Thomas the Writer: Case Study of a Child With Severe Physical, Speech, and Visual Impairments

Doreen M. Blischak
Purdue University, West Lafayette, IN

The development of a comprehensive augmentative and alternative communication (AAC) program for individuals with physical and visual impairments presents a considerable challenge. Frequently, the range of both input and output options is severely limited, as an individual may be unable to use direct selection to access graphic or three-dimensional symbols (e.g., Braille, tangible symbols) or a keyboard (Franklin & Newman, 1992; Fried-Oken, 1988; Locke & Mirenda, 1988; Rowland & Schweigert, 1989). Speech production may be severely impaired as well.

In spite of the fact that there are important visual components in spoken language, literature on the language development of blind children indicates that vision impairment alone does not necessarily cause a language impairment (Civelli, 1983; Dunlea, 1989; Mills, 1983, 1988). Nor is the presence of severe physical and speech impairments sufficient to prevent the development of language competency (e.g., Bishop, 1988). However, little is known about the combined effects of severe motor, speech, and visual impairments on language development. Development of literacy skills may be considered beyond an individual’s capabilities or accessibility, and thus may not be realized fully.

Successful intervention involving language and literacy skills in individuals with severe physical, speech, and visual impairments has been reported. For instance, Locke and Mirenda (1988) described an intervention program for an AAC user who was visually impaired, although literacy development was not a targeted goal at that time. Thorley, Ward, Binepal, and Dolan (1991) used printed words to supplement and encourage the use of manual sign for a child with severe visual, hearing, and cognitive impairments.

Other individuals with visual and physical impairments have used auditory scanning (Beukelman, Yorkston, & Dowden, 1985) and Morse code (Rogow, 1988) for written communication. Certainly, the development of communication competency and literacy are not beyond the reach of some individuals with multiple impairments. As such, case studies can provide additional valuable information regarding successful experiences and intervention (McEwen & Karlan, 1990).

Because the majority of children diagnosed today with vision impairment have multiple impairments (Dunlea, 1989; Franklin & Newman, 1992), it can be expected that a number may require AAC intervention. Although attainment of literacy may not be a realistic goal for all, early and appropriate intervention can result in the attainment of literacy skills that may lead to greater self-expression and independence (Blackstone & Cassatt-James, 1988; Blau, 1986).

In this case study, the communication and literacy development of a 9-year-old boy, Thomas, is described. His early development, family and professional involvement, and the selection and use of his AAC system is described, with emphasis on the development of written language. Descriptions of activities to develop phonological, syntactical, and discourse skills, and the use of technology for conversation, storytelling, telephone access, word processing, and completing homework is provided. Adaptations for Thomas’s inclusion in a second grade whole-language classroom also are described.
CURRENT STATUS

Thomas is a lively, inquisitive boy with quadriplegic cerebral palsy. He does not have functional use of his hands, arms, or legs, and uses a single head switch to operate a power wheelchair and assistive communication device. Thomas also has a central vision impairment that limits his functional vision to identifying some objects and line drawings at close range. Thus, his main sensory channel for learning and interaction is auditory. Although Thomas had occasional ear infections during his preschool years, periodic audiologic monitoring indicates that his hearing is within normal limits. Thomas lives at home and participates in a full range of family, church, community, and school events.

Thomas attends a second grade whole-language classroom where he receives occupational, physical, and speech-language therapy. He also has a full-time paraprofessional to assist him in eating, mobility, and classroom activities. Thomas receives private occupational and physical therapy at local hospitals and attends weekly speech-language therapy sessions at Purdue University.

Unaided Communication

Thomas’s speech is severely dysarthric. He produces word approximations with appropriate intonation for a variety of communication functions (e.g., greet, comment). Thomas’s spontaneous single word productions are not typically intelligible to naive listeners, although family members report that they generally understand 75–90% of his utterances in context. Speech attempts deteriorate with increased communication demands, as increased spasticity makes it difficult for Thomas to initiate vocalization and articulatory movements.

Thomas effectively uses several partner-assisted methods for communication, including answering yes–no questions and vocalizing and/or using eye gaze to respond to presented choices. Thomas also produces one- to three-word utterances (e.g., “What are we...?”) and vocalizes to confirm or refute his partner’s prediction of subsequent words. Occasionally, he spontaneously produces complete sentences of up to six word approximations (e.g., “May I please have a drink?”).

