Learning to Learn: a Systematic Child-Centered Model Skill Development in Young Children Who are Deafblind

Final Report

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Project Background and Rationale

Children who are born deafblind often experience cognitive limitations and orthopedic impairments as well as dual sensory impairments. Vision impairments seriously compromise the extent to which children can learn about events and objects that are beyond their physical reach, while hearing impairments limit what they can learn about the environment from auditory sensations. Orthopedic impairments may limit experience with manipulating and exploring the physical environment. Cognitive impairments may impede the integration of limited sensory experiences and detract from the ability to make sense of the social or physical environment. The tools necessary to comprehend the environment and to interact with it meaningfully (in other words, to learn) may not develop spontaneously through the natural processes of discovery. Repeated experiences with failure, frustration and lack of control coupled with the tendency of family members and professionals to provide more help than is necessary may lead to excessive passivity and disinterest. A sense of helplessness may result, suppressing the ability to learn to act on or respond to the environment in new and effective ways. Teachers and parents also may also experience perceptions of personal failure that may lead to frustration and lowered expectations for the child.

Instructional approaches developed for young children with special needs often assume a high level of dependency and actually end up reinforcing dependence rather than independence (Mithaug, Martin & Agran, 1987). For instance, passive sensory stimulation and hand-over-hand assistance are very likely to promote passivity in the young child who is deafblind (Chen & Haney, 1995). There has been a long history of instruction emphasizing compliance (Bricker & Cripe, 1992). Even approaches that target independent behavior often focus exclusively on the child's motor behavior, sometimes targeting skills that are beyond the physical limitations of a child with orthopedic impairments and often targeting skill areas (such as “daily living”) that are not highly valued by young children (Brown & Cohen, 1996). A focus on motor behavior is often coupled with a disregard for the *meaning* or *intent* of that behavior. This leads to teaching children to produce behaviors that have no meaning, function or value to them. It also leads to the suppression of unwanted or inappropriate motor behavior (“acting out”, self-stimulatory behavior) rather than an investigation of its meaning, and the provision of an appropriate means to express that meaning (Donellan, Mirenda, Masaros, & Fassbender, 1984).

The foundations of learning lie in the child’s ability to initiate interaction with the social and physical worlds and to respond to the opportunities for interaction afforded by those worlds. Mastery of the physical and social environments is critical to learning new things. If we ignore the roots of learning we run the risk of fostering passivity and dependency and compromising early learning. This project sought to develop a comprehensive instructional approach that would nurture “learning to learn” through the acquisition of generic learning skills.

Conceptual Basis for the Project

We had already developed assessment instruments, instructional strategies and materials addressing the component skills that allow a young child to exercise control over the social and physical environments. One line of research addressed alternative means of communication for nonverbal children and the infusion of opportunities to practice social/communicative skills across an entire schedule of daily activities. A second line of research addressed the development of skills required to solve problems that arise in the physical environment by understanding the relationships between objects and between the self and objects. All of these materials had been developed for children who are deafblind. This project synthesized these previous research efforts into one single approach that is systematic and child-centered. The Learning to Learn approach involves three partners-- the child, the teacher and the parent-- in a cooperative learning process based upon the understanding of all partners. Instruction targets the child's understanding of events in the social and physical worlds and the ability to initiate interaction and respond to the opportunities for interaction afforded by those worlds.

<u>Mastery of the social environment</u>

Mastery of the social environment means that we can interact effectively with other people. That is, we can initiate communication with others and we can respond to their bids to communicate with us. Much is made of the need for social relationships, friendships, self-determination and choice-making-- all of which require that the individual can communicate intentionally. This is not an assumption that can be taken for granted for the young child who is deafblind. Communication and social skills allow the child to interact in a functional way with the social environment. An appropriate and effective communication system is necessary to interact socially. For instance, if a child needs to make choices, what mode of receptive communication can the child understand so that his teacher can communicate to him that there is a choice to be made? What mode of expressive communication can the child learn to use so that the teacher understands what choice he is making? For the young child who is deafblind communication often involves an alternative non speech-based system.

Mastery of the physical environment

Mastery of the physical environment means that we can interact effectively with the inanimate environment. That is, we can initiate actions on objects, materials, equipment, and spaces and we can respond appropriately to the opportunities, problems and demands that arise in the physical environment. The skills that allow us to master the physical environment are the concept development skills necessary to understand the uses of objects, the relationships between objects and actions, and ways to gain access to objects. Concept development skills allow the child to interact in a functional way with the physical environment. In the words of Williams & Kamii (1986) “It is not the manipulation of objects itself that is important for children’s learning. What is important is the mental action that is encouraged when children act on objects themselves” (p. 26). These are generic skills -- they are tools that may be used to solve new problems as they appear in new situations or with new materials. They are skills that increase the user's independence and ability to adapt to the changing parameters of a normal lifestyle. If a child needs to learn how to solve a problem that occurs in the physical environment--perhaps the ball she is playing with has rolled under the sofa--what does she need to solve that problem? (She needs to understand that the ball hasn’t disappeared-that it’s still available, even if she can’t see it; that if she can’t reach underneath, perhaps she could rake it out with the help of a yardstick; and that if not, perhaps she needs to ask for help). Success in leisure, recreation, daily living and vocational tasks depends to a large extent on the individual's understanding of the physical environment. Children who are deafblind must function in inclusive home, school and community settings, and they are faced with constantly changing and expanding environments. They need to understand how to activate a new mechanical toy, how to open a new type of milk container, how to open the door to the new classroom, how to make a detour around an unexpected barrier. Such understanding does not necessarily develop spontaneously in the child who is deafblind.

Learning to Learn

If we propose to teach a child *how to learn* new things, then we need to look at the generic skills of learning and consider how the child who is deafblind may acquire those skills. Whether in the social or the physical domain, the motor component is only one aspect of the targeted behavior. The *intent* of that behavior, the child’s *understanding* of what needs to be done and why it makes sense to produce the behavior are far more fundamental aspects of behavior. Such awareness allows the child to regulate his or her own behavior, to demonstrate foresight, and to realize that it is possible to exert some control over both people and objects in the environment. In other words, learning is an

internal achievement, not just a repertoire of discrete, observable behaviors. That is why it is so important to target the intent and meaning of behavior rather than its mere physical expression. Instructional approaches that focus on the comprehension, intent, and meaning, of behavior as opposed to its motor components are ones that are likely to foster "learning to learn".

When we contemplate strategies that might promote mastery of the physical and social environments, there are three major intervention targets. The first is the child's communicative, social and concept development skills, given appropriate adaptations to accommodate individual sensory and motor impairments. The second intervention target is the social environment--that is the behavior of other people that may or may not provide the child with opportunities to interact with either people or objects (Halle, 1987; Rowland, 1990). The third intervention target is the physical environment--that is, the opportunities that may or may not be inherent in the materials, objects, equipment and spaces available to the child that would encourage the child to interact with objects or with people (Gaylord-Ross, Haring, Breen & Pitts-Conway, 1984; Martin, Brady & Williams, 1991). Social and physical environments may be engineered to encourage or to discourage experience, independence and mastery. A major barrier to learning is the tendency of adults to do things for the child, often in a well-meaning but misguided attempt to hasten their participation in or completion of ongoing activities.

