X disability require, but what are the ways in which we can enlarge print on a computer screen. (page 4)

The similarity of assistive and conventional technologies revolves around aspects common to both, That is, all computing involves three things: input, processing, and output.

The ways in which assistive technologies are different from conventional technologies involve these same three aspects. (page 33)

Assistive Technology   The distinction between assistive and conventional technologies is becoming less clear as the concept of universal design is incorporated into conventional technology. Both fields are broadening and converging. What is a necessity for some is convenience for all. (page 40)

Assistive-style input   Everyone needs an input method. If standard methods don't work, you must find an alternative. For example, someone with a learning disability or with complete blindness can usually use a conventional keyboard. But what if you need to protect the keys from being pressed accidentally? Someone with limited dexterity may benefit from one of the many keyboard devices available, such as a clear plastic keyboard that is placed over the entire keyboard, with holes over each key to help guide and support the fingers. One option for people with little or no ability to move their fingers is an electrical pointing device witch an on-screen keyboard. An on-screen keyboard is a software program that displays an image of a keyboard on the computer screen. Using an electrical pointing device, you point to the key you want and activate it by pressing a switch. Someone with use of only one hand may prefer to use a miniature keyboard designed for use with a single hand; another person may benefit from a very large keyboard with picture symbols in place of letters.   (page 43)

Assistive-style input pt2   It is time to discard your preconceptions about keyboards. Do you want a keyboard with 8-inch-tall keys? With tiny keys that you can operate with very small movements? With keys arranged in alphabetical order? With large keys today and small keys tomorrow? All of these options are possible. Why should each keystroke give you only one character? Why not assign whole sentences to a single key? Switches and scanning are a tremendous input option for many individuals. with scanning, the computer automatically and repeatedly cycles through the alphabet and other common characters on the screen. As the computer highlights the desired letter or character, the user selects it by clicking a simple switch, then moves on to selecting subsequent letters. (page 43)

Assistive-style output   People with visual impairments or learning disabilities may benefit from specialized software and speech synthesizers that read aloud characters appearing on the screen. (Many of these products are classified as screen readers and are discussed in Part II.) People with vision impairments may benefit from options that enlarge characters on the screen or allow color and contrast adjustments to the text and background. Braille displays constantly translate what is happening on the screen into tactile output, and embossers can be connected to computers to produce brailled documents. (page 45)

Questions About Input

What parts of your body and what abilities can you use consistently? Is there at least one set of muscles you can move reliably? For example, can you blink, move your chin, use your fingers, or turn your head whenever you wish? Do you think you can use a regular computer keyboard very well, OK, somewhat OK, poorly, or not at all?   You think you can you use a regular computer mouse very well, OK, somewhat OK, poorly, or not at all? How might input devices be positioned to make the input process as comfortable as possible?
(page 47)

Some Input Solutions

By using a switch with scanning, you can operate a computer with reliable muscle movement. There are keyboards that can be altered to create keys of any shape, position, size, and color. There are devices that replace the mouse, and there are ways you can use the keyboard instead of the mouse to accomplish the same tasks.
 (page 47)

Questions About Output

If it's not possible for you to see the screen, did you know that a speech synthesizer can be used to read the screen for you? Would speech output interest you? Do you want to be able to produce output and materials that can be used by people both with and without disabilities? Do you need brailled output? How might output devices be positioned to make their use as comfortable as possible?

Some Output Solutions

Words you create with a computer can be spoken with synthetic speech, translated and embossed in Braille, seen on the screen, and printed on paper. There are several devices that can pass Braille dots beneath your fingertips.
 (page 48)

Check out the journals, available in college and some public libraries', that regularly discuss aspects of assistive technology and that can refer you to other sources. Some of these journals are Closing the Gap, Exceptional Parent Magazine, Journal of Special Education Technology, Journal of Vision Impairment and Blindness, A.T. Quarterly, and Journal of Disability and Technology. (page 58) Another place to have contact with products is at one of the many national and regional conferences that focus on assistive technology and Feature exhibits where vendors display their products. Two national annual conferences on livability and technology are Closing The Gap, held each October in Minneapolis, and the International Technology and Persons with Disabilities California State University, Northridge. These events provide an opportunity to compare different products. (page 89)

An older person or with a cognitive disability, for example, could carry a PDA in a pocket and be reminded of everything from taking medication to showing on time for a job interview or catching a bus. Such a system is functioning- in the Chicago area, where a group is employing a personal com- to call and send messages to up to 50 people with traumatic brain as many times as needed during the day to help them stay on track. With the new generation of PDAs capabilities frill be even more extensive. Example, the locator capability could alert someone with Alzheimer's Cease that they are more than a certain number of blocks from home and, requested, give them printed or verbal instructions as to how to return ..... (page 125)

The right to Achieve Unrealistic Expectations

There has never been a better time for an individual with a disability to challenge all of the stereotypes and notions of "unrealistic" expectations existing in our culture. Not only do we have the right to envision and develop unrealistic expectations, but we have a right to achieve them. (page 127)

Books: Assistive Technology Sourcebook. Alexandra Enders & Marian Hall. Washington: RESNA Press, 1990.

Augmentative and Alterative Communication: Management of Severe Communication Disorders in Children and Adults. David Beukelman and Pat Mirenda. Baltimore: Paul Brookes Publishing, 1992.

Augmentative and Alternative Communication Systems for Persons with Moderate and Severe Disabilities. Diane Baumgart, Jeanne Johnson, and Edwin Helmstetter. Baltimore: Paul Brookes Publishing, 1990.

Breaking Barriers: How Children and Adults Can Access the World through Simple Technology. Jackie Levin and Lynn Scherfenberg. Minneapolis: AbleNet 1986.

Communication Skills in Children with Downs Syndrome. A Guide pr Parents. Libby Kumiss Rocksrille, MD: Woodbine House, 1993.

The Handbook of Assistitive Technology. Gregory church and Sharon Glennen. San Diego: Singular Publishing Group, Inc. 1992.

Living in a State of Stuck: Haw Technology Affects Persons with Disabilities. Marcia Scherer. Cambridge, MA: Brookline Books, 1993,

More Homemade Battery Devices for Severely Handicapped Children, with Suggested Activities. Linda Burkhart. Eldersburg, MD: Linda Burkhart, 1985.

Using Computers and Speech Synthesis to Facilitate Comunicative Interaction with Young and/or Severely Handicaped Children. Linda Burkhart. Eldersburg, MD: Linda Burkhart. 1987.

Utilizing Switch Interfaces with Children who are Severely Physically Challenged. Carol Gossens and Sharon Sapp Crain. Pro-Ed. 8700 Shook Creek Blvd., Austin, TX: 1992.

(page 241-244)

Commercial services with resources for people with disabilities

DIMENET Disabled Individual's Movement for Equality Network (DIMENET) is she on-line service representing the of the disability rights and independent living movements. The network is comprehensive and consumer- controlled. It was designed with access in mind and is user-friendly and easy to navigate. For more information contact DIMENET at L508) 880-5412, 9 Taunton Green, Taunton MA 02780.

Electronic Bulletin Boards of Interest to People with Disabilities

DEN (Disability Electronic Network) (201) 342-3273 Hackensack NJ Technology for people with disabilities, autism forum

HandicapNews (203) 337-1607 Bridgeport CT List of other boards

Information 90 BBS (215) 411-2237 Allentown PA Adaptive devices / computer user

DDConnection (817) 277-6989 Arlington IX Developmental Disabilities Connection   (page 246-248)

Databases ABLEDATA ABLEDATA is national database of assistive technology information. This database contains over 19,000 commercially available rehabilitation products and covers everything from power lifts to computers. You can call, write or fax and ask them to search the database for you. You can access the database via modem by calling their Bulletin Board Service - National Rehabilitation Information Center (800) 227-0216, voice/TT (301) 589-3563, bulletin board service

CO-NET Co-Net, the Cooperative Database Distribution Network for Assistive Tech- nology, is a CD_ROM disk that contains the cooperative Electronic Library. This disk is available from Trace R&D Center Below) and includes: ABLEDATA database

REHABDATA database of publications and reports

Text Document Library containing important documents related to disability and technology

Trace R&D Center University of Wisconsin-Madison (608) 263-2309, Voice

(page 248-249)

Cultivating Minds - A LOGO Casebook (part one of two parts)   S. Weir, Harper & Row (out of print), 1987.   Reference Type: Book

Overall Rating: 5.0 average over 1 person   Keywords: Collections: CIAP
Contributed by: carmien (3/22/00, Last Modified 3/22/00)   Contributor's Rating: 5
Book: Cultivating Minds
Author: Sylvia Weir
Date Published: 1987
Part 1 of 2 parts

Review:
This book is a fascinating and hugely insightful report of a series of experiments using the Logo language with physical extensions (a turtle-robot) and children/young adults with various kinds of mostly cognitive disabilities. Structurally it reads more like a series

of monographs than a book with sequentially ordered chapters, encouraging chapter reading for specific topics rather that hierarchaly building a model or theory. That said, the insights and basic ideas in this book are core to any non-trivial application of computer science to aiding sensorialy and cognitively handicapped persons.

Ms. Wier focuses on autism and physical disability - particularly Cerebral Palsy. Liberally salted throughout the text are reference to other studies, from both the medical/psychological and computer science domains. Highly recommended.

The excerpts that follow are from the introduction and chapters 6 and 14 thru 18.

Sample Quotes:

Introduction This potential to act as a window into the mind of the learner could turn out to be the most valuable contribution of the computer. . . . Ever since the beginning of the school enterprise, they have been faced with an almost impossible task: how to teach a group of growing minds, whose interests, stylus of learning, and levels of knowledge are different, sometimes widely different, yet whose needs must be addressed simultaneously. (Page 1)

For example, the computer can support an exploratory, trying-things-out mode of working which not only may correspond to an individual's natural style, but is often just what is required to solve a problem. In a similar vein, some people are very able in one modality and weak in another; some may be verbally inclined, while others are visualizers. The enormous emphasis on language skills in the traditional curriculum puts individuals Wit's a preference for visualizing at a disadvantage. A computer graphics screen can allow them to use their spatial skill to make academic progress. For example, there is a growing appreciation that spatial reasoning is important in the understanding of mathematics (Bishop, 1980), but until now formal spatial reasoning has had little place in the classroom. How much of the curriculum could be introduced in spatial mode? (Page 2-3)

This use of the computer as an information prosthesis aids the handicapped person by bringing such a person into an information Society. . . . . . . Looking at the world of children with special educational needs has helped me understand the thinking of children in general. When talk about Michael's trapped intelligence (Michael is a quadriplegic described in Chapter Seventeen), I have in mind the often hidden intelligence of the ordinary child, the vast amount of know-how often untapped during traditional classroom activity. (Page 4)

When a handicapped person becomes adapted to total passivity, because of the perception of those around her that kindness amounts to doing things for her, we are witnessing an extreme form of learned helplessness: the cultivation of a self-image that says, "You have to do it for me; I am helpless without you." (Page 5)

My working hypothesis is that the same underlying mental mechanisms are at work in many special needs children as in so-called normal children. However, because special needs children often come at the extreme end of a spectrum of variation, their behavior can appear to be Qualitatively different. They are more vulnerable to deficiencies in their learning environments. Observing such children perform on the computer can often provide a magnified, slowed down view of familiar processes. (Page 5)

Chapter Six   AUTISM AND THE COMPUTER

Combining the simplicity of the button-box with the concreteness of the mechanical turtle provides the learning environment of choice for low-functioning children: the stage is set for observing their spontaneous problem-solving activity. Often, autistic children do not relate their own actions to a resultant change in the world around them. Things seem random and inexplicable. They do not recognize cause-effect chains easily in the unmodified complex real world. We can bring these basic causal connections within their grasp in a simplified button-box-turtle world, where a single key push results in a single action of the robot. Providing this One-to-one correspondence, clear, predictable, and satisfying, formed the oasis for an early study carried out in Edinburgh in 1975. (Page 64)

Autism and the Computer Donald: Behavior Before Logo Sessions

An extract of our report (Weir and Emanuel, 1976) summarizes the story of a 7-year-old autistic boy prior to his Logo work Over the past year in the autistic unit he had learned to read and write. However, his reading was very mechanical ilk texture, with a flattening of intonation and a loss of emotional inflection, It was difficult to avoid the impression that much of this involved a kind of rote learning, with a real lack of understanding. His parents, teachers, and the psychiatrist in whose care he was shared a concern about his apparent "comprehension blockage." Ö.

 Logo Sessions: Regularity and Predictability, Cause and Effect

During the early sessions we left Donald alone in the room and observed his behavior on the video-monitor in an adjacent room. Later, we The physical turtle was placed on the table near the button-box so that any effect on the turtle mould immediately be obvious to Donald, and, indeed, when it moved forward in response to our pressing the FORWARD button, we were rewarded with an "Ah!" "Now YOU do that, to see what happens." Gingerly, he complied with our suggestion that he press a button. At first his behavior was exploratory, cautious, and nervous. The HOOT button was clearly a favorite from early on and he delighted in imitating, accurately the sound with a musical "hoot."

Donald's behavior went through several stages, characterized as follows.

   1. Sequence of steps: pressed button, looked at turtle for response, pressed button again. Button choice: at the beginning of each session stepped systematically through the available five buttons; after that chose any button, I.e., basis for choice not obvious to us.

   2. Sequence of steps: as above. Button choice: concatenated single commands into sequences; for example, constructed runs of Forward's and so propelled the turtle across the table, and later across the floor toward one of a number of objects scattered around.

   3. Sequence of steps: said the action first, e.g., said HOOT or UP, then pressed the button corresponding to the action just said, looked at the turtle for the response. Button choice: constructed complex sequences that appeared to be goal-directed; for example, forward to a chosen object; HOOT; back a little; forward again to almost reach the object; HOOT again; back; then forward up to and straight into the object, knocking it over.

   4. Sequence of steps: pushed PENUP button, which raises the pen on the under-surface of the turtle, pushed PENDOWN button, which lowers it (both movements accompanied by a rather obvious click), said PENUP, stood up, said PENDOWN, sat down. Immediately after this, pushed PENUP button, pushed PENDOWN button, poked the region of his belly button with his finger while saying "up," stood up. Poked his belly

button while saying "down," sat down, pushed PENUP button, stood up with his hand in the region of the belly button, pushed PENDOWN button, sat down.

Donald showed an appreciation of the one-to-one correspondence between pushing the button and the turtle's action. As evidenced by the direction of his gaze. Furthermore, on one occasion, when he pressed the HOOT button faster than the computer could respond, so that the turtle continued to hoot even when he had stopped pushing tile button, he glanced back and forth from button-box to turtle, showing surprise at this apparently unsolicited hoot. He predicted and then obtained an effect, saying "hoot" and then pressing the HOOT button. He did a great deal of explicit acting out, a kind of action conversation.

In summary, Donald did what Papert hoped children would do, it seems, making connections between the turtle's activity and his own body movements. He appeared to be acting out the behavior of the turtle by reference to his own existing body schemas. The new schemas he con- The striking difference between Donald's behavior in the Logo session and his behavior in his regular classroom appeared to rest, in part, on the clarity of the situation, it was unusual for him to be clear about what was expected of him. It was unusual for him to have such clear expectations of the consequences of his actions. For us, the novel feature was the clarity of his intentions as he used the turtle, in contrast to the more usual impression of a "shutter across his mind." (Page 64-66)

Relevance

To help a learner become receptive to our communications, we need both to speak less ambiguously so as to facilitate her perception of what we consider relevant, and to become sensitive to alternative perceptions of relevance she may have. Consider a child in a discovery-learning class, pouring water from one glass container to another. What is she to attend to? The situation is rich with suggestion. The trouble is that there are so many things around. Among the myriad of objects, events, properties of objects, changes over time, constancies over time -- to which of all these possibilities should she attend? The difference between turtle activity and the imaginary container scenario is that in the turtle world, the things that matter are just those things that you have commands to change. . . . . . Exactly what you are supposed to attend to is writ large by what has been selected as the primitive actions in the system. The nature of the material the turtle is made of does not affect your activity. That which requires attention is more "obvious" in this artificial turtle world than in the real world, teeming with complexity and confusion. However, an intrinsic contradiction emerges. We want to simplify the situation so as to keep the salient features uncluttered, so as to enhance the learner's chance of seeing what is relevant. (Page 69-70)

There is growing evidence that different styles of processing are to be found among people with different patterns of attention-focusing (see Chapter Eleven). For some people, identified as having an obsessional type of personality, a single sequence of events is preferred. For others, the hysteroid type, several different foci are preferred and they will rejoice in dealing with many simultaneous changes. Autistic children come at the obsessoid end of the spectrum in this regard. For them, a single focus of attention is what is required and the less ambiguity the better. Indeed, much of their problem stems from the fact that their sense of relevance is idiosyncratic. The consequent lack of a shared relevance is what stakes it so difficult for autistics to communicate with other

people, and a large part of the advantages of using Logo rests on the explicitly shared relevance it enables (see Chapter Fifteen).

Shared Relevance and Communication

Frequent comments in Donald's extensive case notes referred to a striking feature of his school and clinic behavior: "has never made a spontaneous statement to us, except under stress": " speech has to be prompted every time"; "no spontaneity -- has to be asked again and again." I have already described how in the fourth session Donald made "action speeches" -- pushing his own belly button, saying "up" and standing up .... After pushing the LEFT and RIGHT buttons, he verbalized the entity "left-and-right." He then linked together all his previous descriptions of the turtle functions and said "Emanuel -- make turtle go forwards and backwards and left and right, up and down, hoot." After this he systematically stepped through the number buttons in conjunction with the HOOT button -- 2 HOOT, 3 HOOT, -- and ended with, "See how it works." (Page 70-71)

Anything that reduces the number of possible candidates evoked by the incoming stimulus pattern will simplify and speed up the recognition process. This is where the issue of relevance comes in. When there is a one-to-one correspondence between what is done and what happens, there is reduction in ambiguity that translates into a reduction in the number of candidate schemas evoked during the search-and-match process. It is this reduction in ambiguity that forms a crucial element in the success of the approach with autistic children. (Page 71)

Emotional Responses While pressing buttons to move the mechanical turtle, Donald was clearly enjoying himself. He spoke in a warm, vibrant and low-pitched voice. He smiled. He chuckled. He became rambunctiously excited. He showed total concentration, attention, and a high level of motivation during his sessions. . . . . . . (Page 72)

Partial Control and Models of Self   In order to participate in interpersonal relationships, an individual requires a sense of self that includes two models of self: self-as-agent and self-as-object. It was as though Donald could not understand self-as-agent alternating with self-as-object. Either he was granted total agency or he withdrew. Such an all-or-none stance by an autistic comes as no surprise to us. Typically, autistic children have no idea of "turn-taking," the alternation of actor that forms the basis for conversation.