Aided Communication

Thomas uses a headswitch to operate Talking Screen software (available from Words+, Lancaster, CA) housed in a laptop computer mounted to his wheelchair. The Talking Screen features visual (graphic) and auditory (synthetic speech) scanning for message selection and high-quality speech and print output. With auditory scanning, Thomas activates a switch to begin the process and selections are spoken as an area on the computer monitor is illuminated. A second switch activation stops the scanning and a message is then spoken. For example, the Talking Screen is programmed with selections for drinks—milk, water, juice—and corresponding messages—“May I have some juice please?” Thomas’s Talking Screen currently contains approximately 200 items (words, sentences, songs, and commands) along with the alphabet and the numerals 0 to 20. Thomas spontaneously uses the Talking Screen to initiate conversation, request basic needs, participate in some school activities, and complete homework assignments. Additional details regarding the Talking Screen are provided in subsequent sections.

BACKGROUND

Early Development

Thomas was born prematurely in 1983 and spent 3 months in neonatal intensive care. At the age of 1 year, he began receiving home-based services; by age 2, he was receiving private occupational, physical, and speech-language therapy. Thomas also was diagnosed with quadriplegic spastic cerebral palsy and received eye surgery to correct strabismus (an imbalance in the extrinsic eye musculature) and left esotropia (eye turned inward). At that time, the presence of optic nerve hypoplasia (underdevelopment) was confirmed, although the area and extent of the visual field affected were not determined.

During the fall of 1986, at age 3, Thomas began attending an integrated preschool and was enrolled in individual speech-language therapy at Purdue University. Informal assessment indicated receptive language skills at 18 to 24 months and expressive language skills at 4 to 6 months.

Augmentative and Alternative Communication

In the spring of 1987, at age 3½, Thomas was introduced to formal AAC intervention. Here, Thomas’s communication partners continued to respond to his unaided communication (gestures, speech approximations), but also introduced graphic symbols to determine if he could use them effectively (Mills, 1983; Carlson, 1987). Although the extent to which Thomas’s vision was impaired was still undetermined, it was considered important to attempt visually based communication methods. Thomas reportedly used eye gaze to select 3-inch line drawings, but his use was inconsistent. In collaboration with Thomas’s occupational therapist, single switch toys (e.g., Goossens’ & Crain, 1986) and a simple clock-type assistive communication device, the Dial Scan (Don Johnston Developmental Equipment, Inc., Wauconda, IL), also were introduced to begin work on accuracy in using a head switch.

In the fall of 1989, as Thomas started school (kindergarten and a class for physically handicapped students) at age 6, therapy activities began to focus on language experiences; higher level concepts and skills such as verbs, categories, and opposites; and sequencing steps to complete a story. For these activities, a multimodal communication approach was continued, incorporating speech, eye gaze, and the selection of 3-inch pictures attached to the Dial Scan. In the spring of 1990, Thomas received his power wheel-
chair and began work on using his functional vision and switch control to travel on smooth surfaces (e.g., gym).

Work on selecting an appropriate voice output device continued during the fall of 1990, as Thomas turned 7. At this time, the LightTalker (Prentke Romich Company, Wooster, OH) was introduced to Thomas for trial use. It was intended that even if Thomas could not visually follow the light emitting diode (LED), by making use of his residual vision, listening for the auditory feedback (“beep”), and memorizing picture/icon location, he could access the Light Talker via row-column scanning. During this time, however, it was noted that Thomas appeared to have experienced a change in his visual abilities, such that he was having consistent difficulty naming previously identified pictures and symbols. An examination by his ophthalmologist indicated that Thomas was legally blind and had no good central fixation in either eye, and that his condition was not considered to be progressive. It was suggested that Thomas had difficulty maintaining visual fixation for scanning a row of pictures or lights.

Individuals with central vision deficits also have difficulty seeing an object presented directly in front of them and so must compensate by shifting their focus off center (Franklin & Newman, 1992). Thomas’s difficulty with head control thus further limited functional use of his vision. Although the majority of individuals classified as legally blind have sufficient use of residual vision to use it as a primary scanning channel for literacy and academic tasks (Barraga, 1983, cited in Franklin & Newman, 1992), this was determined to be inappropriate for Thomas. Use of the LightTalker was deferred, and clinicians continued to develop Thomas’s use of low-tech options and pursue an appropriate electronic communication device with auditory scanning.