The project involved four major objectives: development of the instructional model and materials, implementation of the model in demonstration classrooms, field tests in additional classrooms, and dissemination of results. The Learning to Learn model and materials developed adhere to the conceptual basis outlined above. The intent of the child's behavior is as important as its physical demonstration. The intervention targets not just child skills but also the social and physical environments. The remainder of this document describes the results of the four major project objectives.

Project Results

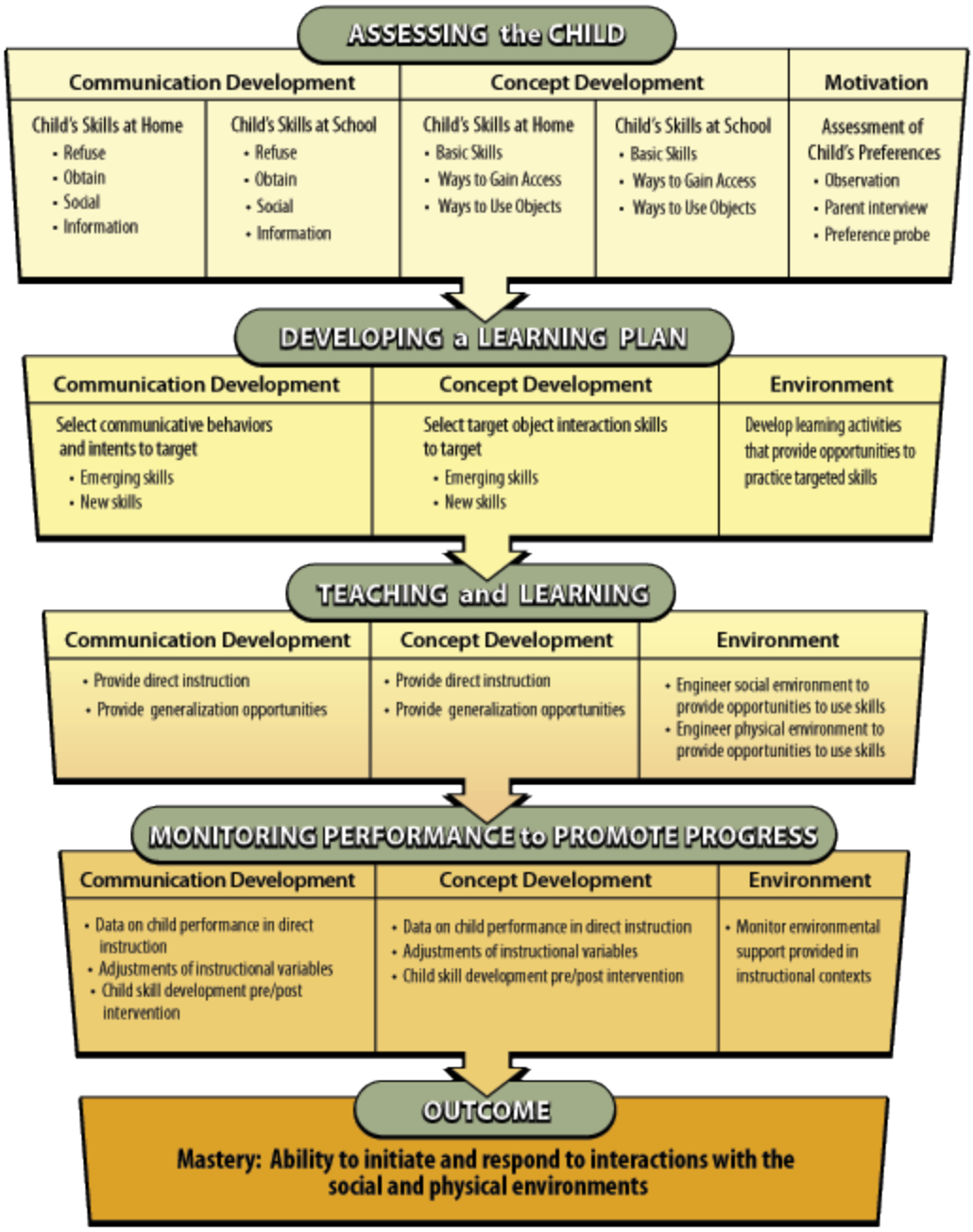
Objective 1—DEVELOPMENT: Description of the Model and Final Products

The Learning to Learn model is an educational approach for children with severe and multiple disabilities including deafblindness. The outcome targeted by the model is mastery of the social and physical environments. Mastery is defined as the ability to initiate and respond to interactions with the social and physical environments. Mastery of the social environment is achieved by communication development. Communication allows us to relay our own needs and desires effectively and to respond appropriately to the attempts of other people to communicate with us. Mastery of the physical environment is achieved through the development of concepts needed to understand how the world around us works. Concept development skills allow us to understand how we relate to the physical environment so that we can interact effectively with objects, structures and spaces.

The Learning to Learn model involves instruction in communication development and concept development that is integrated into typical classroom activities. Hallmarks of the approach include:

- assessment data are provided by parents as well as by educational professionals
- the focus is on instructional contexts and materials that are intrinsically motivating to the student, decreasing the likelihood that extrinsic reinforcement is needed
- social and physical environments are engineered to provide natural opportunities to learn new skills and to practice existing ones
- both the student's performance and the learning environment are monitored to evaluate instructional progress
- instructional strategies target the student's understanding of communication and concept development skills as well as the physical demonstration of those skills

The Learning to Learn Model has four components. The four components of the model are: Assessing the Child, Developing a Learning Plan, Teaching & Learning and Monitoring Performance to Promote Progress.



Learning to Learn Model

Learning to Learn **Materials**

The Learning to Learn materials include some that were developed through earlier research projects and others that were developed specifically for this project. Materials developed through earlier projects had already been subjected to studies of their effectiveness and reliability. New products developed through this project include *First Things First*, the *Materials Checklist*, the *Time to Learn DVD*, two new versions of the *Communication Matrix, On the Same Page* and the *Guide to the* Learning to Learn *Model*. All of the materials except for *On the Same Page* and the *Guide to the* Learning to Learn *Model* were designed for stand-alone use. Educators may pick and choose the assessment and instructional materials that seem appropriate for their own students' needs. The materials together form a comprehensive package to address the four major components of the Learning to Learn instructional model: Assessment, Developing a learning Plan, Teaching & Learning and Monitoring Performance to Promote Progress. Many of the materials address multiple components of the model. The materials that make up the Learning to Learn package are attached separately. The *Guide to the* Learning to Learn *Model* explains exactly how the materials are integrated into one instructional approach. The materials are described below.