 When the problem concerns an unawareness of self, there are advantages in starting with an activity that focuses on body schemas. The advantage for Donald was displayed transparently by the way he always acted out the behavior of the turtle with reference to his own existing body schemas. The explicit similarity between his own actions and those of the turtle facilitated the connection. Our reward was some quite splendid things he did with the system. The connection he made between his own schemas and turtle program's was spelled out as an action speech. He first Coved himself then moved the turtle, looking toward us each time he did this: "Up," he said, pushing his belly button; "Up," he said, pushing the button that lifted the pen.   We expected Donald to enjoy working with our machines and then to experience a problem in transferring the gains he made to his inter- actions with humans. Instead, as he continued with his turtle work, he appeared to be directing his descriptions at us. He behaved as though he telling us about it. (Page 73)

It was even more rare for him to find himself in a situation where what he was in control of was what those people around him wanted him to be in control of, even more rare for him to find himself in a situation where what he was in and, most poignantly, rare

indeed for his control to be linked with such unequivocal understanding: "See how it works'" His sense of control was both mediated by and in turn deeply affected by the strong emotional responses he had to the activity (see Chapter Ten). Again, the connection with the general learner is clear. The issue of control has several aspects discussed further in the next chapter. (Page 74)

Cultivating Minds - A LOGO Casebook Part 2 of 2   S. Weir, Harper & Row (out of print), 1987.   Reference Type: Book

 Contributed by: Carmien (3/22/00, Last Modified 3/22/00)   Contributor's Rating: 5
Book: Cultivating Minds
Author: Sylvia Weir
Date Published: 1987
PART 2 of 2
    Review:

   This book is a fascinating and hugely insightful report of a series of experiments using the Logo language with physical extensions (a turtle-robot) and children/young adults with various kinds of mostly cognitive disabilities. Structurally it reads more like a series of monographs than a book with sequentially ordered chapters, encouraging chapter reading for specific topics rather that hierarchaly building a model or theory. That said, the insights and basic ideas in this book are core to any non-trivial application of computer science to aiding sensorialy and cognitively handicapped persons.
   Ms. Wier focuses on autism and physical disability - particularly Cerebral Palsy. Liberally salted throughout the text are reference to other studies, from both the medical/psychological and computer science domains. Highly recommended.
   The excerpts that follow are from the introduction and chapters 6 and 14 thru 18.
        Sample Quotes:

    Chapter Fourteen
    A STRUCTURED ENVIRONMENT FOR AUTISTIC CHILDREN
        Current teaching of autistic children is rightly dominated by the need for a
structured environment. The regularity of response and predictability of a machine's behavior suits this need and also allows teachers to combine machine's behavior suits this need and also allows teachers to combine flexibility with structure. In general, autistic children prefer the physical turtle to the screen turtle. It becomes a navigational device which the child can send to various places on the floor. The importance of bringing together the autistic child and the computer cannot be overemphasized. Experience suggests that low-functioning autistic children respond more favorably to Logo that do non-autists of a comparable measured intelligence. Using a computer with autistic children exploits their fascination for machines. This is no accident. There are striking resemblances between the kind of difficulties that autistic children display and the kinds of problems one meets in trying to get a computer to behave intelligently, resemblances that invite exploration. (Page 152)
        The Langridge Project
        ......The ages of the children ranged from 7 to 17. All had some type of emotional disturbance or developmental disorder, and their academic performance was well below

that of most children of their age. These children are very difficult to test. For what it is worth, the IQ as measured by attending clinical psychologist is given. One child was untestable. The children are very difficult to test ...... The mean figure for the remaining children was 66. The mean IQ of the children diagnosed as autistic was 57 and that of the non-autistic was 73. All the children could reason and use numbers. Their typical classroom exercises reflect a focus on the learning of basic life skills, for example, the addition and subtraction involved in handling coins. However, the impression one gets as an observer is that much of this is rote learning, and their class teachers agree that often the student's learning does not carry over well into daily life. Two themes will be explored in more detail: the importance of a physical turtle and the use of the child's behavior at the computer to provide insights into underlying cognitive mechanisms. (Page 153-154)

The Langridge Project (2)
Advantages of Using a Mechanical Turtle

For many of these children, progress was slow until we acquired a mechanical turtle. The dramatic response of both autistic and non-autistic children to this physically present, concrete, three-dimensional object was one of the roost striking features of the work with this group of low-functioning children. As before, the use of numbers forms an interesting cognitive focus. Whereas numbers in their regular classwork tended to be used in a rote-like fashion, in Logo, choosing a particular number and seeing it do a particular job of work made numbers come alive for the students.

Computing the number of rabbits remaining hidden was a big struggle for Eva (10), as was a classroom exercise involving work with numbers of dollars and cents. In contrast, when we introduced Eva to the mechanical turtle, there was a noticeable improvement in her choice of was doing. In his research notes, Scrimshaw described the situation: "Prior to this, Eva tended to think only of what had to be done one step at a time. Since she often failed to foresee what the ultimate result of her actions would be, she became frustrated. Now, with the mechanical turtle, she began to plan her moves in advance. More than one factor would seem to be involved in the success of the mechanical turtle with these low-functioning children. The inventors of Logo treated the physical turtle as much the same as the screen turtle, but children do not.

When the physical turtle moves, the entire movement is seen, whereas when the more abstract screen turtle moves it is merely redrawn in a new location. There is a particular feature that knight be relevant in the case of autistic children. We know from the work of Hermelin and O'Connor (1970) that autistics respond to kinesthetic cues better than they do to visual cues. One could argue that this preference might favor identification of their own body movement and the movement of the physical turtle, as Donald so explicitly showed he was doing. Ornitz suggests that:

the spontaneous spinning and flicking of objects, the flapping and oscillating of their extremities, and the whirling and rocking of their bodies may be the autistic children's way of making sense out of the sensations in their environment, including their own bodies and their parts, through kinesthetic (sensorimotor) feedback. (Ornitz 1978)
(Page 154-157)

The Langridge Project (3)
Terry: Finding Meaningful Components

But just what he understood by the two sequences came to be an intriguing puzzle for us, connected with general issues of language usage in autistic children. Because of the explicit nature of the Logo activity, it was easy to see that his understanding was unusual, to say the least. He seemed to treat the whole phrase "eff-dee-space-forty-five" as a single monolithic entity, saying it rapidly as a continuous string of sounds at the same pitch, ... This situation persisted as long as he was using the screen turtle. The breakthrough carne when the physical turtle was introduced. Whereas throughout the screen-based work, he needed considerable prompting to initiate any action, Terry was one of the children who roost appreciated the change to the floor turtle. He became much more self-directed and chose a wider range of numbers. When asked to use another number, he would oblige and change his choice, a cooperation that had not been evident at all during the screen-based work, when if anything, he tended to do the opposite of what he was asked to do. Again, as with Donald, we were struck by Terry's emotional response to the physical turtle, ... Most striking was Terry's response to a successful turtle move. This delighted him and made him laugh excitedly with a display of emotion most unusual for Him. Terry became less vulnerable to the presence of strangers. . . . . (Page 157 - 159)

Chapter Fifteen
AUTISM AND COGNITIVE THEMES
Ritualistic and Compulsive Phenomena
The insistence on maintaining sameness in the environment is a feature of autism that has stood out from the first descriptions. . . . . This peculiarity extends to the details of therapeutic regimes used and can affect responses.. . . . For autistic children, a consistent timing must be absolutely rigid and unvarying. If these contingency schedules are not strictly adhered to, if the timing is not maintained exactly the same, there will be a disintegration of the training pattern (Kozloff, 1974).

Disturbed Interpersonal Relationships
It is not clear whether this poor social responsiveness is an active avoidance, or rather an absence of expected social behavior because of a lack of appreciation of the multiplicity of roles involved in any reciprocal relationship.

Abnormal Language Development
About half of autistic children develop no language at all. For those who do acquire some language, development is delayed and deviant. Acquisition of syntactic aspects, such as grammar, is delayed and deviant. In contrast, the development of meaning aspects of language goes drastically wrong: language comprehension is deviant. If "sit at the table" was learned and understood in the classroom, it is not recognized as meaning the same thing when used in a restaurant.

An Underlying Explanation: Requirement of an Exact Match
The deep rule I choose concerns the symbolic matching process, introduced in the account of perception given earlier.
 (page 58)
This process, I claim, is deviant in the autistic child. Suppose autistic children insist that when any symbolic matching takes place an exact match must exist before two things are ceiled the same. I am proposing that artistic children are at the extreme end of the "fussiness" spectrum I described in Chapter Eleven, when discussing personality differences. (Page 160- 166)

Relation to Existing Theories

My purpose in proposing the exact-match mechanism is to make more specific and to unify some of the general formulations already in the literature. For example, Scheerer and his colleagues (1945) referred to an inability to relate new stimuli to remembered experience among autistic children. Rimland (1964) talked of "stored material emerging unmodified, uncategorized." Menyuk (1978) recognized the basic deficit as one of categorizing and discriminating. Hermelin (1976) refers to the central cognitive pathology underlying autism as an inability to reduce information through the appropriate extraction of crucial features such as rules and redundancies.

The explanation proposed here to account for aspects of autism in terms of a disturbance in the mental schema-matching mechanism provides an example of the general hypothesis that children with special needs occur at the extreme end of a spectrum of behavior, where the same underlying mental mechanisms are at work as in so-called normal children.

No doubt the debate will continue. An important question is whether we can make use of any of this in a practical way, (Page 169-170)

An Information Prosthetic

It is important to stress that the role of the electronic device in the situation I am describing is somewhat different from the usual function of electronic communicators. The computer is not simply acting as a bridge from the child to some other activity, as prosthetic devices usually do. The electronic system is acting as a communication device, but the emphasis is on giving handicapped individuals the facility to have interesting, exciting, and creative things to communicate about (Weir, 1981b). The power of the electronic system lies in the information processing that it supports, comes from the fact that it is an information prosthetic. The central purpose is to encourage and facilitate cognitive and social interaction and the development of language for communication (Weir, Russell, and Volente, 1982)

Making things too easy rarely works. Bow much do you help with a crutch and how much you leave the child to struggle? Notice this is exactly the same question we ask in relation to the education of all children. (Page 179)

 An intelligent, spirited individual, grossly limited in the fulfillment of his potential by severe motor handicap, showed what could be accomplished with a computer. He moved from being a source of frustration to his teachers, who were unable to meet his needs and felt particular concern at the lack of available vocational outlets for him, to undertake a promising college career in computer science.

The Challenge

Michael was 17 years old when the project began, a quadriplegic cerebral palsy (all 4 limbs involved) following birth trauma. His disability was more marked on the right side, with sufficient residual motor power on the left to control his wheelchair, but not a writing implement, Involuntary movements caused his arms and legs to flail around and produced grimacing and drooling. His communication was extremely limited, since dysarthria badly garbled his speech, making him difficult to understand.

A College Career

Michael's Programming achievements confirmed his high intelligence, and, with our encouragement, he decided to apply for, and was admitted into the Computer science program at a New England college.

At present Michael is scoring above average for his computer work, getting good grades for his English, and working away at plugging those gaps in high school mathematics that are holding him back. Here is how he commenced an essay recently, writing as always from the heart, and in his intensely personal way.

Trapped Intelligence   Trapped intelligence is a phrase which is used to describe people who have normal or above normal intelligence but are non-verbal or slow-talking and society assumes that these people are stupid. Project Logo and the computer have changed this meaning. It has allowed people to show what they can contribute to society. (Page 183, 193)

Introducing a computer into the learning environment of a severely handicapped student can revolutionize his life. Students whose intelligence has been inaccessible because they cannot communicate what they know, either because they cannot write or because they cannot speak or because they can do neither; students who in the past would have remained totally dependent on others, financially and otherwise, can now look forward to a measure of independence, to the possibility of earning a living, to the possibility of enjoying a future with dignity.

The ultimate goal is to allow the physically handicapped person to enter into the life of the community as an independent agent, as far as this can be achieved. Increasing basic skills in reasoning, mathematics, problem-solving, and understanding spatial concepts contributes to the fulfillment of the individual in as much as it helps that individual to attain productive self-sufficiency. It is important, however, not to raise false hopes. Michael is blessed with an above average intelligence. Careful assessment of the abilities of each physically disabled student will be necessary to provide realistic guidance. (Page 194)

The Role of Experience

I agree with the Bower-Spelke argument that the child is born with a rudimentary object concept, which is then refined and elaborated by experience. I regard the provision of computer-based activities as a way to begin to fill the gap in experience suffered by individuals who are handicapped from birth. The particular virtue of the largo spatial component of standard Logo activities for this handicapped population is that it allows us the possibility of supplying manipulitory experience at one remove. The lines on the graphics screen can be seen as objects (AS-IF objects), and we can arrange matters so that these "objects" can be manipulated by a minimum of motor effort -- by simply pressing a single key. These manipulations are AS-IF actions (Papefl and Weir, 1978). The child can use the turtle to explore a defined and manageable spatial world and in doing so can learn about shape, length, angle, size, position, and number. (Page 197)

Integrating Spatial Information over Time

Severely physically Handicapped persons can readily acquire visual information about shapes and spatial configurations. It is the information from manipulatory experience that is not easily available to them. Manipulation of objects involves a coordination of several different kinds of information:

Visual information   Haptic information -- information obtained from touching the objects   Kinesthetic feedback from the muscles in the upper extremity -- information about successive positions o1 the hands and fingers as they move with and over the objects   Data from the motor component, I.e., the coordinated instructions to muscle groups that correspond to particular movements.

Normally, identification of objects by touch (haptic identification) develops more slowly than visual identification. A possible explanation for this is that the various features of the object being explored by touch are not available "all-at-once" as they are in the visual case. They have to be searched for and integrated over time. This means accumulating information in appropriate data structures. Haptic identification has been shown to be significantly impaired in brain-damaged children (Rudel et al., 1974). Since it is difficult to test children's skill at palpation if they cannot move their hands and fingers over the object, we decided to use our system to allow us o separate out the difficulty with palpation from another possible source of the deficit, namely, an inability to integrate information over time. (Page 200)

Eliminating the Motor Element in a Standard Task

The next example continues the theme of computer-based activity as a revealer of the problem-processing strategies of individuals whose cognitive systems have suffered injury. James (13 years old at the time of testing) was a quadriplegic whom we have already seen in connection with number choice for his Christmas tree project. He was grossly restricted in the movements he could perform. Every movement took a great deal of concentration and a great deal of time. He had to devote resources and conscious attention to an aspect of the task that would have been done automatically without any thought by non-handicapped children. So for James the conceptual aspects of the task did not get their share of attention. In thy computer task, the motor hurdle was removed. (Page 204)

Non-handicapped persons have sets of automatic routines that take care of movements, routines that do not reach consciousness, and so take up femur resources than they do in the case of individuals with motor restrictions: "In addition to thinking about size comparisons, and where on the board am I going to put this stick, I have a third thing to think about, namely, how am I going to get this hand of mine there and how am I going to make the right movement so that I will be grasping this stick and letting that one go." (Page 209)

Teaching Children with Autism to Mindread, A practical Guide   P. Howland, S. Baron-Cohen, & J. Hadwin, John Wiley & Sons, England, 1999.   Reference Type: Book

Overall Rating: 4.0 average over 1 person   Keywords: Collections: CIAP
Contributed by: Carmien (3/9/00, Last Modified 3/9/00)   Contributor's Rating: 4
Book: Teaching Children with Autism to Mindread, A practical Guide
Author: Patricia Howland, Simon Baron-Cohen and Julie Hadwin
Date Published: 1999   Publisher: John Wiley and Sons   Review:

This oddly titled book describes a series of techniques to assess and teach the ability to infer information about the world in ways that autistics often are unable to do. The book explores the relationship of "theory of mind" deficits to other areas of children's functioning and describes existing experimental work that has attempted to enhance the skills associated with understanding others' minds. Drawing on their own intervention program, and providing detailed information about the teaching materials and strategies

they use, the authors provide practical guidelines for helping children with autism to improve their understanding of beliefs, emotions and pretence.

Sample Quotes:

PREVIOUS ATTEMPTS TO IMPROVE SOCIAL AND COMMUNICATIVE DEFICITS IN AUTISM

There are literally hundreds of studies that claim to enhance the social and communication skills of children and adults with autism. Drug, vitamin and dietary treatments, interventions based on "holding", "music" or "pet" therapies, facilitated communication, sensory and physical stimulation programs, and many others, all have their advocates. Unfortunately, the claims for success are rarely supported by experimental evidence. The interventions that have proved most successful are those involving a high degree of structure, with a focus on the development of more appropriate social and communication skills (5)

(5) Howler, P. and Rutter, M. (1987). Ibid. and Schopler, E., Mesibov, G. (1986).Social Behavior in Autism. New York: Plenum. (page 1)

LIMITATIONS OF TRADITIONAL APPROACHES TO INTERVENTION

Although communication and social skills programs can have an important impact on some aspects of social functioning, generalization to untrained settings is frequently limited. Moreover, there is often little evidence of more general improvements in social understanding... It seems reasonable to assume, therefore, that a focus on developing key aspects of social understanding could result in more widespread changes in social behavior... That is, rather than attempting to change specific behaviors in specific situations' interventions aimed at improving social understanding might produce wider, qualitative changes in individuals' social and communication skills... Recent studies of young, normal children have stressed the importance of the development of a "theory of mind", and it is around this area that we suggest future intervention programmes need to place particular emphasis. (page 2)

THE NORMAL CHILD AS A MIND READER

A "theory of mind" is defined as the ability to infer other people's mental states (their thoughts. Beliefs, desires, intentions, etc), and the ability to use this information to interpret what they say make sense of their behaviour and predict what they will do next... Recent debates have, however, questioned whether this type of understanding is properly called a "theory". We do not discuss this issue here, but instead use the more neutral term of "mind-reading". Dennett1(13) proposed that the "acid test" of whether a child is able to mind-read arises in situations involving false belief... The ability to understand false beliefs is a complex one, because the child has to take into account Sally's belief in order to make the correct prediction about her behaviour. A related achievement in the development of mind-reading is in children's understanding of the principle that "seeing-leads-to-knowing". For example, 3 year olds are easily able to indicate which of two people will Knorr what is in a container, if one of them has looked into the container whilst the other has simply touched it. Such an ability demonstrates that even at this young age, children are aware of the importance of access to information in acquiring knowledge. So much for tests of children's understanding of informational states. What about their understanding of desire and emotion? Desire is often thought to

be the other key mental states next to belief, in understanding others' behaviour. With beliefs and desires. All kinds of behaviour become interpretable.