Throughout the 1990–1991 school year, clinicians used partner-assisted scanning (Piche’ & Reichle, 1990) so that Thomas could participate in conversation and activities for vocabulary development and sentence construction. Here, clinicians presented Thomas with choices (e.g., chocolate, vanilla, strawberry) by speaking each word and using their right hands to indicate the position in space (right side, middle, left side). Thomas responded by gazing at the position of his selected response and/or producing a word approximation. At home, Thomas generally did not make use of the visual component of the partner-assisted scanning. His speech attempts, particularly when given a restricted set of choices, generally were understood by family members.

During the spring of 1991, Thomas received an evaluation at the Indiana School for the Blind. Evaluators reported that although Thomas could see many objects, persons, pictures, and symbols from varying positions and distances, he was quite inconsistent in his ability to do so. It was concluded that Thomas’s degree of physical impairment made it difficult for him to make the necessary accommodations for his vision deficit, severely limiting his functional vision. He therefore did not attend to the full visual field and benefit from viewing a panorama of visual experiences. Although it was not feasible to obtain an accurate measure of intelligence for Thomas, psychological evaluation based on observation and informal evaluation of Thomas’s demonstrated cognitive skills (e.g., memory, problem solving) indicated that his current functioning was, at the lowest, in the mild-to-moderate range of cognitive disability.

Given this encouraging information regarding Thomas’s cognitive abilities, work on developing literacy skills was continued during the fall of 1991, as Thomas turned 8, with emphasis on phonological awareness and spelling tasks. Clinicians introduced letter names and sounds, sound blending, and the spelling of simple words, incorporating these into language experience activities, stories, and school work (Catts, 1991). Although these activities were primarily auditory, enlarged alphabet letters also were presented for visual and tactile (with physical assistance) experience. Syntactic and discourse skills also were emphasized as Thomas’s family was encouraged to assist him in composing stories. Here, family members used techniques described previously (interpreting word approximations, asking yes—no questions, providing fill-ins) as Thomas selected characters, time frames and sequences, and dialogue. He proved to be quite imaginative in creating his stories and each day requested to “make up” (a story).

Talking Screen. During the fall of 1991, it was determined that the Talking Screen was a potential AAC option for Thomas. The auditory scanning component of the Talking Screen allows for the use of contrasting voices for scanning versus speaking. Thus, a neutral voice could be used for scanning choices and a voice with a more age-appropriate pitch and intonation could speak Thomas’s actual messages. The Talking Screen is organized in a page format. For example, a user may store food-related messages on a food page and/or use the food page to access other pages such as breakfast, lunch, or dinner. Many combinations are possible, and the number of items per page may vary from 1 to 32. The Talking Screen also features a dynamic display, analogous to turning pages of a book, so that one page replaces another on the computer screen.

To prepare Thomas for a trial session with the Talking Screen, clinicians designed a “mock-up” paper version to simulate row-column auditory scanning. To this end, the process of message selection was begun and Thomas chose four pages (e.g., people) and items for each. The clinician would then speak each item (e.g., Mom, Dad, Grandma, Grandpa) and Thomas would use a head switch-activated noisy toy to indicate when he had made his choice. Using this mock-up system with all its components before trial use of the Talking Screen proved to be beneficial as it allowed clinicians to estimate scanning speed, switch activation time, and Thomas’s grasp of the techniques necessary to use the Talking Screen, and to begin the process of message selection.

In October of 1991, Thomas received a 1-hour trial session with the Talking Screen, during which time he progressed from accessing a single icon to using a multiple icon row-column scanning array to spontaneously assert that he wanted a hamburger, fries, and coke. It was evident to Thomas, his family, and the team members that the Talking Screen was an appropriate option. Community
members and service organizations in Thomas’s town joined forces and quickly raised money for the purchase of software, a laptop computer, and a printer. Thomas received his Talking Screen before the new year of 1992.