Materials related to Communication Development

Communication Matrix: an assessment of the child's communication skills. The original *Communication Matrix* is a communication skills assessment instrument for individuals functioning at the earliest stages of communication who use any form of communication, including pre-symbolic and augmentative or alternative forms. The *Matrix* covers seven levels of communicative development (from pre-intentional behavior through the use of early language forms) and is organized into four major reasons for communicating: to **Refuse** things; to **Obtain** things; to engage in **Social** interactions; and to provide or seek **Information**. This instrument has been extensively field-tested. The *Communication Matrix…Especially for Parents* is a "user-friendly" version designed to be easier for family members to use. The resulting profile is the same as the one that accompanies the professional format. The *Communication Matrix* is also available online as a free service at www.communicationmatrix.org. A profile and a list of the child's communication skills is automatically generated for printing from the web site. No identifying information is collected.

First Things First: an instructional guide on teaching pre-symbolic communication. This new instructional guide provides practical strategies for encouraging early communication in children who have no or minimal intentional communication. *First Things First* describes instructional strategies for children who are not yet ready to use symbols to communicate. This book focuses on teaching children to **Reinstate** desired events, to **Gain Attention** and to **Make Choices** using pre-symbolic behaviors such as gestures, facial expressions, vocalizations or (in the case of severe orthopedic impairment) switches. It also includes strategies for establishing motivating contexts and materials for instructional activities. *First Things First* includes forms for tracking and

monitoring instruction and is illustrated with photographs of children in school and home settings.

Tangible Symbol Systems: an instructional guide and videotape on using tangible symbols to communicate. *Tangible Symbol Systems* instructional materials include a 75-minute video/DVD and 55-page illustrated manual. These materials show how to teach individuals to communicate using objects or pictures to represent items, people, and events in their daily lives. These products describe and illustrate alternative communication options and instructional strategies for a broad range of learners of any age who are unable to communicate using speech, manual sign language, or other types of abstract symbols. Strategies for determining student preferences and motivating contexts for instruction are included. The field-tested materials are the result of extensive longitudinal research involving individuals who are deafblind or who have other severe and multiple disabilities.

Materials Related to Concept Development

The *Hands-on Problem Solving* materials include concept development assessments, an instructional guide, posters and a checklist. These materials are used to examine a child's everyday interactions with objects in order to address concept development skills needed to master the physical environment. These materials have been extensively field-tested by professionals and parents.

School Inventory of Problem Solving Skills (SIPSS). The *SIPSS* is a 33-item child skill assessment designed to be administered in school or childcare settings by a professional. The assessment items are organized into three strands: **Basic Skills** (the most fundamental ways to interact with objects), **Ways to Gain Access** (skills needed to gain access to a desired item that is inaccessible) and **Ways to Use Objects** (skills needed to use items appropriately in functional contexts). Examples are provided to show how each skill may be demonstrated in the typical school setting. All items can be performed by children with both vision and hearing impairments and by children without expressive or receptive language.

Home Inventory of Problem Solving Skills (HIPSS). The *HIPSS* contains the same items as the *SIPSS* but is designed to be administered in the home either by family members or by a professional who interviews family members and observes the child at home. Examples are provided to show how each skill may be demonstrated in the typical home setting.

Hands-On Problem Solving for Children with Multiple Disabilities: Guide to Assessment and Teaching Strategies . This is an instructional guide for teachers describing the hands-on problem solving approach to concept development and assessment materials. It includes strategies for determining motivating instructional contexts and materials for targeting concept development skills.

Problem Solving Posters. These 11x17 inch full color posters contain the 33 skills from the *HIPSS* and *SIPSS*, and provide space to indicate which skills are being targeted in a

particular activity for up to three children. The nine different classroom posters represent generic activities (e.g., sensory time, structured play, etc.), with examples of how object interaction skills may be incorporated into such activities.

Materials Checklist. The new *Materials Checklist* is a form that is used to inventory the materials in a classroom (or home) and to analyze what specific concept development skills from the *HIPSS* and *SIPSS* assessments might be targeted using those materials.

Materials Related to the Learning Environment

Time to Learn: environmental inventory, teacher's guide and DVD. The *Time to Learn* environmental inventory is designed to help teachers identify and create opportunities for active participation and steady learning in typical classroom activities for children who are deafblind or who have other severe or multiple disabilities. The inventory contains 70 items in eight categories (**Transitions, Activity, Adult's Interaction, Student's Communication System, Peer Interaction, Opportunities to Communicate, Opportunities to Use Objects**, and **Materials**) that help a teacher assess the degree to which a specific activity encourages learning and independence for a specific student. *Time to Learn* is compatible with the *HIPSS* and *SIPSS* assessments and with the *Communication Matrix* in that it specifically addresses opportunities to demonstrate the skills included in both of those instruments. The teacher's guide explains the rationale for each item on the inventory and provides practical suggestions for targeting each item in the design of an instructional program. The new 130-minute DVD contains multiple video clips illustrating each item on the inventory. All of the video clips involve children with severe disabilities in regular activities in their public school classrooms or at home. The scenes were reviewed and selected with input from a workgroup that included teachers from local classrooms.

Putting It All Together (integrative materials)

On The Same Page: learning plan form. *On the Same Page* is a form for integrating assessment information from home and school and for developing and monitoring an integrated learning plan. This form provides space to enter the results of communication and concept development skills derived from administering the *Communication Matrix* and the *HIPSS* and *SIPSS* at home and at school as well as child preference information. *On the Same Page* makes it easy for parents and teachers to compare how the child behaves in the two different environments and to discuss and generate logical new skills to target. The form also includes space to evaluate the teaching environment using *Time To Learn* data to identify environmental supports for learning within activities the team has identified as motivating to the child.

Guide to the Learning to Learn *Model and Instructional Materials*. This is a 10-page booklet that describes all of the Learning to Learn materials and explains how they address each of the four components of the instructional model.

Assessing the Child

Model Component	Related Materials
Communication Development	*Communication Matrix … Especially for Parents*
	Communication Matrix (professional version)
	Tangible Symbol Systems (pre-test, Ch. 9)
Concept Development	*Home Inventory of Problem Solving Skills*
	School Inventory of Problem Solving Skills
Child's Motivation	*First Things First (Ch. 3)*
	Tangible Symbol Systems (Ch. 5)
	Hands-On Problem Solving for Children with Multiple Disabilities (p. 12)

Developing a Learning Plan

Model Component	Related Materials
Communication Development	*First Things First*
	Tangible Symbol Systems
Concept Development	*Hands-On Problem Solving for Children with Multiple Disabilities*
	Materials Checklist
Environment	*Time to Learn Inventory*
Learning Plan	*On the Same Page*

Teaching and Learning

Model Component	Related Materials
Communication Development	*First Things First*
	Tangible Symbol Systems (manual)
	Tangible Symbol Systems (videotape/DVD)
Concept Development	*Hands-On Problem Solving for Children with Multiple Disabilities*
	Hands-On Problem Solving Posters
Environment	*Time to Learn (manual)*
	Time to Learn (DVD)

Monitoring Performance to Promote Progress

Model Component	Related Materials
Communication Development	*First Things First (Ch. 4-7)*
	Tangible Symbol Systems (Ch. 13-15)
	Communication Matrix (Parent and Professional)
Concept Development	*Hands-On Problem Solving for Children with Multiple Disabilities (pp.19-21)*
	Home/School Inventory of Problem Solving Skills
Environment	*Time to Learn Inventory*

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Evaluation of Final Products

Teachers at the field test sites formally evaluated each component of the Learning to Learn materials package during the last year of the project. Six teachers from Washington, California and Texas participated in thse evaluations. The assessment and instructional materials had already been evaluated during the course of projects through which they were developed to ascertain their reliability and validity and to evaluate consumer satisfaction with them. The purpose of these evaluations was to collect data on *the process of using the materials in an integrated fashion*. Four sets of materials were sent to the field test sites over the course of four months and respondents were given 3 weeks to evaluate each set. Responses were collected by non-project staff and were presented to project staff in an anonymous format so that they could not identify which respondents provided which feedback. Each set of materials corresponded to one of the Learning to Learn model components, as illustrated in the table on the previous page.