13. Dennett, D. (1978). Beliefs about beliefs. Behavioral and Brain Sciences, 4, 759-770. 17. Batt, C. and Bryant, P. (1990). Young children understand that looking leads to knowing (so long as they are looking into a single barrel). Child Development, 61, 973-982.

(page 2-3)

THE IMPORTANCE OF MIND-READING: WHAT DO WE USE IT FOR?

Making sense of social behaviour. At this stage, it is worth pausing to reflect on why children are acquiring this extraordinarily rich body of knowledge: what are the benefits to the child in being able to mind read? Dennett was perhaps one of the first to put forward the case for the necessary role of mind-reading in understanding the human world. Attributing mental states to people is by far the easiest way of understanding them. By understanding, Dennett meant formulating explanations of their behaviour and predicting what they would do next. (page 5)

Making sense of communication

A second function of mind-reading is in understanding communication. Perhaps the clearest case for this was put by Grice (22) a philosopher of Language. He argued that the key thing that we do when we search for meaning in what someone has said, is to imagine what their communicative intention might be.   (page 6)

MINDBLINDNESS IN AUTISM

The ability to understand one's own and others' minds appears to occur quite spontaneously in childhood. An increasing number of studies have shown, however, feat children with autism have particular difficulties in reasoning about mental states and it has been proposed that this deficit underlies many of the developmental abnormalities that are characteristic of the disorder   (page 7)

APPROACHES TO TEACHING MENTAL-STATE CONCEPTS

The following section briefly outlines the main principles underlying our teaching programme and summarises the overall results from our studies.(46) Subsequent chapters describe in detail the techniques and materials employed in teaching.

The teaching principles

Teaching needs to be broken down into small steps, so that complex skills are acquired gradually, as a sequence of separate components.

Normal developmental sequences are generally an important guide to the sequence of skill acquisition. Those skills that are acquired early by Abnormally" developing children are likely to be learned more rapidly than those acquired at later stages of development.

Naturalistic teaching is usually snore effective than teaching procedures that take lithe account of file child's normal environment or pay little heed to individual skills or interests.

Behaviours that are systematically reinforced will be acquired more rapidly and will be more likely to be maintained than those that are not reinforced in this way. Although extrinsic reinforces (such as praise), are important for this purpose, intrinsic rewards, that derive from the task itself, or the pleasure that comes from completing it successfully, are at least equally potent.

By ensuring errorless learning (I.e. avoiding the opportunity for making mistakes as far as possible) the speed of task acquisition can be greatly increased.

Problems of generalization (I.e. the failure to adapt learning to new situations or tasks), that frequently limit the success of teaching programmes, can be reduced if teaching focuses on the principles that underlie concepts, rather than relying on instruction alone.

Thus in order to minimize the conceptual complexity of the tasks, the understanding of mental states was divided into three separate components:

o understanding informational states o understanding emotion o understanding pretence

Each child was exposed to teaching on only one of these concepts. Then, each of the concepts was ordered into five successive levels of understanding...

(pages 14-15)

OUTCOME OF THE EXPERIMENTAL STUDY

We were surprised to find that significant changes occurred in the specific areas selected after only a relatively brief training period, and that these improvements were maintained long after intervention ceased. We suspect that a longer training period, together with the involvement of families, as well as teachers could enhance the effectiveness of the methods used even further. For this reason, and as a response to requests from parents and teachers, we have compiled this Guide, to share our approaches to teaching.

FOR WHOM IS THE MANUAL DESIGNED?

The experimental study on which this manual is based involved young children with autism, aged between 4 and 13 years. With a language age of at least a 5 year old level. It is the linguistic level at which normal children clearly demonstrate the ability to read minds. (page 16)

Teaching about Emotions

In this section we describe five levels of emotional understanding that can be taught.

THE FIVE LEVELS OF EMOTIONAL UNDERSTANDING

Level 1. Recognition of facial expression from photographs This is the ability to recognize, from photographs, facial expressions such as happy, sad, angry, and afraid,

Level 2. Recognition of emotion from schematic drawings This is scored if the child is able to identify tire correct face from four facial cartoons: happy, sad, angry, and afraid, in the same way as above.

Level 3. Identification of situation-based emotions These are emotions triggered by situations (e.g. fear when an accident is about to occur). At this level the child should be able to predict how a character will feels given the obvious emotional content of the picture.

Level 4. Desire-based emotions These are emotions caused by a person's desire being fulfilled or unfulfilled. At this level the child should be able to identify a character's feelings (either happy or sad) according to weather his or her wishes are fulfilled or not.

Level 5. Belief-based emotions These are emotions caused by what someone thinks is the case, even if what they think conflicts with reality. The child is required to follow a sequence of three pictures and to interpret the feeling that cartoon characters will experience according to whether they believe their desires have been satisfied or not. The following sections describe how to assess and teach at each of these levels.   (page 23)

LEVEL 1. RECOGNIZING FACIAL EXPRESSION FROM PHOTOGRAPHS

Teaching procedures Children are asked to identify the four photographic facial

expressions of emotion (happy/sad/angry/afraid) in turn (randomized). The teacher first places the set of photos on the table and names the emotion shown in each one of these. The child is then asked to match his or her faces to goose displayed by the teacher. The task is made easy for the child by the teacher providing a model initially. If errors are made at any point the child is immediately provided with the correct answer. (page 24-25)

LEVEL 3. IDENTIFYING "SITUATION-BASED" EMOTIONS Teaching procedures From the set of pictures provided (see following pages) the teacher selects ones that reflect the four different emotions (happy, sad, angry, afraid). There are twelve different pictures for each emotion. The teacher shows the picture to the child and describes what is happening. Then she/he asks a question about how the character in the picture will feel, prompting with the four possible alternatives (I.e.'Will s/he feel happy, sad, angry or aimed?"). The child is encouraged to point to the correct picture. If the response is correct the teacher reinforces this and strengthens the child's understanding by asking "Why is he happy/sad etc?" If the response is incorrect, the correct answer is provided, as is the reason for the character feeling this way.

General teaching principle:

Whether correct or incorrect, the child is always provided with the general principle underlying that emotion.

(example) When someone gives you something nice/you do something exciting (etc.), then you feel happy. (page 27-28)

Part III

Teaching about informational states In this section we describe teaching methods for the next class of mental states, the informational states. These include perception. Knowledge and belief. FIVE LEVELS OF INFORMATIONAL STATE UNDERSTANDING

Level 1. Simple visual perspective taking This is the understanding that different people can see different things. At this level child can judge what you (the teacher) can see or not see. ...

Level 5. Understanding false beliefs This level assesses the child's ability to understand False Belief, the standard approach to theory of mind reasoning. Here children are required to predict a person's actions on the basis of where that person falsely believes an object to be. (page 233)

LEVEL 2: COMPLEX VISUAL PERSPECTIVE TAKING

This involves understanding not only what people see but how it appears to them. This level requires the child to judge both what another person can see, and HOW it appears to that person.

Teaching procedures The teacher questions the child about the position of an object that each of them sees from a different perspective.

Example: Place the picture card (e.g. Mickey Mouse) on the table between child and adult, so that the object appears one way up to the child and the other way up to the adult. Then ask the child: Other-perception Question: When I look at the picture, is Mickey the right way up, or upside down? (vary the order of this choice)

Teaching Other-perception Question: (For an incorrect response) Look, when you look at Mickey, he is the right way up. But when I look at Mickey he is upside down. Watch what happens when I turn the card around. Turn the card around so that to the

child Mickey is upside down and to you he is the right wary around. Now when I look at Mickey he is the right way around, but when you look at him he is upside down. (Another teaching method that may be utilized is for the picture to remain in the same position and the child and experimenter to change seats in order to highlight the different perspectives.)

As at every level, if the response is correct the teacher reinforces this and strengthens the child's understanding by asking "Why?" "What happens?" etc. If the response is incorrect, the correct answer is provided, as is the reason for this.

General teaching principle: Whether correct or incorrect the child is always provided with the general principle underlying the belief: People can see the same thing in different ways. (page 239-240)

LEVEL 5: UNDERSTANDING FALSE BELIEFS This level assesses the child's ability to understand that people can hold False Beliefs the standard approach to theory of mind reasoning. We suggest using two common variants of this task: A. The unexpected transfer task B. The unexpected contents task. In this section we describe various toys that can be used in the teaching of false beliefs, and in Part IV we also describe different computer programmes that can be used in teaching. The initial assessment should include at least one of the variants of each task. Two examples of how to assess false belief are given below. An additional example should be selected using materials such as those suggested below. (page 249)

Part V

Future directions In this Guide we have only included those methods that we have actually tried and tested in a treatment/educational context. However, we wish to make it clear that these methods certainly do not exhaust all of the possible ways in which mindreading might be facilitated in children with autism. In this closing section we outline some possible directions for future work in this area.

USING A PERSON'S DIRECTION OF GAZE TO INFER WHAT A PERSON WANTS OR IS INTERESTED IN, OR WHAT THEY MIGHT BE INTENDING TO DO NEXT

Recent experimental studies' have found that young children with autism are relatively unaware of the significance of direction of a person's gaze as an outward indicator of what that person may want, intend, or find of interest... In contrast, young nonautistic children use direction of gaze as a 'natural pointer' to infer a person's desires' goals' or interest. One idea, then, is that such tasks could be used in teach children wife autism to mindread. (page 273)

Contributions to the CIAP Web Site

Suggestions from Stefan Carmien

EDC & autism and physical vs. screen turtles

A system for autistic children that implements and extends the discoveries related in the use of logo in the book "Cultivating Minds" by Silvia Weir. This book has several interesting statements in the chapter "A Structured Environment for Autistic Children":

> 1."Our purpose in introducing computers to this particular population was to see whether it   would make their learning more meaningful to them. The successes or failures, when they   came, tended to be unequivocal. There is the suggestion, then , that work on machines is   particularly appropriate for the autistic group, in spite of their low IQ as measured." (p.   154)

> 2."For many of these children, the response was slow until we acquired a mechanical   turtle." (Note: the logo environment was either on a terminal or a 'robot' turtle that could   roll around the floor) "the dramatic response of both the autistic and non- autistic   children to this physically present, concrete, three-dimensional object was one of the   most striking features of the work with this group of low-functioning children."(p.155)

> 3."As before, the use of numbers forms an interesting cognitive focus. Whereas numbers in   their regular classwork tended to be used in a rote-like fashion, in Logo, choosing a   particular number and seeing it do a particular job of work made numbers come alive for   the students" (p.155)

There is much to be done in researching the areas of theory and work already done, but this simple combination of ideas and our expertise with 3-D objects in L3D (i.e. EDC etc.) seems to hold promise.

 Pat Howland mind reading - make a EDC tool
 Patricia Howland in her book "Teaching Children with Autism to Mind-Read" (1999) in discussing previous attempts to improve social and communicative deficits in autism states that "the interventions that have proved most successful are those involving a high degree of structure, with at focus on the development of more appropriate social and communication skills". Basing her guide from a discussion of the 'theory of mind' deficits "which is defined as the ability to infer other peoples mental states .. and the ability to use this information." she proposed and teaches a simple set of drills to inculcate the functionality of this ability, if not the reality of those conscious states. "the authors provide practical guidelines for helping children with autism spectrum conditions to improve their understanding of beliefs, emotions, and pretence" (from the back piece of the book). Notwithstanding the very interesting implications to AI and psychological theories of consciousness, the exercises in this book are simple and eminently suitable to EDC type action/reflection space programming techniques. The next step for me is to more closely read about the techniques and how the professional world has received her ideas. She is mentioned in several bibliographies and credentialed so this could be an avenue for research and perhaps a project.

Interviews:

Olsen:
April 21, 2000   Prof. Olson, Stefan Carmien

C: I've got some questions here.

O: Okay go ahead.

C: Could you please ((refer to whether you go further than them)) or just sort of say, that's not appropriate.

O: Okay.

C: What is a cognitive disability?

O: It could have a number of different sources and different kinds of expressions. So, usually it's expressed, where it becomes noticed is where there's some impairment of academic function--a problem in reading, a problem in math, a problem in spelling--difficulty in school. It could certainly have other manifestations, there could be social problems for example. Or there could be spatial problems that might not have much reflection in school behavior. But typically disabilities, learning disabilities are referenced with respect to specific domains that kids have difficulty in, like reading or math.

C: So the definition then of a cognitive disability is skill based.

O: Yeah. Attention deficit disorder might be another one, which maybe is not specific to particular skills but could have an impact fairly broadly. In fact it is the case that most disabilities do have a fairly broad impact. It's unusual that it would be just reading or just math. Usually if there's a reading problem they're not very good in math either. And there's often an implication that the disability has biological origins but of course it doesn't have to be so. It could be environmental origins, although the definitions of learning disabilities often seem to kind of try to exclude environmental circumstances. Even though in many cases they really can't--it's often possible that the disability has some possibility of poor schooling or some kind of lack of nutrition or various other kinds of origins for the disability.

C: Discussed a lot in the papers that Gerhardt sent me--trying to be able to discriminate between genetic based and environmental based.

O: Yeah. Often in the definition for learning disabilities, the way it's set up in public law, is there's supposed to be a discrepancy between performance in a particular subject

area like math or reading and general intelligence. This is part of the public law. There's a great deal of controversy about this. Many people think that that is not appropriate--that kids with lower IQs need services just as much, in fact their origins of their disability might be the same anyway. There sometimes is a distinction between something that's fairly specific to a particular domain vs. something that's more broad-ranging and reflected in general intelligence

C: You said in one of the papers that they can interreact—that the inability to

O: A reading problem

C: A reading problem can contribute to a lack of verbal intelligence. So that not having the correct appropriate diagnostic tools--low level enough diagnostic tools to be able to decide what intelligence is--that they sort of interact at that level. I'm very interested in that particular area, there's something about it that resonates emotionally with me--in the notion of trapped intelligence. Did you read the book Cultivating Minds?

O: No.

C: It's by a woman who uh, I believe it's by a woman at MIT in the 80s who wrote about using logo--a primitive language with people with cerebral palsy and some other dysfunctions that were serious enough that they felt like they were trapped--autistics too. And she uses the phrase "trapped intelligence." And I found that very evocative.

O: Uh-huh, yeah.

C: So the next question is how does that differ from a sensory disability? Let me contextualize a little bit. In the studies that we're doing with just my masters project and also the program called the Coleman Augmented Intelligence Project which is going to be trying to look at what the L3D group can do to work in assistive technology, whether on a level of helping to integrate various parts of it or perhaps create something specific. We're examining this whole area. It seems like there is a split sort of between sensory disability and cognitive disability, and this is putting it a little bit cruder, but the way I see it is that most of adaptive technology for sensory disability involves remapping one sensory mode to another. Whereas cognitive is a little trickier. There's a fellow in our group, Jim Redman, who's blind, and he's made the point – he became blind about 7 years ago – he made the point that you can have sensory disabilities that cause you to have cognitive disabilities.

O: That's true. So that if you start out with a really auditory deficit as an infant and that's not corrected or recognized early, it can lead to more broad cognitive deficits. Christie Yoshinaga in Communication Disorders has some very interesting data that says that if the kids aren't discovered by the time they're six months to have this problem, they have longer lasting cognitive disabilities. She doesn't know completely why, but it appears that the parents may change the way they interact with the kids as a function of

knowing that, and that this somehow helps inoculate them against further cognitive deficit.

C: It's interesting. It's a reflection of that IQ things that it's interactive. Would you say then that my discrimination between sensory and cognitive disability is inappropriate?

O: Yeah, especially when you have a person who say becomes blind later in life, or becomes deaf later in life, the cognitive development has gone through a normal process and for them all of a sudden they have a sensory problem that's probably not going to affect other cognitive function, but they need a prosthetic device...

C: ...to remap it.

O: Yeah. So a blind person would need a screen reader. A deaf person would have to learn sign or have some kind of visual aids to compensate for the auditory problem.

C: So in what ways are they similar--the sensory disability and the cognitive disability?

O: Well I think that they're actually not similar. If the sensory disability occurs later I think they're really quite different. If the sensory disability occurs early it could have consequences for higher cognitive development. So an early otitis media problem, ear infections for example, could lead to a restriction of auditory input such that the whole language system is affected more broadly. If you're an elder person who's losing their hearing, a hearing aid is fine. For a person who developed without sufficient auditory discrimination, a hearing aid won't help. There's some difficulties with language that have been maybe a result of that sensory problem that fixing the sensory problem won't fix the cognitive problem later on.

C: It's like the issue of teaching children who are born deaf to speak. If they became deaf you can teach them to regain that ability. But if they were born deaf it becomes much more difficult to get that feedback.

O: Harder, yes. Although there are attempts to give them feedback visually.

C: I've seen the head, I downloaded the head. It's so clever. And turning it around, and seeing the tongue go and stuff? It's an amazing device. And so we basically already covered can a sensory disability lead to a cognitive disability. That's absolutely true, that's your developmental stage. Interestingly enough, just as an aside, what ((Gene)) Redmond told me was that he was so spatially oriented when he was a sighted engineer, when he became blind it was as if he got a cognitive disability because he could no longer use that kind of mapping. He had to teach another kind of mapping to himself. So the next one--how does an assistive technology designed for different disabilities in the two categories above differ?