Additional message selection then was undertaken with input from Thomas, his family, and school staff. Various manufactured lists also were consulted in order to avoid excluding vocabulary that is important for conversation regulation and clarification (Beukelman & Mirenda, 1992; Blackstone, 1988). Suggestions were discussed each session with Thomas and his mother and slight changes were made as messages were programmed and Thomas began to use the Talking Screen functionally. Fortunately, all message storage was carried out by Thomas’s family, who had little prior computer experience, with help from Words+ and Purdue staff.

As previously mentioned, at this point, Thomas’s Talking Screen contained over 200 message items organized by situation (e.g., music class) or function (e.g., feelings). The most important messages were clustered in the upper left corner of each page in order to allow for quickest access when using row-column scanning. Page 1, which the Talking Screen automatically displayed when the laptop was turned on, contained the names of other pages Thomas could access (Figure 1). Each of these subordinate pages contained appropriate messages, commands to access other pages (e.g., the calendar page contained a command to access the months page), and a command to return to Page 1.

School participation. In April of 1992, Thomas started using the Talking Screen at school, following an inservice workshop provided to school staff by Purdue clinicians and Thomas’s mother and older sister (see Figure 2). It was suggested that Thomas be encouraged to use the Talking Screen as a backup when his speech was not understood, to initiate a conversation, or to participate in group activities such as calendar time, music, games, or storytelling. Use of the spelling page was initiated in therapy for continued work on letter–sound correspondence and spelling skills. Thomas was encouraged to attempt to spell simple words and listen to the voice output speak the resulting word. By the summer of 1992, Thomas used the clear, erase, and print functions of the letter page spontaneously and had achieved a switch accuracy of 82%.

<table>
<thead>
<tr>
<th>TR page</th>
<th>question</th>
<th>foods page</th>
<th>my page</th>
</tr>
</thead>
<tbody>
<tr>
<td>needs page</td>
<td>feelings</td>
<td>drinks page</td>
<td>music page</td>
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<tr>
<td>school page</td>
<td>home</td>
<td>places page</td>
<td>church</td>
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Figure 2. Recommendations for school participation.

1. To keep Thomas in touch with what is going on around him, always remember to tell him what of importance is happening now and what will happen next. Involve him as much as possible in decision making and before beginning an action or activity (e.g., adjusting his glasses, moving his chair). In short, use his strong auditory channel to ensure that he is informed and involved.

2. Always sit on Thomas’s left side, the side opposite his switch. He seeks face-to-face contact and will struggle to sit very still so as not to accidentally activate the switch. Remind him that it is okay to (and that he should) use his Talking Screen to tell others to please sit on his left side.

3. During selected school activities (e.g., story time), close the lid of his laptop without turning it off. The Talking Screen will still function and it will not obscure his view of those in front of him. Again, always ask Thomas before closing the Talking Screen.

4. Thomas can produce a speech approximation for “turn on” to remind others to turn his laptop back on after periods of no use (e.g., lunch). Listen for and respond to his speech attempts. If he doesn’t say “turn on” spontaneously, then have him practice that briefly any time the laptop is turned on for him.

5. Continue to provide as many visual and tactile opportunities for Thomas as possible. Always ask him if an object or picture is in an optimal position for him to see it. Viewing is best slightly off center, as he has a central vision deficit. Take the time to let him touch objects. You can mold his hands around something, keeping a tight grip to prevent his sudden movement from knocking an object off the tray. Involve him in writing/drawing using hand-over-hand.

6. Continue to practice pronouncing and spelling words, emphasizing consonant and vowel sounds and letters, consonant blends and digraphs, and silent letters. Spell words to him and encourage Thomas to attempt to spell new words orally. Compare new words to known ones that rhyme or begin with the same letter.

7. When conversing with Thomas, it is helpful to do the following:

   a. Avoid talking while he is using the auditory scanning on the Talking Screen. Use this time to get a better idea of his available vocabulary.

   b. Allow plenty of response time. Thomas may respond by speaking or using his Talking Screen. Be careful not to rephrase a question or ask him a second question without giving him adequate response time. If he responds to the first question after you have continued, a very strange conversation could result.

   c. Respond in some way to Thomas’s speech attempts. If you do not understand, you could ask him to repeat, give him choices, ask if he could use his Talking Screen, or ask if he wants to “skip it” and talk about it later. You also might ask him if he could try to spell the word, at least some of the letters, but this takes longer.