A summary of the evaluations of the materials is provided on the following pages. For each material, the questions asked of the field testers are provided with the mean score across respondents. All questions were answered on Likert-type scales that ranged from 1 to 5, with 5 always representing the most positive response.

Assessment

Communication Matrix

The information on the Matrix helped to document communication skill development across the school year.	4.7
The combination of information on communication skills from home and school helped me to more accurately understand my student's skills.	4.0
The combination of information on communication skills from home and school helped me to discuss the student's skills with parents.	4.3
The information on the Matrix helped to generate meaningful instructional goals.	4.7
The information on the Matrix helped to document communication skill development across the school year.	4.7

School Inventory of Problem Solving Skills (SIPSS) & Home Inventory of Problem Solving Skills (HIPSS)

The information generated by the HIPSS and SIPSS was useful for the initial evaluation of the learner's object interaction skills.	4.3
The combination of information on object interaction skills from home and school helped me to more accurately understand my student's skills.	4.2
The combination of information on object interaction skills from home and school helped me to discuss the student's skills with parents.	4.2
The information from the HIPSS and SIPSS helped to generate meaningful instructional goals.	4.5
The information from the HIPSS and SIPSS helped to document object interaction skill development across the school year.	4.5

Strategies for Determining Preferences

Procedures for assessing the learner's preferences (as presented in the workshop and in consultations) helped me to determine the learner's preferences.	4.6
Procedures for assessing the learner's preferences (as presented in the workshops and in consultations) helped me to select contexts for instruction.	4.8

Developing a Learning Plan

Time to Learn

Using Time to Learn at the planning phase was useful in developing a learning plan.	4.7

On the Same Page (original version)

The combination of information on student preferences and communication and object interaction skills from home and school with environmental support information helped me to generate a clear and reasonable learning plan.	4.4
Using On the Same Page seemed to help parents to participate in the development of reasonable learning goals for their child.	4.2
It was easy to enter results onto the On the Same Page form.	4.2
Having a large amount of information about the child's skills from home and school and environmental supports literally together on one page is helpful.	4.6

On the Same Page was useful in conveying information during the process of the student transitioning to another school or classroom.	4.0

On the Same Page (revised version)

The color-coding on the revised On the Same Page will be helpful.	4.8
The re-organization/re-numbering on the revised On the Same Page will be helpful.	5.0
Listing each Time to Learn item makes it easier to use and share with others.	5.0
The instructions for using the revised version of On the Same Page are clear.	4.8
The sample data provided on the revised version of On the Same Page is easy to follow and helpful.	4.8

Materials Checklist

Evaluating the materials in my classroom in terms of the skills that could be used to interact with them would be helpful in developing a Learning Plan.	4.5

Teaching and Learning

*Hands-On Problem Solving for Children with Multiple Disabilities: Guide to Assessment and Teaching Strategies*The information contained in this Guide was thorough in its discussion and explanation of how to use these strategies.	4.5
This Guide was helpful in implementing instructional programs.	4.8

Tangible Symbol Systems (Chapters 11 and 12)

The information contained in these chapters was thorough in its discussion and explanation of how to use these strategies.	4.5
These chapters were helpful in implementing instructional programs.	4.8

First Things First excerpts

The information contained in these chapters was thorough in its discussion and explanation of how to use these strategies.	5.0

These chapters would be helpful in implementing instructional programs.	5.0

Problem Solving Posters

These posters are a helpful tool for incorporating problem solving skills into activities throughout the day.	4.3
The eight contexts represented on the posters adequately cover the daily activities in my classroom.	4.8
The posters are a helpful visual reminder to classroom staff to embed opportunities to use problem solving skills into classroom activities.	4.8
The posters are a helpful tool for collecting data on child performance.	4.3

Time to Learn

Time to Learn was useful in terms of engineering the environment to ensure learning opportunities for the student.	5.0

Monitoring Performance to Promote Progress

Excerpt on data collection from Tangible Symbols Systems (Ch. 13 & 15)

The description of strategies for collecting student performance data (Ch. 13) was thorough in its discussion and explanation of tracking child performance in instructional programs related to learning to use tangible symbols.	4.7
The Intervention Record described in Ch. 15 is helpful for tracking a student's progress in learning to use tangible symbols.	5.0
The Intervention Record described in Ch. 15 is helpful it terms of providing clear direction for planning tangible symbols instruction (i.e. for deciding what to do next).	5.0

Excerpt on data collection strategies from First Things First (Ch. 7)

The description of strategies for collecting student performance data in Ch. 7 was thorough in its discussion and explanation of tracking child performance in instructional programs related to learning to use pre-symbolic communication.	4.3
The Intervention Record described in Ch. 7 would be useful for tracking a student's progress in learning to use pre-symbolic communication.	4.3

The Intervention Record described in Ch. 7 would be useful in terms of providing clear direction for planning pre-symbolic communication instruction (i.e. for deciding what to do next).	4.2

Excerpt on data collection strategies from Hands-On Problem Solving for Children with Multiple Disabilities: Guide to Assessment and Teaching Strategies (pp. 19-21 plus forms)

The description of strategies for collecting student performance data was thorough in its explanation and discussion of how to track child performance in instructional programs related to object interaction.	4.3
The Intervention Record included with this material is helpful for tracking a student's progress in learning object interaction skills.	4.3
The Intervention Record included with this material is helpful in terms of providing clear direction for planning object interaction instruction (i.e. deciding what to do next.)	4.0

Intervention Record and Glossaries (from Tangible Symbol Systems and First Things First)

It will be helpful to have a generic intervention record that combines the previous versions into a single form that can cover three types of instruction.	4.7
This new form is an improvement over the existing separate forms for each type of instruction.	4.7

Time to Learn

Time to Learn was helpful for monitoring the learning environment and making adjustments to promote further progress	4.3

Objectives 2 and 3—IMPLEMENTATION and FIELD TEST: Student gains in Model and Field Test Classrooms

The first year of the project was devoted to preparing materials for the instructional package. Model implementation activities commenced in Year 2. Field Test activities began in Year 3.