O: My orientation is more towards learning, and perhaps even working on the deficit itself. So if they have a phonological deficit in reading I try to teach them phonological

skills. If a person can't read because they're blind, then you have a very different sort of need. Instead of trying to teach them to read, you provide a prosthetic device that reads for them. For a kid who's having reading problems though you still want to teach them to read because it's important in our society that they learn to read. You have devices and methodology that would help them in learning to read rather than avoiding reading. And in fact there's a bit of a conflict between people who develop prosthetic devices for what they called "dyslexics." They say, "Okay dyslexics can't read therefore we'll read to them. Our position is dyslexics can read, they're just way behind their peers. They can can learn more or less; almost in all cases they can learn enough to get by. So we object to using a screen reader as the prosthetic device. We want to use it as a teaching device. And so we advise companies that develop this methodology to try to make it more pedagogically more useful instead of just as a prosthetic device. To give you an example, there's a company named Kurtzwell which has now been bought by (( )). They have a screen reader where you can scan books in and it reads to the kids. And they've thought of it more as a prosthetic device and they're now starting to realize it probably has real good implication in learning as well and they're talking about redesigning their interface to make it more pedagogically useful rather than as just a crutch. Crutch is kind of a pejorative term here because we think that most of these kids can learn to read and they shouldn't just depend on a machine reading to them.

C: It's almost an axis here you can draw up between cognitive and sensory disability and prosthesis and retraining--there's got to be better word than "retraining"--and you can pretty much map what you want on that axis, that's interesting. And I'll tell you another little thing that's interesting, my boss had--I have a 40-hour-a-week job. I'm an MIS fellow at a hotel reservation company and my boss is mildly dyslexic. He's the president of the company. But we're a wonderful team because my mind works like a jackrabbit. He'll tell me something to do and I'll go write the code immediately. Of course it won't work. There's two kinds of people who write code. They write code that works, it takes a long time to do but it runs right the first time, and one that takes a short time to do and they iterate over it. I'm an iterator. But together we have this thing where I will bring him what I've brought to him, and because it takes him so long to read it, he must parse out every concept that I had and not gloss over anything. And he finds the problems. And I rely on him to be a slow reader to do that.   It's interesting. It's a strength.

O: How do you do a dissertation when you have the 40-hour-a-week job?

C: It's a masters program, not a Ph.D. How do I do that? Well, it's worse than that. I have a 40-hour-a-week job and I have a 12-week-old baby and a teenager and a 5-year-old. And how I do it is I have a very understanding company and I get sick and I do it slowly. I only do a class a semester. This is very exciting for me, this is wonderful. So I guess I do need to discuss this--the difference between living tools and learning tools. I see out there in my survey of what seems to be out there in terms of tools there seems to be a fair amount of learning tools that are getting increasingly more sophisticated. Some work like, yourself. But I see the living tools, by and large unless there's a simple mapping, that are not very sophisticated at all. And beyond that every year it just sort of falls off. I don't know where to go with that question. It's just an observation. We went

to the Boulder Valley School District Assistive Technology and right now I'm very interested in prosthesis as prosthesis. What is a prosthesis? which of course is not your forte, but you may have some insights. And also one tool – I really don't think it was a prosthesis as a tool called the dynomite and icons and you push icons and you create sentences out of it, logical groupings and then it would pronounce them. And the children were taking it home from class over the weekend and using it. And it really was a tool, a lens by which they could see. But I guess the idea here is you need to figure out at what point when you give them a tool are you forcing them to become cripples in a certain way for the rest of their life and at what point can they continue to grow?

O: Yeah, it's an issue with dyslexia because sometimes wealthy families particularly will hire somebody to do the reading for their kids. Well that really retards their kid's learning of reading. It's an assumption that they have a disease that they can't read but it's just not true.

C: Isn't it Bob Dylan that said, "...crippled like a rich man's child." Where do you see the biggest need in terms of tools, computational tools in this sort of field, both learning and prosthesis? Where do you see a big hole where just nobody's doing anything?

O: There's a lot being done. Of course the most basic thing the computer provides, and the programs that run on it of course, are the interaction that could not equally be afforded by an individual tutor, let's say. We have an ideal interactor that's a teacher with a child, interacting and exploration of learning and so on. Or sometimes groups of kids. Computers I think can provide that interaction, and the more sophisticated they become in terms of recognizing speech or communicating through animated faces or whatever--the broader range of possibilities they have for providing feedback on performance, monitoring performance, cleverly designed programs can do a good job of motivating kids. They can also turn out to be a sort of social interaction tool as well, and this is something that hasn't been very much explored in the field. But whenever it's possible to get kids ganged up with computers where they can communicate with each other about a particular problem, this has real benefits in terms of the social dynamics of learning. And there is some work being done on that. Vanderbilt, John Bradford and that group there, has tried to design information environments--the computer is a tool then to provide information and allow the kids to gather information, work interactively in solving a problem.

C: I'm very interested in that. We have a tool that's been developed in the LTD group called the EDC. Basically it's a tool for helping groups make decisions about things. It's been applied to urban design. You have an area here where you have the design that you're working on as a group and you're all sitting around a table. And you have an area here that reflects back what you've changed. If you change something, for example, in urban design, if you alter something that changes the pollution index, it will give you information about the pollution index of what you've done and the consequences. And one of the very neat things about it, and I'm thinking about this specifically with autistic kids, is there's a sense of tactility to it--you use legos, big duplos, to indicate certain artifacts. So you would take a green duplo which would be a house or a tree and you put

it on the table and voila, on the table there's a tree. There's an interaction between the physical and the computational representation. And I think that would be very powerful. This is John Bransford.

O: Yeah, Bransford.

C: And I'll just look him up. It's very interesting. I like the notion of kids working together and being able to build something. I'm a strong believer in the sort of, almost mystical substratum of intelligence that's down there that you can tap into. What can you tell me about autism? Do you know much about autism?

O: I don't know much about autism, just very general things. It's a really broad spectrum disorder ranging from kids in a vegetative state to ones that can be fairly functional. Like a woman up in Fort Collins.

C: The famous one

O: Yes, what is her name?

C: Templeton.

O: Yes, Templeton.

C: I just copied a section in Oliver Sachs' new book, and passed it around to people in the group. She's turning into an icon. It's very interesting. It's a little scary too. One of the things that Gerhard has mentioned is that so many parents who have autistic kids hope, and hope in their hearts that something can be done about it and there's not that much that can be done.

O: Yes, because it's such a broad spectrum disorder. She's unusually high functional. It's clear that she has a pretty unique disorder in the spectrum of autism. She's a lot more functional than most autistics will ever become.

C: I fear that many parents are looking at her and if you go out on the web and there's a lot of autistic pages that are done by parents to the point where they have a classic parent's autistic page and all of them refer to her and I feel that she's being held up as you see what we possibly could do and it's sad.

O: On the other hand for some it will probably be of benefit because it's probably the case some autistics really do have potential beyond what they would ordinarily realize and that could be a benefit to them. But in other cases parents may end up feeling guilty if their child doesn't reach that kind of goal. And it's not their fault at all, because the disorder has such a different range of severity.

C: There's a wonderful little chapter in that Cultivating Minds about a man who was brought into this group, I think it's at MIT who had cerebral palsy so bad that there was a

big wall between him and the world. And they figured out ways for him to communicate, and as they figured it out they began to discover that behind that wall was somebody who was quite smart. And he ending up getting a degree in Computer Science at Amherst or somewhere, and watching his growth through the whole thing was so inspiring--there was sort of like Steven Hawking I suppose.   Have you heard about Patricia Howland?

O: I haven't.

C: There's a book that, she's a teaching doctor at the St. George Hospital in London, which I suppose is very reputable. And she's written a book called Teaching Autistic Children to Mindread. What she proposes is that one of the things that's missing in autistic children according to the theory of mind is that they're missing that facility and you can actually teach them to mimic that facility enough so that they can get by. And I find this fascinating because it's the flip side of the ((eye)) put back on the kids. I'm going to get in touch with her and ask her but I'm looking to see if anybody's heard of her. Do you have any insights into Down Syndrome?

O: No, I don't.

C: And of course dyslexia. You are Mr. Dyslexia.

O: OK.

C: So many things lead back to you. Do you have any recommendations for the book for us propeller heads to read so that we have a good generalized idea of what dyslexia is all about?

O: Uh, the book. There's a book that's out of press, unfortunately. Let me try to think of ((others)). I'll have to think about your question more broadly here. There are personal books, like Reversals, Eileen Simpson—which is a biography, a description of her struggles with dyslexia, and that's one way of getting at it. It's usually an idiosyncratic view of what dyslexia is in terms of how it affected that particular person. There's lots of books that are collected readings that have various chapters in them, some of them you see sitting here, like Dyslexia: Advances, Theory and Practice, Converging Methods for Understanding Reading and Dyslexia. For gaining reading difficulty in young children there's a broader book that probably would be about reading problems more from a social angle, social educational angle. The usual view of dyslexia is that it's something that exists in spite of reasonable teaching and of course the problem of literacy in this country goes much more beyond that. Since we have so many poor schools in poor literacy environments it's arguable, I would say it's almost certain, that the biggest contributor to literacy problems in this country is poor environment, poor education, poor nutrition and so on. But in any good environment like Boulder you've got tremendous variance amongst kids in terms of how easily and quickly they learn to read and there're some that are distinctly way behind in spite of a reasonably good school system and supportive family and so on. That's what we typically refer to as a learning disability--a problem learning something in spite of reasonably good environmental input. This book right here

has come out in subsequent, this is a 1988 New York Press, <u>Dyslexia Theory and Practice of Remedial Instruction</u>. There's a new edition by Uhry and Clark and I don't seem to have that new edition here in my office, it seems to have taken a walk, but that's a pretty good book.

C: Second author?

O: There's an additional author. Second author is Joanna Uhry. I think that's the one I'd recommend.

C: That's good. As I said I want to build up a …

O: And then as I said there's a lot of collected chapter books on dyslexia and they each have their own kind of different perspective, things that they emphasize, and really there's nothing here.

C: Well this is a good place to start.

O: Yeah, OK, that's what I'd recommend.

C: Cerebral palsy, any insights into that?

O: No, and there's another very broad spectrum. Cerebral palsy can affect people in very different ways.

C: Actually, just by saying that (( )) that's interesting to me because I do see cerebral palsy pop under lists of cognitive defects. My own understanding of cerebral palsy is that basically it's a motor issue.

O: I'm not an expert in diagnosing cerebral palsy, but I think that cerebral palsy often is due to anoxia at birth. So you have brain damage associated with oxygen starvation, and that can affect the brain in many different ways. And that's often where cerebral palsy comes from, that's its origin. It's not so much a genetic disorder.

C: It's an environmental disorder.

O: And one that's hard to fix from teaching. Such kids are going to need a whole lot more support to get wherever they're going to go.

C: And it's often clustered with others because of that.

O: Yeah, now sometimes it could be relatively confined to the motor area. They may be relatively cognitively normal or even above normal, outside that.   But I suspect that it probably varies a lot in its manifestation.

C: A lot of things like autism and a couple of other things are, it feels very much like a diagnosis of schizophrenia--it's really a big bag.

O: Yeah, a big range of severity and manifestation of the disorder. Classifications are a real major problem in mental health as well as learning disabilities.

C: Now that we've got tools like cat scans it's going to get a little bit better.

O: Maybe. People hold that hope out. I hope that it works that way.

C: It's a, I guess what we're taught is that it's a computational, combinational explosion. A factorial kind of deal where there's so many different inputs.

O: I could tell you that so far FMRI has not made I think major breakthroughs in dealing with dyslexia. There's a tremendous amount of attention to it and effort expended in that direction, but I haven't seen much that's very good come out at this point.

C: Sometimes you have to keep chipping at the rock with a little hammer.

O: That's right.

C: So, in talking with me, you have some idea what I'm looking for, what I'm trying to do, do you have any advice for me in doing this?

O: In terms of picking, you've got to pick a very specific project that's useful for a master's thesis so you have to limit your scope.

C: Small and focused.

O: Well you're aware of some of the technology that's already going on around here. You mentioned the faces for example. You might try to latch onto something like that, work with it. You'd probably have to collaborate with Ron Cole.

C: He came and talked to my user interface design class.

O: So, you might want to talk with him--pursue something in that direction. I'd recommend you do that rather than try to come up with something new and different.

C: What I'm thinking what I want to do at a masters level is get my toes wet doing something. There's no way that I'm going to make a big splash in the water. I'm not going to solve any problems. But I may get some better idea of what the problem is. So talk to Ron Cole. Actually he might be useful to talk to about these issues anyway.

O: Mm hm.

C: Well that's great. That was wonderful. (( )) When I do do that I'll go ahead and send you... so you can see it.

O: Right.

C: Thank you for your time.

O: You're welcome.

Yoshinaga Itago
An interview with Professor Yoshinaga-Itano, on the 26th of April.

C: So what I'm doing, to sort of contextualize this, is I'm going to be doing a project for my Master's degree, rather than do the essay or whatever it is they do, and what I intend to do is a nontrivial but very small piece of software that will be a, at this point I'm intending it to be a cognitive prosthesis, for people who have developmental or cognitive disabilities. So what I'm trying to do is collect information about this sort of thing.

Y: By cognitive prosthesis what do you mean?

C: Well that's an interesting one. The closest 2 things that I can come to now, and I may change my aim as I come along, you know as you learn more about the domain, the closest thing I can come to now in terms of a cognitive prosthesis is 2 things that I've seen, at the Boulder High School district, their assistive technology group did a demo for us working with Gerhard and Coleman on project, and they had a device, it was like a little teeny computer

Y: Right, we have them here.

C: It was called a dyno-mite, and the thing that really nailed it for me is that it was not something that was just learned to, just used to develop yourself as a learning process to be able to train yourself so that you can do this but it was actually something like glasses

Y: To communicate.

C: It was a communicating device. So I see, that to me is very appealing. And it may be that I change my focus, but right now, and then the other thing I've seen is a project called Visions, it's a for-profit thing that they showed us a video about it at the Boulder High School district, and somebody's installed in a townhome, this ((fellow)) had a daughter with Down syndrome or something that was affecting her like Down syndrome, very low IQ, very small vocabulary, very limited ability to be able to do things like count or such, but using this device, which is basically a bunch of speakers in the building with touch screens coordinating with a computer, she was able to almost completely live on her own. She was able to get up, to get dressed, she was being cued to do certain things, so when I say prosthesis, I mean it's at least the way Gerhard originally presented this to me, it's like glasses, you know it's what you put on to get you closer to the way everybody else normally is.

Y: I think that actually probably is not a good analogy, glasses. But it gets into this first question of what is a cognitive disability. When you're talking about this one individual who is able to use the computer to live independently, my guess is that your assessment of the cognitive disability is not, that the person is not as cognitively impaired, if with the use of a system technology, the level of functioning rises to a much higher level. So, cognitive disability really has to do with, I mean some people would call it intellectual

disability, or mental disability, it has to do with the way that we define whatever intellect is, and potential is, and typically when we say that a person is cognitively disabled, we mean that they're some standard deviation apart from the normal distribution. And it really depends on the definition, in some cases we're using 2 standard deviations from the mean, it depends on the assessment that we use. We typically assess with both verbal and nonverbal assessment tools. It is possible to have a cognitive disability that is just in one modality, but not in another, like to have a visual cognitive processing problem but not have it in auditory, but most of the time when people talk about cognitive disability, they're talking about individuals who actually have more of a what we call a flat profile, that their ability level no matter what modality

C: Are depressed on every

Y: Are depressed on everything. The exceptions of course would be the individuals like what we call the savants, those are the people they've done movies about where

C: Yeah, I'm thinking about Templeton?

Y: No, she's autistic, that's a different thing. A savant is someone whose intellectual capacity is depressed in all areas except for one unusual ability.

C: Like the Indian mathematician savants, or

Y: Or the people who, you give them a birthday they tell you what day of the year or something, not necessarily a useful skill, just something that's beyond the ability of most people. But, functionally speaking, socially speaking, everything else, is depressed. So a cognitive disability, while it's not totally a flat profile, is an ability profile that is significantly different from the normal distribution. Then you have on here how does it differ from a sensory disability, sensory disability is very strictly defined, and that has to do with in most cases it would either be in the area of blindness or in the area of deafness. So individuals who, their sense for hearing and their sense for vision are not normal. And so they have varying degrees of visual acuity, varying degrees of auditory acuity, it can be solely in audition, solely in vision, or it can be like in deaf-blind individuals, where it's partially in vision and partially in audition. Now, frequently, not frequently, but you can have a combination of a child who has a sensory disability, a visual or auditory problem who in addition has a cognitive disability, meaning that the abilities that are not affected by the sensory deficits, so in other words, if you were looking at deafness, you would measure cognitive ability by their visual functioning, and their social functioning, and if those abilities were within the normal limits, you would assume that the individual had normal cognitive ability. On the other hand, there are many many disabilities that cause other things, not disabilities, there are etiologies

C: Could you explain that please?

Y: Causes. Viruses, high fevers, diseases, things like that that can cause a sensory disability but the can also attack the brain, and they can also cause a neurological and cognitive disability.

C: Like lack of oxygen at birth?

Y: Low prematurely, lack of oxygen at birth, it can just attack the auditory or visual system, but it can also attack the neurological system, and in those cases we could have a child with multiple disabilities, both sensory and cognitive. If you look at deafness for example, 40% of all the children who are deaf or hard of hearing have a secondary disability. That disability is not always cognitive, sometimes it's a motoric disability.

C: Motoric, motor.

Y: Motor, or vision, or balance. But there are 10% of our population in which it is a cognitive disability, so the actual potential of the child is depressed.

C: Now in that article I read in the Camera about the work that you've done recently, if you identify hearing disabilities at a very young age, then you can, it almost seemed like you can help them grow the pathways so that they can

Y: Yes. Well, that's the hypothesis. The only thing we know is that if we identify them early, that those children, at least in the early years of language development, they're delayed, but they're not so delayed that we would ever even qualify them for special ed functioning, they're still within the normal distribution, they're within a functioning level of

C: But they're shadowed.

Y: Yeah, they don't have the same distribution as the total normal distribution, but what's remarkable about that for a deaf and hard of hearing children is that the historical population functioned at 50% of their chronological age, and they did that for their entire educational program, no matter what, the average child.