   d. Repeat Thomas’s speech productions as he says them so that you can construct a statement or question. Thomas frequently speaks one word at a time and waits for his communication partner to repeat the word. Don’t hesitate to predict if you think you may know the end of the utterance. Thomas will say yes or no to confirm or deny your prediction.
The fall of 1992 began a landmark school year for Thomas. As he turned 9, he was included in a whole-language second grade classroom with the assistance of a paraprofessional (teacher’s aide), helper-for-the-day (peer), and continued speech-language, occupational, and physical therapy. Thomas began studying for and passing grade-level oral spelling tests, dictating stories and journal entries, interacting with peers through shared reading experiences (e.g., peer reading to him during SQUIRT—super quiet uninterrupted reading time), and reciting poetry (that had been stored in his Talking Screen. For much of his spontaneous daily interaction and school participation, Thomas preferred to rely on unaided methods of communication—vocalizations, word approximations, and responding to partners’ questions and offered choices, using the Talking Screen to initiate conversation and express basic needs.

During this time, therapy activities concentrated on exploring methods to increase Thomas’s independent writing abilities, as Thomas had expressed an interest in doing homework. Eight to ten sentence passages were recorded on cassette tape followed by three or four multiple choice questions. Thomas was required to listen to the passage and use his Talking Screen letter or number page to select and print answers. Thomas’s success in completing this homework demonstrated his achievement of several very important skills.

To benefit from listening to aural reading (or “auding”), an individual must be able to process auditory-linguistic information accurately and efficiently, which involves comprehending word meanings, remembering sequences, extracting details, and understanding the main idea (Franklin & Newman, 1992). This requires consistent attention to the auditory stimulus, a task that may be particularly difficult or distressful to a visually impaired person who uses the auditory channel to maintain contact with the environment (Mills, 1988). Thomas also had to hold information in his memory while waiting for questions to be read to him and choices offered. Further, he had become accustomed to a great deal of one-on-one attention and had stopped listening independently to taped stories for the most part, preferring the more interactive story dictation and oral reading activities. In spite of these potential obstacles, Thomas completed short assignments independently after clinicians determined the appropriate reading rate and pause time between questions.

**Vision evaluation.** Another important event during the fall of 1992 was Thomas’s visit to a low vision clinic. Here, the optometrist corroborated that Thomas’s visual acuity was profoundly affected but that he could see 4-inch stimuli at close range. Further, it was noted that Thomas may be able to make better use of his vision with adaptations to overcome fatigue and positioning difficulties. Before this evaluation, family, school staff, and clinicians had been making ongoing efforts to encourage Thomas to use his vision. Because of his apparent fluctuation and lacking a clear expectation of Thomas’s actual visual capabilities, they often were hesitant to spend prolonged amounts of time with visual materials. Armed with this new information, school staff and clinicians began using a large sheet magnifier (i.e., one typically used to magnify an entire page) to enlarge objects, drawings, and pictures; writing on a large black dry erase board with neon marker; and introducing sight words using 3- and 4-inch black letters on neon paper.

Use of Morse code via the software program Morse Code WSKE (Words+) with an enlarged-print word processing program also was introduced in the spring of 1993. Thomas demonstrated an understanding of the methodology behind using Morse code, but despite practice across several sessions, did not appear to have sufficient switch control to produce switch hits and releases with the appropriate relative timing (i.e., pauses between letters and words). Even with intense practice, the use of Morse code appeared to be a tedious and frustrating method for Thomas. Clinicians turned once again to auditory scanning as a viable access method for word processing and introduced the software program Scanning WSK (Words+), which features auditory scanning, abbreviation-expansion, and word prediction.

**Future goals.** In the fall of 1993, at age 10, Thomas returned to his home school and began third grade. Here, he receives individual therapy on a less frequent basis as he continues to become more integrated into the elementary school curriculum and activities. Ancillary service providers (e.g., school computer staff) continue to provide technical support for continued expansion of Thomas’s independence in spoken and written communication skills and telephone access. At this writing, Thomas uses a speaker phone at home and Scanning WSKE and a page magnifier at school.