Model Sites and Participants

Sites were recruited on a classroom-wide basis. That is, willing schools and teachers were recruited first. Then any students in participating classrooms who qualified for the project (by virtue of experiencing both vision and hearing impairments) were given the opportunity to participate. Parents of all students who were offered the opportunity consented for their child to participate. There were two model classrooms for this project. Model Classroom #1 was a public pre-school classroom located in Portland, Oregon. This classroom participated in Years 2 and 3 of the project (the teacher moved on to another position after Year 3 when the classroom was disbanded by the school district). Model Classroom #2 was a public elementary school classroom located in Beaverton, Oregon. This classroom participated in Years 3-5 of the project. Three students moved abruptly out of Portland area schools during their second year of participation. Two students participated in the project for two full years. In these cases, data are reported separately for each year of participation and these students are treated as two participants in any mean measures reported. Demographics for student participants in the two model classrooms are provided below. The last column indicates other impairments experienced by participants in addition to the vision and hearing impairments that they all experienced. All but one of the participants in the model classrooms was male. Over-representation of male participants is consistent with the deafblind census data for the United States, (where the percent of males to females is 55% to 45%), but not to this degree.

Demographics of Model Classroom Student Participants

Classroom	Year	ID	Age	Gender	Ethnicity	Etiology	Additional Impairments*
Model #1	2	129	3.1	M	Caucasian	TBI	DD, MF, OI, SD
	2	130	3.6	M	Caucasian	Cytomegalovirus	DD, OI
	2-3	131	3.3	M	Caucasian	Hydrocephaly	DD, OI
	3	132	3.5	M	Caucasian	Cytomegalovirus	DD, OI, SD
	3	133	4.5	M	Hispanic/ Latino	Unknown	DD, MF, OI
Model #2	3-4	145	8.5	M	Caucasian	Down Syndrome	MR
	4	147	9.5	F	African American	Prematurity	DD, MF, OI
	5	150	6.8	M	Caucasian	Unknown	DD, OI

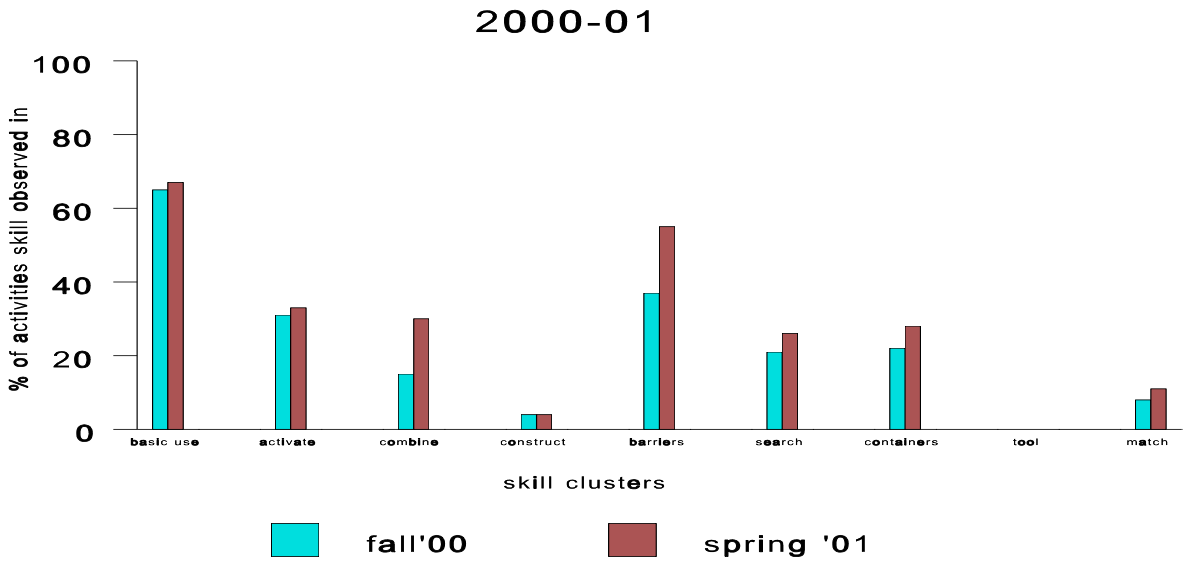
*Key to additional impairments

DD = Developmental delay MR = Mental retardation SD = Seizure disorder
MF = Medically fragile OI = Orthopedic impairment

Evidence of Classroom-wide Effectiveness of the Instructional Model

In previous projects we had proven that using *Time to Learn* to structure activities resulted in greater class wide opportunities for children to communicate for both target

and nontarget students. However, the same hypothesis had not been tested for the concept development (object interaction) skills also targeted by this project. In Model Classroom #1 that hypothesis was put to the test in its first year of participation (Year 2). Project staff observed the entire classroom, recording the types of object interactions in which all children engaged using the items from the *SIPSS/HIPSS*. They recorded actions engaged in by both participating and nonparticipating students. These data were collected for one whole school day in the Fall of 2000 and then again in the Spring of 2001. The next figure shows the data collapsed into skill clusters. Increases were seen in all skill clusters except for Construct and Tool Use *across all students*.



Data on Progress of Student Participants

There are two major data sources that speak to the effectiveness of the implementation activities conducted in the model classrooms. These are child performance data collected by personnel who conducted instructional programs and pre-post assessments of student skills conducted at the start and end of each school year. Child performance data varied widely depending upon the student, the targeted behavior, the instructional activities and the teacher conducting the programs and taking the data. These data cannot be collapsed in any meaningful way. Their primary purpose was to inform consultations between project staff and participating teachers. Pre-post assessments were collected to demonstrate child progress across each school year of participation. The *Communication Matrix* and the *SIPSS* were administered at the beginning and end of each school year for each participant. These pre/post data are summarized below.

Communication Matrix (described in previous section). The *Matrix* data can be summarized numerically, with a score expressed as a percent equivalent to the total number of points out of a maximum possible of 148 points. The next table shows pre-post scores for *Matrix* data collected at school as well as Rate of Gain scores

(calculated as gain/pre-score). The parent version of the *Matrix* was also given to parents for them to provide information about their child's communication at home and in the community. Parent assessments were completed by parents of seven children at the start of a school year. For children whose parents provided this information, it was used in generating learning goals related to communication.

Communication Matrix Data: Model Classrooms

Classroom	Year	ID	Pre-score	Post Score	Rate of Gain
Model 1	2	129	18%	19%	6%
	2	130	11%	14%	27%
	2	131	8%	13%	63%
	3	132	14%	18%	29%
	3	133	12%	14%	17%
	3	131	14%	24%	71%
Model 2	3	145	20%	41%	105%
	4	145	63%	75%	19%
	4	147	19%	24%	26%
	5	150	8%	20%	150%
Mean			**19%**	**26%**	**51%**

Clearly there was a wide range of functional communication skills among the model classroom participants, with pre-scores ranging from 8% to 63%. The rate of gain across participants also varied widely, from 6% to 150%. The next figure provides a more detailed summary of communication skill progress derived from the Communication Matrix. This figure provides information about the functional improvement of each participant, showing the Level of behavior and the degree of accomplishment within each Level for each school year. The figure shows that of the eight participants who began the year without any symbolic communication skills (Level V or above), four demonstrated some symbolic behavior by the end of the year. It is gains such as these that speak most clearly to the improvements made in communication skills over the course of the project.