C: Just a little segue about that article, I just had a baby on the 24th of December, and we got out of there real fast, because we wanted to go home and stuff, and we didn't do the auditory test, and so when Gerhard suggested you and handed me the article, I read the article and said, OK we gotta go get this checked out.

Y: Yeah, it's a good thing to get checked out because it's a very quick, easy test to do. And most of the time we catch the baby, but you know in your case you left early, the same thing happened with my second born although we weren't doing screening at the time, you know I went in in the evening, went out in the morning, and there was no time for them to screen. So basically what we're finding with that population is access to language at early age affects cognitive disabilities.

C: That's a cognitive disability sort of.

Y: Yes, but the difference is that the deaf and hard of hearing child has the potential for normal or above normal cognitive ability, the ability of our intervention to optimize that so they can actually do that is limited apparently by something that occurs in the first year of life, because we haven't been able to overcome it, and with the intervention that we use, it's much more effective if we get them early, so the only thing, the only inference that we can then make is that there's something that happens during that time that somehow, and yes, I would say that it's cognitive.

C: But when you, the way that you're defining cognitive disability, I guess you know I was looking for the miracle thing, the very cool thing that you can do, and so the classic cool thing was, there's a book by, I can't remember her name, it was a professor at MIT, it was a book called Cultivating Minds, and you've heard of the book? And she talks about his one person who had cerebral palsy, I think it's cerebral palsy, so bad that he himself later referred to it as trapped intelligence, and he was in there but he wasn't able to get out there, and so the one, you envision yourself as being able to write something that's going to release the trapped intelligence, and that's kind of

Y: Now that I would not call a cognitive disability, necessarily, because it's only the, only our ability to measure it and the body that prevents us from being able to measure the actual

C: So if we had really good instruments we would have been able to figure out what was going on.

Y: Yeah, on the other hand there are individuals trapped in bodies like that that no matter what we do, with instrumentation, they do not have the intellectual capacity.

C: That do not have the water in the cup.

Y: That's right. It's not just that the motor prevents them. They don't have whatever neurology or genetics that is required to be able to function at functional levels, even with the assistance. So I think actually what you're talking about is not really a cognitive disability, what you're interested in is people of any type of disability for whom instrumentation can assist that individual in optimizing whatever intellectual capacity that they have.

C: Yeah, I think that's sort of it, but I mean it sort of bifurcates. One is that the trapped intelligence thing, but the other is seeing this video and knowing that there are people that with a little bit of help in the right kind of way could function at a much higher level, not at a normal level, but at a much higher level, and it's ultimately more satisfying for them as human beings.

Y: A good example is the physicist Stephen Hawking, where he obviously his body doesn't work at all, but his mind's OK, and there are kids that are born like that, and the

question is, he fortunately had his motoric functions through most of his life and then lost it, that's a very different thing of being born that way.

C: But he is not cognitively disabled.

Y: No, he is not cognitively disabled.

C: He's, I guess you might say it's not really even a sensory disorder, his motor, motory is that a word?

Y: Well he's motorically impaired, or disabled, whatever. But the kinds of assistive technology you're talking about we actually have, and I know that the Boulder Valley Public Schools showed you some of them, we have those, we also have a library here and we have clients who come in from infancy all the way through the school-age period. There are different levels of assistive technology and the levels of assisted technology have to do with the cognitive, not only, well it's predominantly the cognitive potential of the person, the more intellect they have, the more sophisticated a system they can use. The more, even if they can point, or push something, or use, I mean even if they couldn't if they could just use their, we've actually had people who use gaze, or blink, in order to operate equipment, because fortunately technology is at a level where you can use that.

C: I had a friend who had a remarkable experience, and I want to interview him about it, at the age of, he must have been 40, he was struck down with something I can't remember what it was, but he went from basically like this to worse than a quad, and basically he spent about a year with his wife, doing the you know you scan till you get to the thing and then they

Y: Right

C: And now he's back functioning again, so he's walking around and so he must have all kinds of insights into the, you know how that thing works.

Y: but most of the devices require some sort of a keyboard, and obviously we're limited by how much can go on a pad, and how many, you know even if you had unlimited space, the individual doesn't have the space, so we're limited by a certain amount of space, so that limits us to the number of different combinations of strokes that the individual can use. So basically what people have designed at the highest levels of the assisted technology is almost a new language system.

C: That's like the dynomite, or like the thing that Hawking uses that he's able to build up

Y: Right, you can build up because what you have to do is compact and layer concepts and phrases and ideas so that with a certain number of things that you can memorize, you can easily begin to articulate speech, basically this is, the device talks for you.

C: It's a liberator, isn't it, one of them?

Y: One of them is a liberator, there's a ((min-speak)) device, but basically what you're doing is creating a new language system, and I guess just in the same way that we have certain limitations to the articulators, for the phonemes of the English language, there are some limitations on the, even if they have no problems with hand-motor coordination, there's only so many that they can do and keep in their cog – I mean even a normal functioning person, or a gifted person can only keep so many of those stored. But my guess is that they are actually using these movements and patterns of movements in much the same way that we unconsciously use our articulators, and so while we might teach it analytically to begin with, "push this one and this one," the way the child actually learns it is "this this says hi" yeah, "Hi how are you," and that is hi how are you for them, and the fact that it comes out differently in the computer, but that is their language for that particular function.

C: That's what I found so interesting about the dynomite. In fact the fact that these kids were taking it home on the weekend. That made me go "Oh OK this is something that…"

Y: They can't communicate with people without it. It is their, they can joke with it, they can, they can articulate their needs.

C: Now would you say that that kind of thing is a cognitive prosthesis?

Y: No, I would never call them a cognitive prosthesis. I would say that it's a communicative prosthesis. It is a vehicle by which people who are limited by their bodies can communicate their ideas to other people.

C: I want to not get stuck in here's the sentence of what I am, because what I'm trying to do now is learn, and not have a fixed mind about what's needed.

Y: Now, ((Tracy Kobach)) who teaches our augmentative, we have a class actually in summer that we teach to our masters students and combined with the class is also a camp in which the students go out and use the devices.

C: What's the name?

Y: Tracy Kobach. She's the coordinator of services at Children's Hospital. Actually I could give you her phone number because I think she's probably the most knowledgeable person on our faculty. 303, 861, 6024. she teaches this masters level class and then the students go up to I don't know if it's Aspen or where it is but they go up for a week and they spend the entire week up there just using the devices with kids who are motorically involved. And their cognitive levels are everything from very very low functioning to very very high functioning.

C: So this would be somebody who'd be a real asset to talk to her.

Y: Yeah, because I think you really need to see not only what the devices are but you need to see how kids use them, in their, how they use them to learn and how they use them to communicate.

C: Well, even from a sophomore design viewpoint, the first thing that you do is you go in you look and see what somebody does.

Y: Right, so but it the technology, there's no question that the technology has opened up opportunities and doors for these individuals that really had minds locked in bodies that were unable to allow them to function in society. It is incredible and remarkable because I think people would have guessed before that these individuals had no cognitive functioning and that's not true. And it's only through the technology that we now know how much they think and how much they have in their heads.

C: Can we back up a little bit, so I can get this, I'm getting a lot of very useful practical stuff, but I want to sort of ask ((droll ??)) into your theory. So it is a useful thing to discriminate between cognitive disabilities and sensory disabilities, but I also might think about a category called motoric disabilities.

Y: Actually I think what you're talking about is really more related to motoric than sensory disabilities. Individuals who are paralyzed, cerebral palsy, actually the toughest motor group is individuals who, and autism is a good example of this, where the neurological damage is such that their motor systems are actually in and of themselves intact, but what they can't do is send a message from their brain to their motor systems, to do what it is they wanted to do when they wanted to do that. And it can be so gross that even that standing up, they know they want to stand up, they can sometimes even tell you they want to stand up,

C: Well this is sort of Oliver Sacks world.

Y: It's called apraxia and it's a programming disorder, in which their brain can't program the instructions to get to their body. Which is very different from something like cerebral palsy, in which their brain does fine with the message to their motor system, but the motor system is incapable of doing it, so it can be, and there are different types of cerebral palsy, they can be spastic, where their whole motor system tenses up and then they're just not able to move, it can be flaccid, where they're just so loose that they can't get their motor system to do it. They can be ataxic, where they just don't have any control at all and they're flopping. There are varying degrees of cerebral palsy. Now autism, there are lots of controversies about what autism is, but some people have actually described it as a global apraxia. That's a global problem in which the individual is incapable of programming motor movements. So it can be gross motor movement, it can be fine motor movement, it can be speech motor movement. Those individuals can have a very hard time using the technology because they know what it is they want to do they can't get it to do it.

C: Now that's severely autistic individuals. But you could also have Asperger's, which is not so much the motorically disabled, but there is

Y: It's more social/pragmatic.

C: Right, I read a book by Patricia Howland, do you know her, she's a doctor at St. George Medical Hospital in London, she's written a book which I find fascinating, called How to Teach Autistic Children to Mind Read, and her hypothesis is, and it seems weird, and when she says mind read, she's talking about theory of mind and talking about, what she's saying is that high-functioning autistic kids can't take the perspective, so what she does is she's come up with a series of exercises that teach the children to act as if they saw the thing, even if they don't see or feel the thing. And I found that very interesting, I don't know.

Y: Yeah, see that's I think that's not in the realm of the thing you're looking at, because that really is a cognitive kind of a, I guess you can call it a disability or a cognitive delay. People like Temple Grandon, for instance, who's a very high functioning autistic, she has no problems with motoric functioning, in fact you ought to see her drawing, she's just phenomenal, and she has no problem speaking, I've heard her speak, I've seen her draw, she writes books

C: I read a chapter in Oliver Sacks' book about her.

Y: Yeah she is but, the children that we see, the reason they come in is that they're not talking, there's something very unusual about their motor function.

C: The classic autistic stuff, the repetitive stuff, the banging the head against the wall image that everybody has, that kid of stuff.

Y: Right. Now I would say the kind of technology that you're talking about is most commonly used with individuals with cerebral palsy, or individuals who have some real motor delays or disorders, and have also cognitive problems, but they're not so severe that they can't function, in other words Down syndrome children. They're mostly, in most cases but not in all, their mental capacities are lower than normal public.

C: Uh-huh, are you talking, I don't know much about IQ scales, but like 85, 80, 75.

Y: Well some of them, Down's can range from normal all the way to almost nonmeasureable. So typically kids, I mean there is a range of functioning in which kids can learn to communicate, and there's a range of functioning in which they can learn to read. Now, the Down syndrome children that are on the low range of that spectrum can be very much helped by assisted technology.

C: A sense that I had about this one system, the vision system, was that the man who designed it designed it for his daughter originally and that his daughter was right at that edge, where if she actually had somebody sitting next to her at all times going "look at

that, thing about this," she'd be fine so all he did was go "Oh, somebody doing that all the time, well I can make a computer do that." But it's finding that cusp where it's not the functioning that, the function is not so depressed that there's not much you can do to pull it up and it's not so elevated that this thing in particular wouldn't help, it would be more like a toy.

Y: Right. There is also a whole group of children who have nothing wrong with their mind but their oral motor system doesn't work. They can't get their speech articulators to function so that they can articulate clearly enough so that anybody can understand them. And those children, I suppose in past societies they would have been mute children, but assisted technology can be of great assistance for them.

C: Sort of the liberator kind of dynomite kind of stuff.

Y: That's right. Now in the area of something like dyslexia, those individuals, I mean that's a different type of device that would help them. Dyslexic people are talking people, they have no problem with understanding, typically they're OK at understanding regular conversational speech and learning from the conversations that people have, their problem is they can't translate visual symbols into, from reading, into meaningful systems.

C: I had an interview with Richard Olson about this and the sense that I came out with is that if I make a little diagram like this that has, and at the time I wasn't thinking about motor, and I have sensory, and I have cognitive, and I have living or say prosthesis, or learning or adaptive or training, the place for dyslexic is in adaptive, in training people how to do it. There's really not too much point in creating something, and he was saying that some wealthy people have a very dyslexic child and they bought something that would read to him and all that ended up doing was creating a child that can't read.

Y: making him more disabled. And with dyslexic children we can teach them how to read, unless they're incredibly severe in terms of their neurology. I think that some people who are dyslexic will never learn to write fluently and their speaking is probably better, and in that case those things like the spoken language understanding center are doing where computers that you can talk to and they'll just print out what you have to say probably will be an asset to them.

C: I have a basic disability that's sort of a learned thing. I basically can't read my own handwriting. And it's a result of ((too many?? 20)) years with computers and bad handwriting in the first place, and I just bought one of these little portable scanners and it opened up worlds for me. I can go the libraries now and come back without having the books and I can scan the thing into it and it holds it in memory and I can dump it into there and it's very interesting how even for somebody that seems to be doing OK

Y: Oh yeah, technology is pretty amazing. So I think there are a lot of things that can be done for a lot of different types of individuals. The kinds of prosthetic devices that we use in my area are hearing aids. Devices that help individuals hear better, optimize the

residual hearing that they have left, make it able for them to listen and understand in noisy situations.

C: The talking head, you know.

Y: That's more of a different thing.

C: That's more something for teaching people who are deaf from birth how to talk and articulate so you can see the tongue from the inside and that's not a prosthesis, that's an adaptive device, a device to help you learn how to do stuff. Is this a reasonable sort of taxonomy to talk about tools for learning to talk

Y: I think so. Actually I think that's a really good way to, the hearing aid is a tool for living, it gives you access to sound in the environment if you have the potential to be able to use amplified sound. The computer is something different. It's a tool for writing and things like that unless it does what these assistive technology devices do. But it sounds like what you're most interested in in the assistive technology for individuals with motoric disabilities.

C: I think so.

Y: And there are some populations of kids, in fact I just did a workshop, well a couple of years ago, with a manufacturer who was, you know the engineers were fascinated with what do you do with the kid who can't point and push? And they have eyeblinks and they have

C: Sip and puff

Y: Yeah, I mean they're totally locked in their bodies and about all they have is their breath and their eyeblink and can you somehow come up with some sort of a device that will access the keyboard in the way that hands do, and I mean it's a fascinating problem.

C: It's interesting stuff and it's sort of we are all sort of looking for the big emotional bang for the buck and this is, if you want to do good, this is a big bang for the buck because you're letting somebody out, you know. And you say that there's lots of places where it's not happening, there's lots of niches and…

Y: I think there's lots of niches, I think that obviously the companies that have manufactured the devices that they have have found some people who are interested enough to do something but I think none of them would say that they've solved the problem. And there are a lot of different theories about how to program the systems, and which program will actually work the best for kids who have the ability to use them.

C: Well there's an interesting larger sort of issue in the Cultivating Minds book, and they're talking about how autistic kids were responding so well to the physicality of the turtle, and the difference between the turtle on the screen, in ((Logo)) and the actual turtle

that rolls around and lowers the thing and how they could actually, they were identifying with it so much that they were pointing to themselves and pointing to the turtle and having some sense of cause and effect in ways that they had not clearly seen before. And that's another interesting sort of avenue about, and that's something that Gerhard has worked on, making physical things, computationally enhancing physical things.

Y: Well, I mean when your body can't move but you can move something else, somehow manipulate it in space, it's got to be an incredibly satisfying and an incredible accomplishment for these kids that are trapped in their bodies.

C: The science fiction vision I've always had, I've been thinking about this for years, you know somebody was really trapped in their body with all the muscles remapped and they put on a skeleton and they turn into a superhero and the world is theirs again. That probably won't happen for a very long time, but you never know.

Y: Right, you never know about those things, and I do think that that motoric, the limitation, I really think that's what it sounds like you're most interested in. That's why if you go see Tracy, even if you have an opportunity this summer to visit in the camp, I think you would see some things that you might not get because these kids live there, and you have to be with a family all day to see, they do things differently in a 24 hour kind of a basis than they might even in the school.

C: It's contextualized in an intimate sort of way. Do you have anything that you would suggest that it would be useful for me to look, to read, any other people?

Y: You know I think Tracy, since this is not my particular area, she would probably be the best person. We have one of our faculty members here supervises therapy with the assistive technology and her name is Lynea Pearson, and she has a child with Down syndrome who actually uses the … OK what was the first one you talked about seeing?

C: Oh the dynomite?

Y: I think she has got a dynomite.

C: Yeah I'm real interested in that. It's a it compresses things in an interesting way. It's particularly applicable, it's particularly sort of, there's something that you can do if you get very smart and you figure out how to apply certain kinds of theory to it, you could do things. So Lynea Pearson is a supervisor here

Y: And she's also the mother of a child with Down syndrome who uses that device.

C: That's great, that's really useful.

Y: [looking for phone number]

C: I can look it up in 411

Y: Yeah and if you actually call … oh here's the number. 492 3038, and leave a message for her.

C: That would be good, all right. Thank you very much. I'm going to use this for my own purposes but would it be all right with you if we typed this thing up and lightly edited it and put it on the ((Coleman)) website? The Coleman augmented intelligence project website?

Y: There's an augmented intelligence website?

C: Uh-huh, it's right here. It's the project, did you meet the Colemans when they were here recently?

Y: Yes.

C: so we saw them right after they saw you, there's a page right there and Gerhard's group was, people that are interested are forming around this and we have a little mission statement, and doing research and this is part of my Masters project but also part of this thing, would that be OK with you?

Y: Sure I think so. I mean you know when you're talking like this it's hard to know whether you've articulated it correctly.

C: Well it's been very very helpful. I'll tell you what, I have notes on the back of this but let me write down the website here. Check it out, it's interesting, it shows what were doing and some of the project ideas we have. This has been really really really good.

25th of May, year 2000. Mr. Baseman wrote Visions software
(Interview with Bill Baseman.)

C: Well basically, when I graduated with an undergraduate degree about 8 years ago, had my midlife crisis, got a degree in computer programming, what I originally wanted to do was write software for the handicapped, and I looked all over the place and there just wasn't any place that would hire me, that wouldn't require moving to Boston or California. So I gave up on that and did something else. Many years later my company, as one of the benefits, they sent me back to grad school, and my mentor, my advisor is a guy named Gerhard Fischer, and he was contacted by a fellow named Bill Coleman, who is one of the founders of Sun, and Bill Coleman wants to leave his footprints on the sands of time, and he started up something called the Coleman Family Foundation, which sponsors the Coleman Augmented Intelligence Project. The intent of the project is for Gerhard's group, which is a user interface, artificial intelligence group, with Ph.D. students and a couple of research assistants, to use what he has done, the tools and the approaches that he has done, develop both theory and practical models of tools that could help people who have cognitive disabilities. So when Gerhard said I've been asked to start this thing, do you want in, I got very excited. And how we ended up getting to you was, on the board of directors, actually assistant director of the L3D group, Gerhard's group, is a guy named, I can't remember, head of the cognitive psychology department, his daughter is an adaptive technology specialist in the Boulder Valley School district. We had lunch with them, they did a demonstration in their lab and we had actually dinner with them, and they said "we have enough time, let's look at this video." And I looked at the video and I went "Whoa. This is amazing, this really works, this is so cool, this is so simple." So much of what I've seen so far were tools for learning, so much of what I've been exposed to so far were academic ideas about how things work, I had really not seen anything that was, and the way Gerhard originally approached it, he said in the same sense that many of us need glasses to function normally – I couldn't have driven here without glasses; if I tried to do so it would have been dangerous – that we want to investigate tools that allow people of different ability to function in a more, I don't know if normal is the right word, but

B: Independent.

C: Independent fashion. So I saw this and went "Whoa, this is amazing." And I contacted you and you suggested I take the tour, and I took the tour and the guy BJ who was the coordinator in some sense of the group there couldn't speak more highly of the system. It's a great system. And he showed us the system and he showed up people using it. And it was like "This is so simple. And it really really really works." It's not somebody's idea of what ought to work according to my theory, and it's nothing that's outrageously expensive, you're not surrounding yourself with so many layers of technology that requires a lot of maintenance. So that led me to call you. Could you give

me sort of a short version, or the medium version if you want, of how you ended up doing what you did?

B: We had a daughter that has developmental disabilities, and my wife Nancy and I were both professionally involved with people with developmental disabilities, people with disabilities. I was a lawyer practicing in special education law, and she was executive director for the arc of Arapahoe and Douglas counties. So we were both professionally involved and personally involved with our daughter. Our dream was to have her out working, living as independently as possible. She doesn't read or write, she has no math or money skills, she has no concept of time. If we said we're going to go to the ball game on Saturday and it's Tuesday, why every 5 minutes she is asking if it's time to go, and a vocabulary of about 40 to 50 words that you would understand, that an unfamiliar person would understand. So our dream when we saw all the skills, even though she's got a lot of limitations, when we saw all the skills that she had in terms of following direction and so on and so forth, we thought first of all a voice prompting system is what came to mind, that we were trying to develop a computerized system where she could get voice prompts that would come on at different times of the day and days of the week.

C: Had you seen other systems like this?

B: There is no other system like this.

C: No I mean when you first said "Oh voice prompting." In the context of seeing other things that didn't work?

B: Prompting is an art that you learn when your daughter goes through 18 years of special education. And so prompting is what, when she would be prompted to do something from a verbal standpoint, she had a lot of skills in terms of carrying that prompt out. The problems that she had were that she didn't like people in her face telling her what to do, so this would create power struggles and so on so forth, and we wanted to eliminate the human being from that because …

C: That's so great, it works so well in the demo that you showed us. That was a real point that he made, he said that these, now you have someone who's authoritative sounding but not someone they would know, so that they can feel like they have no existing relationship with. And it could be a friendly sort of voice, but it's an abstract sort of thing.

B: We've found that it doesn't make any different whose voice it is. We originally, our daughter's system has her mother's voice, and I think sometimes she does recognize that. But I think in many cases of the systems that we've put in, the individual that uses it doesn't recognize the voices. So we started out and we developed that, got involved with an audio-video installer/dealer in town, and they thought they could do it, and find the stuff that we needed for it, and did, some stuff we're no longer using but was satisfactory at the time, and we put in the voice prompting system in our home before she moved out. After she had had some training at our home, I mean she responded immediately to it, and it really changed our relationship with her. We were no better than a, any kind of

director person, or special education aide or whoever was telling her what to do, we were telling her what to do too. And now we were no longer doing that and so the relationships between father and daughter and mother and daughter really changed, we became more friends and so on. So we decided that that was going to be a real satisfactory method for her to move into her own place, and in February of 96 she moved into her own townhome with that system. While we were moving that system over and embellishing on it and so on so forth, I saw a touch screen, which I had never seen before, a touch screen monitor. One of the problems we had always had, Stacy again follows directions well, and is good in terms of matching things, she could cook a meal in the microwave or on the stove, but it would have to be, go get the can of beans and so on and so forth. We tried a series of picture books for recipes, and they didn't work because she would turn 3 or 4 pages at a time and miss the steps. And I saw this touch screen and discussed how it worked and so on and so forth and determined that yeah you put pictures on there and touch the picture and another picture would appear and I basically determined that you can't skip pages, doing that. And that's how we started developing what we call our picture prompting system. We developed meals that you cook off of a touch screen, recipes, and then after we developed that, we were thinking well there's really no end to what we can do in terms of supporting an individual with this on a particular task or activity.

C: Did you have the shopping module …

B: Shopping, and buying cards, and domestic work, and going to a restaurant, and then from that we developed what we call our communications collection which are a variety of books and cards and

C: That was very clever, in that collection we were demonstrated the weekly menu planning and weekly shopping part, and the picture of the meal with the ingredients behind it, color-coded so you could put them back together, and that transferring over to physically doing the inventory, matching the picture with the inventorying the kitchen and then making piles and then from that pile you have a shopping list, works so well.

B: It's simple.

C: Well the thing is I mean it's interesting, because in our situation you know hanging around, I'm a graduate student and people I hang around with are Ph.D. students, and we're using all this multisyllabic language to describe the concretization of, undercutting the ((??)) of affection, but it's just very simple.

B: And that's the reason we use photographs, we realize there's no generalization necessary, an dour daughter grew up with the so-called Pic-Syms, which are the little graphic drawings of everything, and she'd been in a situation where she was trained, she could identify it, but once she got out into the real world those were kind of meaningless graphics for her.

C: The pic sym was some sort of

B: It's just a little graphic drawing, you know where you've got a drawing of a stop sign, you've got a drawing of a

C: And those were standardized somehow?

B: In school. Oh my God that's all they use in schools, they call it pic syms.

C: For the developmental disability.

B: To teach and train. You've got a little picture of a bathroom, a graphic now, a drawing, not an actual photograph a picture of it.

C: Just abstracted, right.

B: And from that little pic sym, a person with cognitive limitations is supposed to be able to transfer that over to the real bathroom.

C: And that's hard to do.

B: Absolutely, for a great majority.

C: So you specify the thing, you make it concrete.

B: Right, that's what the photograph does.

C: So, that's as far as we want the training, I imagine it's something similar to say card shopping or whatever else, when you walk through and you specify, now you're going to have to have this, you're going to have to have that, and in the demo they had before you even got to the store there was one of the 2 fellows that were living there tended to hoard on his recyclables, so there was a special picture there saying don't forget to take your recyclables, and they just showed them calling, you know they're going and stuff like that.

B: Why don't I give you an example of the card store, because that's one of our favorites, is the card store. Here's the video that you requested.

C: Oh thank you, that's great. There's a… just to finish this with, if we wanted to buy this, for research purposes

B: Buy?

C: To buy the system, the most basic, simple version of the system, what would be the price?

B: Well it would depend on what you're talking about.

C: Well, there was some talk about, we're building a new engineering building, and there's going to be in the new engineering building something called the Coleman Assisted Technology Lab, which we envision part of which as being a series of the tools which we've discovered and done that will be a demonstration area. And at one point in discussing this, Gerhard Fisher, who's sort of the head of the project, said "Perhaps we want to buy this system, and install a small version of the system there so the people

could see here's one way of doing this thing." What's the price range for something like that.

B: It would depend on, we're coming out with a new product which has some generic aspects to it, simply because we have learned through experience that many of the individuals that we put systems in for require the same categories, so that you're looking at grocery shopping and meal preparation and so on

C: Right so they don't have to start from scratch every time.

B: Right, and so we're coming out with new products probably in July that will allow a person to say OK, let's say it's a banking category, they would send us, they would go through a series of checklists, a series of prompts, and check the ones that the individual needs and we will input that along with the initial picture of the bank, that person's bank as the first picture prompt. That we could just develop a program for you, probably in the neighborhood of, again it depends on the categories you choose, if you choose meals it's more expensive than if you just choose a single category like banking for example. But three or four thousand dollars, something like that. That's without equipment now.

C: We would provide a PC, and a touchscreen, and since it would be like in a lab it wouldn't need the sophisticated switching, audio switch

B: Computers would be fine for your purposes.

C: That's good to know. So you were going to show me cards

B: Oh card store. Well the idea behind card store is because, I don't know what your background is in terms of people with cognitive limitations

C: you can assume zero.

B: OK, people with disabilities, particularly those who have significant communication problems, become more and more isolated from family and friends when they, particularly when they move out on their own because they don't have any communication skills to keep relationships going. I mean if I write you a letter for example, and you don't write me back and I write you again and you don't write me back, pretty soon I quit writing you and pretty soon we forget about each other. So we wanted to find a way and we developed this initially in the prototype with our daughter, we wanted to develop a way in which she could initiate communication and keep these types of relationships going. So what we've done with card store, one of the ways we do card store, the way we did it with her is that we have, we take the photographs of different friends and family members, and then we will put those pictures in on a calendar basis, in to that category, and so when they access that category, Dad's picture will appear in the prompt, depending on what day. And one a card is purchased for Dad, somebody else's picture will come up the next time. Then we link the voice prompting system with the picture prompting system so that if you want the person to buy a card for somebody and mail it every 2 weeks, then every 2 weeks the voice prompt will come up and say for example, Stacy you're going to buy a card today, want to see who you're

going to buy a card for? They touch the card store and then my picture appears and now they know they're going to buy a card for dad. So then they go to their, they're instructed to go through this book and match the picture on the screen with the pictures in this book, then you've got corresponding pictures in there. Then a person that has no communication skills is prompted to take this card out.

C: So for the tape, this card is a little card that says please help me pick a friendship card, it's for my dad.

B: So a person that cannot communicate in the community can hand that to the clerk, and the clerk will get the appropriate card for you to send.

C: It does like 4 things at once, it's so simple. She's out in the world, she's interacting, and she's continuing the connection with the people in her world, and it's all genuine, none of this is a mock up , none of this is like we're going to pretend like we're doing it so you feel better. it's all real stuff.

B: absolutely. Yeah, she buys a card, with all the limitations that I told you about, totally independently. And it's the appropriate card. And when she returns from buying the card, prompts continue to go, get the money that you need, you saw those prompts.

C: The other cool thing about cards in general, is they tend to be iconic in nature. Rather than, modern one's you know. Most of the cards don't have these long involved poems like they used to a long time ago, so that she can look at it and she can actually sort of get what's going on there, and has more of an opportunity to pick something that she feels

B: Depends on the person. Depends on the limitations of the person. She really does, she can't read or write. She knows she's getting a card, and she knows that she's going to get it for dad or sometimes get it for her brother. And she's got the money to do it, but she could not get the appropriate card without help. So that allows her to do that. She brings the card back then and she's continuing to work off of her page where she's matched it.

C: Now do you initiate this thing when you situate the client? Do you find a card store and go in the first time, are the instructions the first time to go in the card store and sort of explain the situation?

B: We don't do that. We do expect people to do that. We'll look at anywhere from a 6 weeks to 3 month training period depending on the person and the intensity of the training. So in return, there's a prompt to get your card out, and sign it if they can sign it, make your mark, then put your card in your envelope, then turn the envelope over and put, now you're working with the address of that person right here, so that is on a self adhesive label, and it shows where the position is on the envelope, and when you close the book you've got your return addresses here

C: And some stamps.

B: and some stamps. So it's prompted to do all that, where to position it, and then it's done. And so without being able to read, write, have many skills, communicating, or

know what time of the year it is, a person can do all of those things independently and get a card, and then the important thing is they've done it independently, the second thing is that now they've got an opportunity to initiate communication with other folks, and in return get letters back or get calls back and so on so forth, and it keeps a little tighter bond and more relationship. So that's it. You saw with the meals, and those things, that's another example of

C: Yeah the meals is an obvious one. I mean I saw cards on the video, and when you look at it you go well that's nice card store, she must like cards, but it wasn't obvious from the video the dimension, the extra dimension of that.

B: And even for a person who can't communicate, we put these systems in for individuals who have significant memory problems, so they will leave the house, and even though they're verbal, they'll leave the house and get to wherever they're going, or can't remember where they're going, and they use this card not to communicate at the card store, but as a prompt when they get to the

C: What was I doing, now what was I doing

B: And what to do when they get there.

C: Let me ask a computer science-y questions. We talked a little about the steps that led you to decide to write your own. You looked up and there wasn't anything out there that fulfilled what you wanted, and you didn't have a grand vision, I'm putting words in your mouth here but it seems like you didn't have a grand vision of the whole system, but you started with one part of it and then you went, "Oh well that works, now there's another part." Then you saw something else, and you started integrating them together. So there wasn't any sort of theoretical underpinning, or grand idea, or

B: Well the primary idea was with the voice prompting system. We never even dreamed about the picture mounting system. And again it depends on the individual, some individuals really don't need the picture prompting system, the voice prompting system is what they need to get through and to do the things that they needed to do around their residential environment.

C: Yeah I thought it was pretty cool that you used parts of Windows 95 operating system to trigger the voice prompting. It wasn't a big complicated, the only complicated part is telling it what speakers to go where.

B: that's the auto patch the director device that we use with it. And there's other software that goes into that, their operating system with a picture prompting system, because they don't mesh, the systems lock up when the different voice prompts are going off with the picture prompting system versus the voice prompting system. So we have another software that is added to that so that the system doesn't lock up.

C: In my understanding, since they let us take a look at the machine itself, it's written in Astound or something like that.

B: No we don't use Astound anymore.

C: what do you use?

B: Well, those are things that I'm not going to discuss.

C: That's fine, but it's some sort of multimedia scripting language.

B: Yes

C: And in the device that we saw there was this multimedia scripting language and then quite separate from it were the event scheduler.

B: Right the voice prompting.

C: But now you've got both of them together in one

B: No, but we need, we have 3 different, we have a software for our picture prompting system, we have a software for the autopatch, we have a software that when you put the picture prompting system and the voice prompting system together, that it prevents them, it prevents the lock up. What it allows is that if a voice prompt is going off, you'll interrupt that voice prompt with a picture prompt

C: It'll cue it up and wait till it's finished.

B: It will now, it wouldn't before. It would lock up otherwise, so it allows that to finish its cycle, that's what it allows it to do. And then we've got the software that we use for the voice prompting system, so there's actually 4 different pieces of software that can go into a system depending on what system has been purchased.

C: And it's all running on Windows…

B: Windows 98 now.

C: The next question is were there other systems that inspired you.

B: No.

C: You just saw, there were 2 things that you've kind of mentioned, one inspired you kind of negatively, one inspired you positively. One was the experience of discovering the touch screen, which gave you ideas, and the other one was the, what was it called, pict-

B: Oh, the pic syms?

C: Pic syms, which didn't work, that was a way not to go. So in a sense you could say that going so concretely was emphasized, it was clear that any level of abstraction didn't work at all for certain kinds of people. you wanted to have the Dole pineapple and the picture of the Dole pineapple to be exactly the same, rather than some kind of glyph.

B: Yes. And those are people with significant limitations that need that concreteness.

C: So I guess that also answers to whether there were systems that dis-inspired you, or were particularly unsuitable.

B: Part of this is 18 years of personal experience with our daughter.

C: That's the best, that's absolutely the best. That's the biggest kind of leap that I see that we're going to have to face, as technologists, we understand cognitive science, normal cognitive science, and we understand deeply understand technology, hardware, software. What we don't understand are the real needs of people in a real context, with cognitive disabilities. So the biggest thing that we have to continually remind ourselves is that, because we have expertise in one area it doesn't mean others. We have to be very careful about reinventing the wheel, and careful of getting carried away with our own ideas when they may not match up with the real needs of others.

B: Well, and what you really do, you find what you do is if you just picture yourself, and what your own needs are, and say what does this person, this person has the same needs and desires and wants independence and control over their life just like I do, you know whether you provide any of the support system to accomplish that given the person's limitations. Overcoming the barriers that that person has with regard to the control… My wife always give a really good analogy to that, she'll say she knows on Saturday she's going to clean the house, and if she is going to clean the house she doesn't particularly want to but she will and she knows she has to clean the house, and when I come home and I say well honey have you cleaned the house yet? It'll piss her off. And now because I've taken away the control that she has in terms of when and whether she cleans the house or not now somebody else is taking over that control and so now she might decide well I'm not going to clean the house at all. And it's that kind of thing that we don't, we experience every day in our own lives, but we don't give people with limitations that same opportunity, ((we take it)) way out of their control.

C: That's great, because what you're talking about is dignity in the first place. What you're talking about is their struggle; the fact that they might say no or ignore you is not dysfunctional, in fact it's highly functional as a human being. What they're saying is no this is my world, and there's a big difference between, well, similar with my wife. She's got a Palm Pilot. She loves her Palm Pilot, and it beeps when things are supposed to happen. And if that thing beeps and says start making dinner, Stefan has to work late and can't help you, that's a lot different than me calling up and saying remember I'm working late and can't help you, if I say that she might be pissed at me. But if that thing beeps, she's in control, she made it happen, same deal. That's all done with choices.

B: Choices is that people who can't communicate and you'll say, or they'll say to you, what would you like for lunch today, Stefan, would you like to have a hamburger or a hot dog, well you've got to be able to communicate that you really don't want either one of those things you really want pizza. But a person who can't communicate that is now left with 2 choices that have been imposed upon them, and that's the other thing that we get around with the system. We provide an individual choice. You saw the meal category, so

now you know that they've got a selection of different meals that they've chosen from a book and we've programmed them for them.