SIPSS (described in the previous section). This instrument was used to assess object interaction skills that reflect an understanding of the physical environment, or concept development. The *HIPSS* (home version) was also given to parents for them to provide information about the child's object interaction skills at home and in the community. Parent assessments were completed by parents of seven children at the start of a school year. For children whose parents provided this information, it was used in generating learning goals related to concept development. The next table shows pre and post scores as well as Rate of Gain scores (calculated as gain/pre-score) for the *SIPSS*. Total scores are expressed as percents equivalent to the total number of points out of a maximum possible of 66.

SIPSS: Model Classrooms

Classroom	Year	ID	Pre-score	Post Score	Rate of Gain
Model 1	2	129	26%	27%	8%
	2	130	24%	26%	8%
	2	131	9%	18%	100%
	3	132	8%	12%	63%
	3	133	6%	18%	300%
	3	131	23%	24%	9%
	3	145	78%	89%	14%
Model 2	4	147	35%	56%	60%
	5	150	53%	62%	17%
Mean			**29%**	**36%**	**64%**

Object interaction skills also varied widely for this group, ranging from 6% to 78% at pre-test. Exceptionally low scores were demonstrated by subjects who had severe orthopedic impairment. Rate of Gain also varied widely, ranging from 8% to 300%.

Field Test Sites and Participants

Field test sites were established in Years 3 and 4 in public school classrooms in six different sites in Beaverton, OR, Lacey and Spokane, WA, San Antonio and Lamesa, TX and Santa Rosa, CA. Three subjects participated for 2 years. Field Test Site #4, with two subjects, did not complete project activities. Demographics for participants in Field Test sites appear in the table below. The last column indicates other impairments experienced by participants in addition to the vision and hearing impairments that they all experienced. Across these classrooms, the gender balance of participants was virtually equal.

Demographics of Field Test Site Student Participants

Classroom	Year	ID	Age	Gender	Ethnicity	Etiology	Additional Impairments*
Field Test 1	3-4	134	8.0	F	Caucasian	Cerebral palsy	DD, MF, OI
Field Test 2	3-4	135	5.5	M	Hispanic/ Latino	Unknown	DD,MF,OI
Field Test 3	3-4	136	7.8	F	Caucasian	Cerebral palsy	DD,OI
Field Test 4	3	137	8.7	M	Caucasion	Charge syndrome	DD
	3	138	7.6	F	SE Asian	Microcephaly	DD
Field Test 5	3-4	146	7.2	M	Hispanic/ Latino	Unknown	DD
Field Test 6	4	151	9.3	M	Hispanic/ Latino	Unknown	DD,OI

*Key to additional impairments

DD = Developmental delay
MF = Medically fragile
MR = Mental retardation
OI = Orthopedic impairment
SD = Seizure disorder

As in the model classrooms, the *Communication Matrix* and the *SIPSS* were administered at the beginning and end of each school year for each participant.

Communication Matrix. The next table shows pre-post and gain as well as Rate of Gain scores (calculated as gain/pre-score) scores for *Matrix* data collected at school. The parent version of the *Matrix* was also provided to parents for them to provide information about the child's communication at home and in the community. Parent assessments were completed by parents of eight children at the start of a school year. For children whose parents provided this information, it was used in generating learning goals related to communication.

Communication Matrix: Field Test Sites

Classroom	Year	ID	Pre-score	Post Score	Rate of Gain
	3	134	8%	12%	50%
Field Test 1	4	134	16%	18%	6%
	3	135	7%	10%	43%
Field Test 2	4	135	7%	16%	114%
	3	136	12%	13%	8%
Field Test 3	4	136	13%	15%	15%
Field Test 5	4	146	16%	20%	25%
Field Test 6	4	151	20%	32%	60%
Mean			**12%**	**17%**	**40%**

Clearly there was a narrower range of functional communication skills among the field test participants than among the model classroom participants with very low pre-scores ranging from 7% to 20%. The Rate of Gain across participants varied from 6% to 114%. The next figure provides a more detailed summary of communication skill progress. This figure provides information about the functional improvement of each participant, showing the Level of behavior and the degree of accomplishment within each Level demonstrated at the beginning and end of the school year. The figure shows that of the two participants who started the school year without any intentional communication (Level II or above), both had acquired intentional communication by the end of the year, an extremely significant accomplishment. Of the four participants who began the project with no or emerging intentional communication (Level III or above), all had mastered that level by the end of the school year and one demonstrated some symbolic behavior by the end of the year. It is such gains as these that speak most clearly to the improvements made in communication skills over the course of the project.

SIPSS. This instrument was used to assess object interaction skills that reflect an understanding of the physical environment or concept development. The *HIPSS* (parent version) was also provided to parents for them to provide information about the child's object interaction skills at home and in the community. Parent assessments were completed by parents of ten children at the start of a school year. For children whose parents provided this information, it was used in generating learning goals related to concept development. The next table shows pre and post scores as well as Rate of Gain scores (calculated as gain/pre-score) for the *SIPSS*.

SIPSS: Field Test Sites

Classroom	Year	ID	Pre-score	Post Score	Rate of Gain
Field Test 1	3	134	23%	39%	74%
	4	134	32%	50%	56%
Field Test 2	3	135	14%	26%	86%
	4	135	30%	41%	37%
Field Test 3	3	136	2%	9%	400%
	4	136	12%	15%	25%
Field Test 5	4	146	38%	58%	53%
Field Test 6	4	151	61%	67%	10%
Mean			**30%**	**38%**	**93%**

SIPSS pre-scores varied widely for this group, ranging from 2% to 61%. Rate of Gain ranging from 10% to 400%.

Data from Videotaped Instructional Programs in Model and Field Test Classrooms

Project staff made videotapes of two major activities targeted for each model classroom participant at least three times per school year. Each videotaped activity lasted approximately 15 minutes. In field test sites teachers made videotapes themselves and mailed them to the project. In these sites, the mean number of videotapes was four per year per participant. A total of 96 videotapes were made of participants in model and field test classrooms.

Since the performance of individual children varied widely and the variables targeted to increase or decrease depended on the abilities and programs of each, it was not logical to conduct group analyses of these data. Instead, the coded data were used to shed light on the relationship between teacher strategies, as measured by *Time to Learn,* and child and teacher behaviors as measured by the other two codes. Teacher behavior became the primary target of project activities. Of interest was the degree to which teacher behavior could be shaped using *Time to Learn* as a catalyst, and the relationship between teacher behavior change and child behavior change. Also of interest was the question of whether teachers were able to target both communication and concept development skills within the same activity.

Project staff coded the videotapes in three ways. The *Expressive Communication* code was used to document the use of specific types of communicative behaviors (pre-symbolic and symbolic), communicative intents, the initiation of communication, and cues from teachers to elicit communication. The *Object Interaction* code was used to document the demonstration of 39 generic object interaction skills related to concept development, the initiation of object interaction and cues from teachers to elicit object interaction. For both of these codes observations were made on a modified frequency basis, scoring the presence of each behavior category for each 60-second interval. The environmental inventory, *Time to Learn,* was also administered to the videotapes,

providing a measure of strategies the teachers used to conduct instructional activities that would encourage communication and concept development. Reliability checks were conducted on all codes on at least 20% of videotapes for each subject. The three coding systems are described below.

The Expressive Communication Code

The *Expressive Communication Code* is an observational system that tracks the rate and type of pre-symbolic and symbolic communication by students; the communicative functions or intents expressed by students; the rate of cues for communication from teachers or peers; and the use of comprehension checks for students learning to use symbolic forms of communication. Observations are made on a modified frequency basis, scoring the presence of each category of behavior during each one-minute interval. Reliability checks were conducted on at least 20% of the videotaped data for each participant. The statistics computed to assess inter-observer reliability for these data are the Mean Occurrence Reliability--or the mean agreement on the occurrence (as opposed to the non-occurrence) of a behavior category (a score above .80 is preferred)--and the Mean Kappa Coefficient--an agreement statistic that takes into account the rate of occurrence and non-occurrence of the behavior category (a score greater than .60 is preferred). Reliability was computed on each behavior category. For this set of data, the Mean Occurrence Reliability was .91 and the Mean Kappa Coefficient was .84 (across behavior categories and across all 96 sessions).

Object Interaction Code

This code tracks skills that are associated with concept development as demonstrated through interactions with the physical environment. It is based on the skills included on the *SIPSS* assessment and a related instrument, *Hands-On Learning at School,* that includes an expanded set of object interaction skills. The *Object Interaction* code was used to document on a minute-by-minute basis the demonstration of any of 39 object interaction skills, the initiation of such skills, and the provision of cues for object interaction by the teacher. Inter-observer agreement (# agreements /#agreements + # disagreements) computed for each category on a minimum of 20% of the data collected on each student yielded a mean agreement of 91% (across behavior categories and across all 96 sessions).

Time to Learn

Time to Learn is the environmental Inventory that was designed to help teachers determine to what extent a specific classroom activity encourages skill learning by a specific student (what constitutes an opportunity for one student included in an activity may not constitute an opportunity for another student). *Time to Learn* is administered to the learning environment, as opposed to the child, and the resulting scores are independent of child skill level. *Time to Learn* includes 75 items organized into eight sections: **Transitions, Activity, Adult's Interaction, Communication System, Peer Interaction, Opportunities to Communicate, Opportunities to Use Objects,** and

Materials. The inventory was administered after viewing the entire videotaped session and was applied to the activity as a whole. The total *Time to Learn* score reflects the diversity of strategies used by the teacher to promote the production of communication and concept development skills for the specific student. This score does not reflect frequency or rate of behavior; it reflects the percent of the 75 strategies that the teacher was observed to implement during the activity. Inter-observer reliability was assessed between two project staff on at least 20% of the videotaped sessions for each participant. Two observers first scored the videotapes independently and then engaged in a consensus process to determine the final score. The mean percent agreement was 93% across the 96 sessions.

Analysis of the Coded Videotape Data

To examine the relationship between teacher behavior and student behavior, Pearson's correlations were run between total *Time to Learn* scores and summary scores derived from the two other observational codes. The purpose was to examine the relationship between *Time to Learn* scores and the actual performance of the child in terms of the frequency of various types of object interaction and communicative behaviors and the actual performance of the teacher in terms of the rate of cues provided. Strong correlations would suggest that environmental changes, as measured by *Time to Learn* scores, are indeed associated with changes in child performance. These analyses were conducted on all 96 videotaped sessions from both model and field test classrooms.

Relationship between *Time to Learn* Scores and *Expressive Communication Code* Scores

The major variables derived from the *Expressive Communication Code* were:

- Cues to Communicate: proportion of intervals in which the teacher provided at least one Cue for Communication that the student was capable of perceiving and to which the student was capable of responding
- Communication: proportion of intervals in which the student produced at least one intentional communicative behavior (either pre-symbolic or symbolic)
- Initiation of Communication: proportion of intervals in which the student Initiated Communication (communicative behavior that was not prompted by a Cue to Communicate from the teacher)
- # Intents: number of different communicative intents (out of four) demonstrated by the student

The first variable reflects teacher behavior, while the others reflect student behavior. With the exception of # Intents, these variables all reflect the rate at which each behavior category occurred. Of the four Expressive Communication variables described above, all but the first (Cues to Communicate) showed strong and positive Pearsons correlations (2-tailed $p<.01$) with the total *Time to Learn* score. Thus, higher *Time to Learn* scores were associated with higher rates of communication and initiation of communication by students and in their us of more communicative intents. We would not expect the first measure (Cues to Communicate) to correlate highly with *Time to*

Learn score because the inventory tracks more subtle, non-directive sorts of opportunities.

Relationship between *Time to Learn* Scores and *Object Interaction Code* Scores

For the *Object Interaction Code*, the major measures derived from the coding were:

- Cues for Object Interaction: proportion of intervals in which the teacher provided at least one Cue for Object Interaction that the student was capable of perceiving and to which the student was capable of responding
- Object Interaction: proportion of intervals in which the student intentionally engaged in at least one of the 39 object interactions included in the code.
- Initiation of Object Interaction: proportion of intervals in which the student Initiated an object interaction included in the code and the behavior was not prompted by a Cue for Object Interaction from the teacher.
- % Clusters: % of different clusters (out of 14 clusters of related skills) represented by the object interaction skills demonstrated by student across the session
- % Complex Skills: % of different complex skills (out of 13) demonstrated by the student across the session.[1]
- % Different Skills: % of different skills demonstrated by student across the session (out of 39)

The first variable reflects teacher behavior, while the others reflect student behavior. The first three variables reflect rates of behavior, while the last three reflect the diversity of object interaction skills observed. Of the six Object Interaction variables described above, all but the first two (Cues for Object Interaction from the teacher and Object Interaction by the student) showed strong positive correlations with the total *Time to Learn* score (2-tailed $p<.05$). Thus, higher *Time to Learn* scores were associated with higher rates of initiating object interaction by students and with the three measures of variety of object interaction--% clusters, % complex skills and % different skills. The lack of relationship between the *Time to Learn* score and rate of Cues for Object Interaction from teachers is in accord with the data related to the *Expressive Communication Code*. In both instances, we would not expect the rate of cues from the teacher to correspond with *Time to Learn* scores because *Time to Learn* tracks more subtle, non-directive sorts of opportunities than the sorts of teacher cues tracked by either of the other codes. It is interesting that while the correlation with rate of student Communication was strong, there was no significant correlation between *Time to Learn* score and rate of Object Interaction by students. This is most probably explained by the fact that communication requires two partners, so teacher involvement is crucial. Object interaction, on the other hand, can be accomplished completely independently. Environmental strategies implemented by the teacher would be less likely to be associated with rates of object interaction than with rates of communication by the student: since once the student has

1 Complex skills were: Complex Search, Opens Complex Containers, Selects and Uses Tools to Gain Access, Operates Complex Objects, Complex Combinations, Constructs, Uses Tool to Assemble/Disassemble, Matches to Complex Visual Features, Uses Abstract Information, Pretends to be Something Else Using Props, Plays Game with Peer, Plays Game with Group, Cooperative Interaction

access to an object it is possible to interact with it independently.