C: What's interesting about the book and the meals is that it's the one way; the entire system has made certain assumptions about how the individual is in need of prompting and in need of these tools, how they look at time. It's very linear and it's very momentary. It's like right now. But the meal thing itself is over, it's here's the book, what do you want this week, to go shopping, and it introduces in a very general way, and in a very concrete way, the notion of something that's going to happen in the future that you need to plan for now, and it works. My next question is what was your design rationale. And you just answered that, basically talking about choices, basically talking about dignity, concreteness, and matching the representation to the need. I'm extrapolating out here, that some people, this system needs to be made very very concrete, and some people it doesn't necessarily need to be made that concrete. And you're able to do that through the process of setting it up. Did you have a list of functions, well you just said you wrote down a list of needs, did you actually sit down and write down a list of needs when you

B: Not with my daughter, but we do now when we do an individualized system. We go through and do a variety of assessments, we go through an assessment process, and then a design process follows that.

C: That's interesting. So the assessment process is a checklist of some sort.

B: Yes, and it's a functional assessment. We identify what a person does and doesn't do, and what their cognitive limitations are.

C: So you have a standard set of questions you ask about the situation.

B: Yeah what we like to do, we have a tool, and assessment questionnaire that we use, but we've even gone, we like to do our assessment on a person-to-person basis. Like an IP meeting, and individual planning type, we sit down with the individual and with the people that are significant in that person's life, and find out as much as we can about the person, what they like to do, what they don't like to do, so on and so forth, and where they need support. And then the system is designed based upon that.

C: Now that's sort of jumping ahead, to the question about evaluating how it worked. Over the process of designing it for your daughter, there must have been some points at which you stopped and said OK well I've run this play does it work, and what do I need to change, and the interesting thing from our point of view is, at that point when you beta-release a product, you ask the user how it works. But in this case, since the user itself has problems in evaluating their own processes, how did you go through that whole thing.

B: Well, with our daughter we support her, so that was very, that was not a difficult thing. With others we rely upon the staff that normally… you know normally this system is being purchased like up in Boulder for individuals that are supported by an agency. So we rely primarily on the staff at that agency and so on. We can take baseline information

of what the person's doing on their own before they get the system and then evaluate what they're doing, it normally comes down to how much reduction in staff is now taking place for this individual. For example with our daughter which is the best example I could give you, she would require with all of her limitations to live in the environment that she lives in, she would require about 40-50 hours of direct care support a week. But she gets 3. That shows that the system is working. Does she follow every single prompt, does she make mistakes, sure she does make mistakes, no she doesn't follow every single prompt, all of the time.

C: I understand there's some sort of logging.

B: In our software yeah, you can log in to see the prompts that are going off, and the time period between prompts. This is in our picture-prompting system.

C: So you can log on when she's, what menu selection she's making?

B: You can log that and you can tell whether she's quitting in the middle of an activity, by virtue of the fact that there's a 20 or a 30 or an hour or 2 hours in between

C: Now do you use this logging thing when you said you developed a new bit of what you have, a new piece of it. What's the process that you have for evaluating it before you sell it to a customer. You want to be sure it's going to work.

B: We don't have a way of evaluating other than the initial functional assessment and the assessment process that we go through to design it. I mean can we, how do we determine whether there's going to be some benefit, normally we do that through the functional assessment. If the person is a person that is not going to take direction, that doesn't respond to a voice prompt and things like that, that doesn't match well, those are indications that the system is not going to fit that person's needs. But we have found even with people that have, even where… we designed a system and installed it for an individual in Denver, who was right out of an institution. Living in an apartment complex that had 24 hour staff, similar to out in Boulder. When we introduced him to the initial stages, we introduced him to the touch screen, picture prompting system, he was just fascinated with just touching, that's all he did, just touched it, just touched it, just touched it. and we thought there's no way this man is going to benefit from this system. The residential provider insisted we design it for him, so we did, and he's making terrific strides, he's now cooking side dish meals that he, with help, but he now participates with the other folks because now he can develop a meal, so even in cases where maybe there are parts of the whole system that wouldn't be beneficial there are other areas that are beneficial. We just put a system in for a man in Bakersfield, again similar, significant behavior problems, absolutely no communication skills. He had been, the first time a system was used he learned how to access a choice category which is recreation. And when they asked him what he would like to do today, it was the first opportunity he'd ever had to make a choice, and to communicate to them what he wanted to do. So is that going to, is the system going to benefit that person like it benefits our daughter? No. That person is always going to require 24 hour supervision, but there are these other benefits

that is going to give that individual more independence, more choice, and more control over their life than they had before.

C: We're beginning to develop sort of a folk saying about developmental, about disability in general, which is the problem set of disabled individuals always has a universe of one. Which is to say that you can line 5 people up that are handicapped, even similarly handicapped, and the solutions are all going to be uniquely different. So when you write this, you're writing this in conjunction with a programmer of some sort that you've hired. So do you do like formal specifications for this or do you sit down, there's an idea of how you want to do it, he produces something, is it sort of like that and then you sort of iterate over that?

B: Yes.

C: OK. what advice would you give to someone like us attempting to create a useful and well-adapted system such as yours. I'll just say the first thing you've already said, which is know the population.

B: Right, well that's absolutely imperative, the experience of that. It's also important to view people with cognitive disabilities and cognitive limitations as people who can succeed. If you approach it with a caregiver standpoint, that that person's always going to have to be taken care of, as opposed to how do we allow the person to take care of themselves, that's an extremely important approach to developing something that's going to be beneficial to a person.

C: That's beautiful, that's like the quote that caps it all up. I mean that's the deal, the deal here is, every time you reach down to help somebody, you push them down a little bit. From the point of view of what you're saying is, you're giving tools to people to help themselves.

B: Where we see the system not work is when you've got direct care staff that's not allowing the person to be independent, that's not allowing the system to work because they need to…

C: There's financial and power issues involved. This was touched on a little bit by (( )). It's a difficult one.

B: Oh it is!

C: Because sometimes people don't understand, like Christ said "The poor will always be with us," there's always going to be handicaps, there's always people going to be work with people with handicaps, with handicap issues. It's not a question of if you install 8 million vision systems there's not going to be any work for caregivers.

B: See, the irony of all that is, is that in that elite, all these catchwords, empowerment, and self-determination, and control, and choice, it all comes from the system. The problem is that when you talk about connecting people with disabilities in the community is very important from an agency standpoint, and that's what they preach. The problem is

they don't do it. And they don't do it because they spend all of their time doing the day-to-day needs and they don't have the money nor the manpower, the resources, to do the community connection. Once you've eliminate the day-to-day stuff, which you can do for a lot of folks with this system, you can reallocate that resource to go out and do all the things that they preach.

C: so to some extent, I was thinking about, you sell the thing as it will reduce the amount of caregiving hours, but what you're not saying, and I think that anybody who's been involved with handicapped issues, you're not saying this reduces the amount of time that's needed to do the thing right, it's just that now you have time to do the rest of the stuff right.

B: Well it does both, it does both. But you're right, the reason we developed the system had nothing to with whether or not we spent money on direct care for Stacy. It had all to do with allowing her the opportunity to have control and be independent, and make choices. In order to market the system, it's the other side of the coin. We have to market it based upon the amount of staff, the cost of human resources that it can reduce.

C: In fact that's resources that are drudge work, by and large. They have to be done by someone with a big heart but it's drudge work. So now you have an opportunity for people who actually went out and got a Master's degree to actually do Master's degree level stuff.

B: and to do the things that are really going to change the plight of individuals with disabilities, because it's connecting people into the community. That ultimately really changes people's viewpoints and eliminates being afraid of people that have limitations.

C: I've often felt that one of the problems we have in marginalizing people with handicaps is that the way we have taken care of them removes them from the marketplace. If you get them out in the marketplace where little kids can see someone who's disabled in some fashion, then the shock value becomes lessened. This is a bad example, but in the West you had the town drunk. The town drunk was the town drunk. He's OK you know, he's the town drunk, somebody's got to be the town drunk, he's the town drunk. And in most cultures you have the old person, you have the feeble person, you have the feeble-minded person, you have the crippled person, and they're all out there in the marketplace. But when you start hiding these people you get a very disturbing image of who we are. And who we are is all those people.

B: Absolutely. And when you send out a caregiver with the person who has these limitations, the interaction that takes place out in the community is really between the storekeeper and the person who's the caregiver, not the person who has the limitation. When you utilize the system that we're utilizing, they're out there basically on their own, and there has to be an interaction between the person at the card store and the person using the card to have that person get the kind of card that they want. For the grocery storekeeper to see the individual utilizing the picture shopping list as they match their food items and so on and so forth, the bank has to support the person because they can't communicate what their pin number is or whatever, those types of things are what brings

the community and a person with limitations together and eliminates the fears of that person and makes the community understand that these are just folks.

C: I'm reminded a little bit of that book, The Seven Kinds of Intelligence, do you know it? Some academic, he says that when we look at intelligence we're looking at it from a very very limited perspective. There are lots of other kinds of intelligence besides the kind of intelligence that's measured with IQ tests. My wife has very low verbal ability, she can't articulate well, she's always checking words; English is not her native language in the first place, and so words are not her friends, but she's been a dancer for years and years and years, and she has a degree in somatic psychotherapy, so she has this wisdom of the body that's not easy to measure, but you can see it, and I would argue to some extent that letting people out into the world like that would help to express those other kinds of intelligence.

B: Different types of skills. Absolutely.

C: Let's see if I have anything else, because our hour is up. Did you take a look at our website by the way?

B: I did not.

C: Would it be OK once this thing is edited down, would it be OK to post this on the website as a resource for researchers?

B: I'd like to look at it first.

C: Then that's what I'll do, when I get it transcribed, and then I get it edited down the way I'd like to do it, probably the best way that you could see it completely is I will put it on an HTML page that I won't publish in any way and I'll just give you, I'll mail you the address. That way you can look and see, it'll look exactly like this. Would that work for you?

B: Sure.

C: And clearly I'll reiterate that Visions can be obtained at dadadada. Thanks a lot!

July 31, 2000 Dr. Emily Richardson
I have her permission to transcribe this for my own use, and if we would like to do something else we have to contact her and get her permission, explicitly with all the details. I feel most comfortable with that anyway, because you can take things out of context all kinds of weird ways.

C: So what I am is a grad student and I'm, I've chosen, I'm in the computer science department getting a master's degree, and you can either do it with a project or not a project, so I decided to do a project, and I'm also associated with Gerhard Fischer and the Center for Lifelong Learning and Design, which is sort of a AI lab full of research people and Ph.D. students, and they have been contacted by a fellow named Bill Coleman, who is, was a philanthropist, he's one of the founders of Sun, and he wants to start up of researchers to do software/hardware projects for cognitively disabled people. So I have this one thing that I'm doing on my own and I'm also working with this other group of people that are out of that Center for Lifelong Learning and Design. So my immediate goal in this is to get backgrounding information so that I'm doing something that is useful for the world and not just an academic exercise and develop a small, nontrivial, useful application for people with cognitive disabilities. So I've talked to Professor Richardson?

R: That's me.

C: What's his name, he's a fellow … Richard Olson, who's a dyslexia fellow, and then Yoshinaga-Itano, who's a speech person. I've also talked to someone who's developed a system for helping get people with very low functioning intelligence live on their own, very interesting system, and my review of that system is on our web site, or will be. So where you fit in, is obviously looking at your website and what you've got published there and what you do, you understand something in the professional sense about the area at least in general am interested in, but one of the things we're really looking at is what Gerhard Fischer likes to call the space technology effect. What we also like to think about is the (curb cut) effect, which is that there are things that you develop for handicapped people that end up being a really good spin offs for nonhandicapped people, so from one point of view, whatever I do could possibly have impact on this time of life that we're all going to go through which will all make us progressively more handicapped in one way or another till we die. So you're an expert in aging and the effects of aging, and so that's sort of where that piece of the puzzle is, and that's where my interest is. What I have now, I've not really decided on a project, but I sort of have a glimmering of a project, having to do with prompting for people who are cognitively disabled to the point where they really have problems with scheduling and timing and this and that, and thinking about some kind of hand held device that would help them with prompting. This obviously would have other effects, other implications, other implementations for people that were aging and whose memories were having

problems. I'll just jump into the thing now. Some of these questions are going to be, you're going to say "Well that's not my field or expertise," but if you see anything you think would be useful for me to know, please

R: OK

C: so the first thing is, how do you define a cognitive disability?

R: Well I'm a neuropsychologist by training, so it's typically defined by performance on standardized tests, and extent to which it interferes with everyday function. So as a neuropsychologist, I define a disability as something that represents a deviation from average, the average population is able to do, capable of doing, or a deviation from the person's previous level, and secondly does that dysfunction or decline have any significant impact on their ability to carry out everyday abilities, everyday functions, (and they live in) despite that disability, do they need any assistance. So that's how I define disability.

C: So you do track what is sort of a metric thing but also what is an issue of life but within the issue of the lifestyle, comparing life, the ability to function in the world, that could be also a comparison with a normal group, but obviously in comparison with normal sort of behavior, (( )) that's especially applicable for aging issues.

R: Right, right, and the two, you did mention they're separate tracks but you can't do without them. So someone can have a discrepancy in their testing from what's considered to be average, but it has no relevance to their everyday functioning, so I wouldn't classify that as a disability, and so that's why the 2 have to go together. It has to be a measurable discrepancy, and it has to have some real world implications.

C: I just had this flash when you were talking about that, with the science fiction short story, I think it's Flowers for Algernon,

R: Yeah, that's a real poignant story.

C: So when we talk about disability, originally we started talking about well there seem to be cognitive disabilities and sensory disabilities, but I've discovered also there's motoric disability, which sort of fit between the 2. Could you discriminate between those 3 kinds of disabilities and talk a little bit?

R: Um, maybe, I'm not sure I can. It's actually a complicated issue. The motor and sensory component are usually considered physical disabilities separate from cognitive disabilities. So someone can have a paralyzed limb, and not be able to also feel anything in that limb, so have a motor and sensory disability, and yet have intact cognitive functioning in the sense that their memory is (( )) fine, they can speak and understand, and so they don't have any obvious cognitive problems, any obvious problems, they can process information, use the information, communicate to others. It's an artificial distinction though, because actually a lot of sensory disabilities are

keyed to good cognitive processes. A person can be blind, have a sensory disability of blindness, and that blindness can be from birth, and they can have great difficulty in their spatial ability which is considered to be a cognitive

C: So what's, there's an interdependency in some funny way. This is what we started discovering, when we started looking at, oh sensory disability that's real easy you just map it from one place to the other, you take it from reading, not being able to read something because you're blind, you just have it read to them. W have a fellow in our group who's an engineer who was blind for the last 7 years, and it happened quite abruptly to him, and he was a very visual learner, so he says what he sort of alerted us to is the fact that no no no, because I don't have this, I have a cognitive handicap that I have to learn, figure out how to do.

R: How to do something differently. Right, he can no longer use his sensory ability to map things in his head like he did before. And we've learned that over the last 15-20 years, that there's a real as you say interdependency, that we've made artificial distinctions in the past, and to some extent in the medical field we still make that artificial distinction, but it's much more complex than that.

C: The other interaction that I've seen, there's a book called, it's a professor at MIT, that worked with (ROKA) the language, it's a very primitive language, it's the turtle model of language, you know, anyway it's a computer science thing. She worked with a lot of people that were autistic, Down's, you know classic

R: Mentally disabled.

C: Yeah, and one of the things she talked about in the book was the notion of trapped intelligence, which is sort of a Stephen Hawking kind of thing, but you have several other issues, and there were people with extreme cerebral palsy, where they had it since birth, and they were quite bright. And she has one example of a person that ended up oddly enough getting a degree in computer science from Amherst or something, but this guy when he was like 12 or something was like you know he's never going to be able to do anything in the world and they gave him some tools to be able to now with the motoric disability discovered hey the guy in there is a real smart guy. So that's another sort of thing that I'm seeing that motoric disability, sensory disability can mask the thing.

R: Yeah that's true. Those are actually good examples of the flip side where you can compartmentalize these and say look how the motor part is very different from the cognitive part and yet people had mistaken the motor. But I think there's more interdependency than we had noticed in the past. But certainly coming up with tools for people to get past certain motor or sensory or what's considered peripheral disabilities so that the person can express themselves or use what kind of intelligence that's spared (( )).

C: That's the thing, that's the cool deal. This is so exciting, it's so cool. You know you can do all this fun stuff (( )) there's not downside to this. So we've talked about how they're similar, what I said in my letter was can a sensory disability lead to a cognitive disability, and I guess it's really not an issue the other way around, and we've talked a little bit about how they're different. Could you talk about, do you have any experience with using assisted technology?

R: Um, let me think, what would qualify as that. Mostly my clinical work has been in diagnosing people, the difficulties, but have not worked intensively on the rehab end, in assisting people. I know of people secondhand that have employed assistive technology and it's interesting that you have sort of this germination of an idea of using a handheld device. I worked with an individual who, a colleague of mine who had applied for grant money to use

C: PDAs?

R: Well it was before the Palms came out.

C: Was this in Chicago?

R: No, it was several years ago, and he wanted to use, well it was just coming out as organizers, electronic organizers, to use with people with chronic alcohol abuse that also had memory problems as a result of their alcoholism, and to use those to assist them, and unfortunately the grant wasn't liked because it was felt to be a very primitive idea.

C: The steps are catching up. The technology of the Palms is like, I'm right at this very cool place, I did we're doing research I found somebody I can't remember where stashed away somewhere who was talking about doing a when I started some kind of project in Chicago with people who had memory problems and radio network PDAs so I guess they're like Palm Pilot 7s or something, or maybe they were just pagers I'm not sure, and they were using those as prompting systems.

R: So someone externally would prompt them through their Palms, or

C: A computer database, externally. So the one thing that I've really seen that was so simple, it was really great, it was this guy he was a lawyer, he has a child I'm not even sure what the diagnosis is, but she had basically a 150 word vocabulary, 20 of which you could understand, not being part of the family, and he figured out a prompting system based on a computer and a touch screen that allowed the child to move out on her own.

R: That's pretty amazing.

C: And I thought, and there's a video of the thing, and I saw the video, and then I went and I there's a place in Boulder here that has one, an installation, and the technology is so simple, but it works, it really works. It's very interesting.