Relationship between two *Time to Learn* Sections: Opportunities to Use Objects and Opportunities to Communicate

Additional correlations were run to examine the contribution of two specific sections of *Time to Learn* —**Opportunities to Use Objects** and **Opportunities to Communicate**. These two sections reflect the diversity of types of opportunities provided by teachers to target communicative intents and types of object interaction related to concept development. First we examined whether the scores from these two sections were associated with the frequency of behavior on the part of students and teachers. We found high and positive Pearson's correlations (two-tailed $p<.01$) between Opportunities to Communicate from *Time to Learn* and Communication, Initiation of Communication and Cues to Communicate. Similarly, we found high and positive Pearson's correlations (two-tailed $p<.01$) between Opportunities to Use Objects from D2L and Object Interaction, Initiation of Object Interaction and Cues for Object Interaction. These results demonstrate conclusively that increasing the diversity of strategies for encouraging communication or object interaction, as measured by scores on the two "Opportunities" sections of *Time to Learn*, is associated with increased rates of cues on the part of teachers and increased rates of behavior and initiation of behavior on the part of students. A final correlation was run between scores on the Opportunities to Use Objects section and the Opportunities to Communicate section to examine the degree to which teachers were able to target *both* communication and object interaction in the same activity. This correlation also yielded an extremely high and positive Pearson's correlation (two-tailed $p<.01$), demonstrating that, indeed, teachers did not have to sacrifice efforts to target a variety of communicative behaviors in order to target a variety of concept development skills. In fact, activities in which a more diverse slate of *communication* skills was targeted were those in which a more diverse slate of *concept development* skills were also targeted.

Summary and Conclusions

The Learning to Learn project was conducted in public school classrooms in four states. With the exception of one participant whose etiology was Down Syndrome (and who experienced both hearing and vision impairments), the participants experienced more severe and multiple disabilities typical of many children labeled deafblind. As such, their entering skill levels were low even as assessed using instruments designed especially for children with severe and multiple disabilities including deafblindness. Nevertheless, all participants showed progress in terms of both communication skills and concept development skills. Rates of gain, which are relative to entering score levels, revealed that all participants made considerable progress, even those who entered with very low skill levels. That, in and of itself, is a striking accomplishment. Furthermore, gains were made even by children in field test sites whose teachers did not have face-to-face interactions with project staff. This result speaks to the efficacy of the materials as they were revised over the years of the project and ultimately implemented as a total package in its final years.




As discussed in the first section of this report, the merits of the individual assessment instruments and instructional strategies had already been demonstrated in previous research and demonstration projects. This project involved the integration of those materials into a cohesive package that would improve educational outcomes for children who are deafblind. The key findings from the project are summarized below.

- Parent involvement is key to the Learning to Learn approach. Parent input is solicited at the first step of the model (Assessment) where parents are asked to provide assessment information from home and community. Their input is given equal weight to that of professionals. Side-by-side comparison of child performance in the two environments presents a complete picture of the learner. This aspect of the model also encourages the collaboration of parents and teachers in setting individualized instructional goals and in determining exactly what form instruction should take. In project classrooms, parents were very willing to provide such input, demonstrating a high rate of compliance to such requests.
- The Learning to Learn model represents a seamless instructional approach based on assessment instruments that lend themselves clearly to the development of individualized educational goals. The Learning to Learn assessment instruments are pragmatic in terms of their immediate usefulness for generating instructional objectives. Skills are expressed in terminology that is meaningful to parents and teachers. Inspection of assessment data on a child's communication or concept development skills suggests both emerging skills with which the child needs further practice and logical new skills to target.
- The Learning to Learn approach emphasizes a logical sequence of instructional targets and the harnessing of the learner's intrinsic motivation to learn. These concepts are compatible with Bailey's (2002) discussion of critical experiences and teachable moments. Bailey suggests a shift in thinking away from the notion of critical periods (which imply that the opportunity to learn may be permanently missed if not provided by a certain age) to "critical experiences". Critical experiences are ones that are essential for children to maximize development. Such experiences may adhere to certain sequences—that is one sort of critical experience may necessarily have to follow a highly related one: but age *per se* is not considered as important as developmental status in relationship to readiness to learn. Teachable moments are related to critical experiences: teachable moments occur when the child is intrinsically motivated to learn something new. When the targeted skills are generic ones, teachable moments are likely to occur in many different contexts. The generic communication and concept development

skills targeted by the Learning to Learn approach might be conceived of as critical experiences that may be taught in a logical progression, always structuring learning around contexts and materials that are intrinsically motivating to the learner.

- *Time To Learn* proved to be an effective tool for teachers to organize their interventions. This environmental inventory was used to focus the teacher's attention on aspects of the social and physical environments that encourage learning. It seemed to serve as a useful heuristic, suggesting teaching strategies other than the typical heavily teacher-directed ones. It also proved useful for project staff to monitor interventions conducted in participating classrooms. The *Time to Learn* data generated from the videotaped programs showed strong correlations with teacher and student behavior. Although it would not be possible for classroom staff to conduct the detailed analyses of videotapes that project staff conducted, it *is* possible for teachers to administer *Time to Learn* to project activities as they observe or even conduct them. Project data show that *Time to Learn* scores are a good reflection of teacher and child performance.
- Participating teachers were heavily involved in the development of materials that knitted together the four model components: Assessment, Designing a Learning Plan, Teaching & Learning and Monitoring Performance to Promote Progress. Teachers were especially instrumental in creating *On the Same Page*, the form that integrates all four model components. We feel that the continuous input from participating teachers was key to the development of materials that educators were able to use without on-site support.
- The analyses of the videotaped target activities for each participating student showed conclusively that teachers could target opportunities for concept development and for communication development in the same activity.
- Some of the project participants had severe orthopedic impairments and demonstrated neither intentional communication skills nor intentional object interaction skills at the start of the project. For these students, the distinction between communication and concept development skills seemed to blur because they were dependent on others to engage *both* the social and the physical environments. Intervention would target one or two motor behaviors that might be used equally for communication or for interaction with the physical environment. For instance, a student might learn to activate a switch to gain someone's attention (a communicative behavior) using a swiping motion of the hand. That same motion might also be targeted as a way to activate a simple mechanical toy (a concept development skill). The critical learning involves the child's *understanding* that the specific movement can be used to gain control over the social environment (communication) and over the physical environment (concept development). Another student might achieve the same understanding by learning to approach someone to gain his or her attention (communication) and to approach a desired object to gain access to it (concept development). At this very early level of skill development, the distinction is less important than the significance of the child's *awareness* of the potential effect of his or her behavior on *either* the physical or the social environment.

- Students in model and field test classrooms achieved comparable outcomes. Consultation in model classrooms focused initially on child performance, while in the field test classrooms the focus was primarily on the learning environment. This suggests that teacher behavior could be shaped using *Time to Learn* as a catalyst and that the benefit of this environmental emphasis was reflected in student progress. A second implication is that teachers were able to understand the Learning to Learn materials and that they were able to implement the strategies described by the materials without face-to-face support from the project.

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