R: you know we've used in the cases that we've seen, we've used some pretty basic kinds of reminder systems with people to assist them in continuing to live independently, for example I had a patient who had a type of dementia that is called slow aphasia, which affects language zones. So her ability to express herself had highly deteriorated, she couldn't communicate through language and she was having great difficulty understanding people's speech, but yet she could still go grocery shopping, she could still pay her bills, she could do a variety of things, but she couldn't for example one of the biggest drawbacks for her was being able to use the phone.

C: Is that like a Broca thing?

R: It affects actually Broca's, Wernicke's, and global areas, so there's a whole section that just starts deteriorating, and eventually it becomes a global dementia. Her's lasted, from the time I saw her to the time that she finally died was a 3-year period. So mostly we were trying to assist her in quality of life. But we had, we developed kind of a little booklet for her that had pictures, so when she went to communicate she would just point to the pictures.

C: It's exactly the same deal. There's 2 tours we've done, we've done a tour of Boulder High School district assisted technology, and there's a really cool tour called the Dynomite, which is a real expensive handheld PC with a touch screen, for people that have problems, it's in there but they can't put the words together, can't do that thing, so they have icons that you can touch and build up sentences, and then push a button and then there's the sentence. Hawking has a similar sort of thing called the Liberator, but it allows more sophisticated building of stuff, you know. But the interesting thing, I really want to comment about this person you worked with, one thing I've discovered with the prompting, the prompting system that this person developed, the video one, is that it was really necessary to make the pictures nonabstract, they had to be concretely exactly, to the point of if this person is going to go shopping for a jar of pineapples, it had to be the picture of a Dole pineapple thing. And they could have it because they couldn't abstract out.

R: Yeah that's actually a very good observation, it has to be very concrete, nouns, very obvious actions for verbs, but nothing that involves functors, associations, so, you know like

C: So this happens with aging populations too? This is sort of an issue with, aphasia, is that also affecting, not just being able to come up with the word, you know the word's there, but you know, but also the ability to abstractly map ideas, if I can see the word sun and see a picture of the sun, 2 different issues?

R: It's not, there's some, we think, some deterioration in a person's abstraction ability as we age, but certainly it's modified by educational level, and raw intelligence and things like that, but it's not to the degree that we have probably a major impact on a person's functioning. So it's not something that I would consider a disability. It's also not something that if you compare the 2 patients I had to an aging population it would be, any technology that you develop for that person would be so vastly different from what a person who's normally aging could benefit from.

C: One of the slogans that we have about severely handicapped people is that the problems are a universe of one. That the combination of things, it's not just one, that the combination is so complex that you, it's difficult to create a generic thing that could easily map to, this is what the assisted techonology people are having problems with, is they get these really generic programs that are real hard to structure and set up, and then they get these programs that aren't generic that only do one thing. And it doesn't fit for this person, so it's a real tough sort of

R: Yeah it takes a lot more individualization (( )). There was a very eminent neuropsychologist who died just a few years ago who was diagnosed within 3 years of his death with ALS.

C: ALS is?

R: Is what Stephen Hawking has. Amytrophic lateral sclerosis, Lou Gehrig's disease. So he was diagnosed with it, and rapidly progressed, and finally died. But I think within a year and a half of his initial diagnosis, he was entirely paralyzed, and yet his mind was still working really well. And his wife was so creative in going all over the world, finding bits and pieces of technology, software and hardware to put together so that he could still function, and he was editor of a major journal,

C: Is there a story about this guy that I could read somewhere? The name of the guy?

R: Well the guy's name is Nelson Butters. So you could contact colleagues, contact people around him, but what I also had heard was that the only function he had was movement of his right thumb, and she got all the technology so that as I said, he could continue to edit journals, to advise graduate students, continue to communicate, and then he lost movement in that thumb, and it took a while before they discovered that he had very slight movement in his big toe, and so she got infrared technology, or whatever that could, laser technology, something that could detect that very miniscule movement and he was back in business again, functioning right up until… that's an extreme example of what assistive technology, (( )) did him well but had to be individualized, and his wife had to be, it wasn't like she could just go to one company and say do you have this for someone for ALS, she had to be …

C: The technology is interesting because it's this grey area in our culture, so it's populated with some charlatans, it's populated with some people who have wacky ideas, it's populated with crap that doesn't work, it's populated with stuff that's way

too complicated, that somebody who, you know, it's probably some very great stuff, it's very interesting to try to shift through it and look at it, and look at it. Sociologically it's interesting, because it's this grey area, they're not part of our culture, and you have we've mainstreamed ourselves so much, that we're "Honey don't look at the guy in the wheelchair," it's sad. And that's one of the interests that I have in getting people these tools is I want to get the laymen all out into the market. I want to get the retarded people out into the market, because there's a place for the town drunk, you know, and when we start locking people up we become a much less diverse society. Another sort of axis that I've sort of worked with is the difference between living tools, tools for living and tools for learning. And I guess the learning thing comes from a lot of rehab issues and a lot of developmental issues, but do you see that as, do you have any comments about that?

R: I don't know if I do, I guess it sort of brings up a distinction in rehab between remediation and compensation. Remediation being trying to relearn the skill that you've lost.

C: Internally remap it to some other way yourself.

R: Yeah, yeah. And compensation is try to figure out how to get around the deficit. And so

C: Those are better words I think.

R: So what you're saying is sort of the living skills may correlate more with our ideas of compensation. What do you do with the environment, how do you restructure the environment so that you can get around the handicap that you have and still be able to function at your optimal level. Whereas the learning may be in the realm of remediation, helping the person come up with new cognitive strategies,

C: So a blind engineer on the one hand had to figure out ways of memorizing things and ways of structuring things, on the other he has a web browser called Jaws that reads the web for him, so that's a clear break between the 2.

R: Right.

C: And specifically talking about your expertise, I'm assuming having looked at your papers and stuff, we're talking a lot about memory, and you're talking a lot about abstract processing. What do you see, what would you see as a really cool thing that would help people, if you could just wave a magic wand?

R: I'm not sure I know. The population I've done most of my work with is the demented population. I mean I've done a lot of normal aging work

C: (( )) There was again and there was also a sort of dementing and drug stuff.

R: And when I think about that population that I'm most familiar with, the people with Alzheimer's disease and so forth, when we work with them what we try to do is find out what are they still capable of doing, and putting them in an environment that maximizes their abilities, but naturally they continue to decline, and one of the hardest things is, even if you come up with reminders in their environment, so you know you're talking about a computerized reminders, but even if you put out different kind of visual reminders for taking their medications, like in the early stages when they could still manage their medications, there's the problem of them not remembering to use it. So you can have a

C: So closing a feedback loop. So that's a cool thing in terms of helping memory which is one of the first questions that one of the guys asked when they looked at this system was, do you have log? Can you keep track of what's going on? Can you extrapolate from the tracking, and they guy that wrote it, he's in love with his daughter, he loves his daughter, and that's what he's thinking about, he's not really thinking about some other things, but that question is really interesting because what that was saying is, can we take the information, the use of the thing provides information, and can we take the use of that thing the information (( )) in that, and actually use that to modify what's being done, and that's sort of a very cool idea, for even just on the level of the (flag), saying that there's, the computer reminder or the PDA reminder to take your medicine happened, but the smart hinge on the medicine cabinet didn't open up within 20 mintues, and this happened 4 times in a row, and we could flag somebody.

R: Right, or whatever handheld thing, the person put it down and forgot to pick it up, so it's doing all these reminders but the person isn't (( )), or doesn't know how to turn off a reminder and indicate, whatever part that the individual has to play, what active role that person has to play, in this system, that's where it at least in the cases that we've seen it breaks down. Whatever system we use the active part that the person has to do in responding to these reminders, or indicating that they responded, breaks down. And what do you do as the backups to that.

C: This is so cool. This you just paid for the entire interview. I got the one idea coming out of it,

R: Well I'm glad to hear it!

C: No because the thing is, it's not a static target, for some people, for some people it's a static target for some people it's not a static target, and their relationship with the system is not static, so when you write a list of functional parameters for this thing in a larger sense, one of them is that the device must be able to track the response of the device and do some kind of notification for deviance from that. And of course the coolest thing would be it changes itself along with the thing. But the first thing would not be bad either. And now with these PDAs the Palm Pilot 7 being wireless

R: I'm still on my Palm 3, and I'm very happy with it, and I keep seeing these new things coming out. But the idea that my colleague had, and you're again having, of carrying around some kind of compensatory memory device, it wasn't doable back then because we didn't have the technology that could do what potentially the system could now.

C: The cool thing for me about the Palm revolution, what's happening in the Palm revolution, is not so much that we have the technology, I'm an academic but I'm also an older guy who careered and used to be in manufacturing, and I saw the Dynomite which is a very cool tool that you can give to a 7 year old and they don't destroy it because it's indestructible, it's got a touch screen and it does all this cool stuff but it's five thousand dollars.

R: It's the practical use of it, widespread use.

C: Yeah, widespread use. Use for the people in the first place that are marginalized, and I look at these things and the cool thing about these things is they're making millions of them, so you've got economy of scale, and you don't think about the pen, that's just a touchscreen that's practically indestructible that's throw-away-able, for $250, so there's some cool possibilities. So now I have a little section where I was asking you to talk about autism, and Down's, and dyslexia, and cerebral palsy, but that seems to be not too relevant to your field of expertise.

R: Yeah I can tell you about the differences but I don't know that they're something that you want to spend, you might be able to find other people (( ))

C: I guess, here's the capper on it, do you have any comments being, any comments from our conversation about the way that I'm trying to do stuff. For instance, Richard Olson, one of his comments was don't try to do too much. You know, please don't try to do too much, find something very small, and that was something I'd been thinking about all along.

R: That is very good advice. Small, simple, (( )). I don't know what else to tell you except what we talked about. If that's the way you're thinking of going, the key to it is making sure the people part of it is working.

C: In the world of computer science you see too many people who are just mesmerized by the technology and they don't think about the user at all, and that's the wonderful thing about this people in this group with Gerhard Fischer and we're all, we're practically not even computer guys, because we're all, all we're thinking about is the user

R: Now and the population you're thinking of in the short run at least for this kind of thing is adult, child?

C: Probably at this point adult, because it's easier to get feedback about what's going on, because you know at least for what I'm doing I'll want to do user testing, and it's a lot easier to do it even with somebody who's severely retarded who's an adult, than it is with a child, and also I'm thinking about the adult in the sense that I'm not hitting a moving target, what I'm giving to the child is someone [tape cuts off side A]

C: So you're asking if the population is primarily people with memory disorders? I don't know yet.

R: You probably, this is just one thing I would say you should keep in mind, which I'm sure you're already thinking of getting your user-friendly bent, of course as you know, we probably already all know, the older the current cohorts are, the less comfortable and less familiar they are with technology.

C: I have a father who has 78 patents. He cannot for the life of him open up an attachment in email. So this is a brilliant man, self-made multimillionaire, da da da da, but it's like, I sent him an attachment, couldn't do, I finally sent him the web page, he couldn't figure out how to get to the web page, so I'm very aware of, this thing has to be, my last class, I took a user interface design class, and we did this little application for MediaOne, on a screen on a refrigerator, scheduling for a family, and one of the things we tried to do and we pretty much succeeded was you should be able to walk up to this thing and not even know Windows and be able to use it. And there should not be any instructions. So that they graphic layout, it's what is known in computer science as the ATM issue. Is that if you have to read how to use an ATM, they're expensive machines, so

R: Exactly. So, you know keeping that in mind for these current cohorts it's not going to be a problem when the younger generation gets to these ages and older because we're all going to be computer literate and technology literate, but the current cohorts even my generation and on, you know it is the kind of thing that if it is too complicated if I have to read instructions forget it.

C: I look at user testing of this sort of thing very much like, I'm an MIS guy for a hotel reservations company here in Boulder, and I'm in charge of working with the redesign of our website, and it's very interesting because you've got about 3 seconds to sell this thing, and if you don't do it right then, they're gone they're gone forever. So it's the same kind of deal that they the people that use this because they're diminished capacity at least initially probably don't have a lot of inspiration to do it. So it's gotta be easy and it's gotta give them very quick and immediate, something has to work for them right away. The payoff can't be delayed.

R: Right, right. Because these are also, when you get into brain-injured populations or demented populations, these are the people who stop using microwaves, because it's far too complicated.

C: That's a great quote. That's a wonderful quote. No it's true.

R: So it is important that any introduction of new technology has to seem like an old shoe.

C: Mm-hm, has to feel really comfortable, and has to immediately give them some benefit they can see.

R: Exactly, exactly.

C: Well thank you!

Short report on Vision system –

We (Jim Redman, Eric Scharff, and myself) were given a tour and demonstration of the Visions system at an assisted living apartment complex in north boulder. The tour was lead by BJ Sample <bsample@ddcboulder.com>, the House Coordinator for the Developmental Disabilities Center. He was pleased at our interest in his system and discussed his Vision administration needs with us as well as demoing it for us. He was so open that he basically let Jim, Eric and I poke about in the PC running the system and would be willing to talk further about his experiences with Visions and would be a good contact for evaluating systems we produce.

His experience with Visions is basically positive. It really works: severely cognitively handicapped people can live more independently with this tool. BJ said that Bill Baesman basically sold this product as a tool to reduce staffing costs, which caused a lack of enthusiasm from the staff to implement it. That, and the fact that much of the staff in this sort of situation (assisted living) often stay for a short time and are, by nature, more people than technology oriented caused problems with maintaining and reconfiguring the system for different users. This administration interface problem is similar to the issues that the BVSD team presented to us. He was mildly interested in a set of templates for new users but it was clear from our discussion that any of these tools have two distinct interfaces, the user and the administrator (or configurer).

Description –

Hardware:

Visions is a multimedia scripted application that consists of a networked PC running win95 with two monitors (one in the system closet with the CPU, one a 15" touch screen display in the kitchen) and a soundcard providing input to a amplifier and switching system controlled by the PC. The switch is connected to (up to) seven speakers and can be controlled by software to divert the soundcard out put to any one or set of the speakers. The speakers are currently in the kitchen, living room, bathroom and two bedrooms, placed on wall close to the ceiling.

Software:

The system runs on the MS Windows 95 platform. It is written in "Astound!" (http://www.astoundinc.com/products2/astound/astound.html) , a power point-like scripting language. The Astound! Script is modifiable at the system console or thru another networked machine with astound! loaded. The Astound! script provides the touch screen interaction, and the Windows 95 event scheduler and the driver application for the audio switch provide the independent audio prompts for the system.

Physical tools:

The users are supplied a set of photo albums, one for each activity. The images for these albums and for the touch screen are actual photos of the items, activities and users, this degree of customization allows, BJ felt, the user to be more comfortable and accurate in using the system. On our tour we looked at the kitchen set, but there were others for activities like going out, videos etc. The kitchen set comprised a system of meal planning, food purchasing and meal preparation. The user started at the beginning of the week with the meal planning set, which had, in each picture pouch, a picture of the meal and individual pictures of the ingredients of the meal, all of which were identified on the back so as to facilitate putting back after the week had passed. The entire packet was moved to the weekly meal preparation book as it was chosen. After choosing the meals for the week, the ingredient cards from the weekly meal preparation book are pulled and visually compared with the kitchen inventory (note – not by writing, visually – this constrains the user to particular brands but allows for a much wider range of abilitied users). The cards that correspond to existing stock are replaced in the meal-planning book and the remaining cards (with pictures of the ingredients) are used for the shopping book. Shopping is handled by matching pictures to items at the local Albertson's where the user has a charge account. Similar scenarios exist for other kinds of activities.

The touch screen:

When the user wants to do an activity (for which he may be prompted by a audio cue (note the audio cues and the touch screen system are not bound, but completely separate systems)) she goes to the touch screen and navigating thru a simple menu

chooses that activity. If there are two users in the apartment, each has his or her own menu system with customized images on the menus of him self doing that activity that the menu item is guiding. The touchscreen system does not appear to allow for backing up once an activity is started, if a cue is missed and the user becomes confused, she must completely restart. The touch screen walks the user thru the activity, by simple pictures and voice cues (BJ confirmed that it was much easier for the users to respond to voice cues that were from a non authoritative figure that he may recognize). It's pretty much as the video shows.

Brief Analysis:

   The first impression was that an amazing amount of leverage can be created for this kind of handicap with very simple tools. This thing worked- BJ said that he could use more of these. He also said that it was applicable for a fairly narrow range of disfuctionality – not quite a unique problem requiring a unique solution but not for everyone in his care and not without proper setup.
   The institutional context was interesting. Apparently there was some degree of reluctance to use the system on the part of the staff as it was seen as a device to eliminate jobs (rather than allow them to focus on areas that only humans can do). Unfortunately Bill Baesman sells his system as a staff-reducer. Again we heard of the difficulty of administrating the system, and documentation seemed to be poor.
   The use of customization was excellent, not only were each menu designed for the user intended, but the images and sequences had a one to one match with the users world.
   The design of the system is very simple and there are a number of obvious places for improvement, in both the user and administrative interface. There is no ability to backtrack ones path if there is a problem, and it is difficult for a novice to setup and modify.
   The use of physical items and tying them to the touch screen system is brilliant and obvious. Here is a place where we can learn from when we start modifying the EDC for such uses. How simple – if a user has problems with abstractions, give him concrete things!

This analysis is brief but I expect to go into more detail when I get to a design rationale part of my masters project.

Proposed Project

Email – May, 2000

Gerhard-

        I have a idea for a possible Masters project I want to have
your response to. Basically what it is is to create a augmentative
communication device (to use a phrase from Dynamyte's literature) on a
HandSpring platform. Handspring is a Palm Pilot clone that has a plugin
slot that will accept a wav file player, or possibly a speech
synthesizer unit. The big win here is that the palm device (esp. the
touch screen) is very hardy and inexpensive due to economy of scale,
the OS (PalmOS) is not difficult to write to, and there is a possibly
of having the Palm device talk to an EDC like device thru it's Ir port.
        This would have some theoretical elements, having to do with
the design and meaning of the icon system, also it would be user
modifiable and thus be a L3D type tool. It even fits into the CIAP area
of a possible product.
        I'm excited about this idea, what do you think?

                        Stefan