**DISCUSSION**

Certainly, Thomas has benefited from a broad range of experiences and interventions that have contributed to his present levels of language and literacy achievement. Table 1 provides a summary of the types of experiences that contribute to literacy, constraints imposed by visual and physical impairments, and suggested experiences and intervention strategies to overcome these constraints. A discussion of experiences specific to Thomas, including his use of the Talking Screen, follows.

**Language and Literacy**

Observations of Thomas’s family and a review of clinic records indicate that from early infancy, family members, clinicians, and educators made extraordinary efforts to promote Thomas’s active participation in communication and emerging literacy activities. When Thomas was a preschooler, it was noted that in spite of his known visual impairment, family members and clinicians intervened to encourage reaching (toys, Mom’s hair, pictures) and engaging in language play in social routines (see Carlson, 1987; Rogow, 1983, 1993; Stratton & Wright, 1991). One particular interference in participating in language experiences for the child with visual impairment involves the physical distance between the child and an object or person under discussion. Developing infants reach to objects by
<table>
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<tr>
<th>Components of literacy development</th>
<th>Constraints from visual impairment</th>
<th>Constraints from physical impairment</th>
<th>Suggested intervention strategies</th>
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<tr>
<td>broad experiences (Stratton &amp; Wright, 1991)</td>
<td>• difficulty matching language input to event</td>
<td>• difficulty ambulating</td>
<td>• involve in everyday routines (Kekelis &amp; Anderson, 1984)</td>
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<td></td>
<td>• difficulty reaching and feeling objects</td>
<td>• difficulty reaching and feeling objects; limited sensorimotor interaction (Carlson, 1987; Hogg &amp; Sebba, 1987)</td>
<td>• describe and bring experiences to him (Kekelis &amp; Anderson, 1984; Landau &amp; Gleitman, 1985)</td>
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<td></td>
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<td>• difficulty moving independently to bring objects, persons, experiences closer and making compensatory postural adjustments (Carlson, 1987)</td>
<td>• imaginative play (Rogow, 1988)</td>
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<td>language experiences (Stratton &amp; Wright, 1991)</td>
<td>• tendency of others to give directives, labels, child-centered topics (Kekelis &amp; Anderson, 1984)</td>
<td>• severe speech impairment (Carlson, 1987)</td>
<td>• adapted toys (Carlson, 1987)</td>
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<td></td>
<td>• difficulty matching language input to objects, persons, experiences (Landau &amp; Gleitman, 1985)</td>
<td>• severely restricted use of direct selection, slow rate, altered communication patterns (Fried-Oken, 1988)</td>
<td>• positioning to facilitate participation (Foley, 1990; McEwen &amp; Lloyd, 1990)</td>
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<td></td>
<td>• limited access to graphic means of communication</td>
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<td>• respond to natural signals (Mills, 1983; Rogow, 1988)</td>
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<td>reading aloud (Stratton &amp; Wright, 1991)</td>
<td>• cannot see print or follow text with eyes</td>
<td>• cannot choose his own books independently (Light &amp; Kelford-Smith, 1993)</td>
<td>• early, multimodal AAC intervention (Carlson, 1987)</td>
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<td>• cannot choose his own books independently</td>
<td>• difficulty retelling, asking questions about stories (Katims, 1993)</td>
<td>• social language play in routines (e.g., rhymes) (Rogow, 1983, 1988, 1993)</td>
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<td>• cannot ask questions about print (Hiebert, 1986)</td>
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<td>• encourage to ask questions (Erin, 1986)</td>
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<td>book handling; understanding purposes of print (Hiebert, 1986; Stratton &amp; Wright, 1991)</td>
<td>• cannot see print</td>
<td>• cannot handle books independently (Light &amp; Kelford-Smith, 1993)</td>
<td>• stress social nature of language and literacy (Koppenhaver, Evans, &amp; Yoder, 1991)</td>
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<tr>
<td>scribbling/writing/composing (Light &amp; Kelford-Smith, 1993; Stratton &amp; Wright, 1991)</td>
<td>• cannot see detail</td>
<td>• cannot scribble/write independently</td>
<td>• provide means to request books, encourage active participation (Foley, 1990; Teale, 1986)</td>
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<td></td>
<td>• little direct experience with writing</td>
<td>• single switch user</td>
<td>• make up stories (Beringer &amp; Gans, 1986)</td>
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<td></td>
<td></td>
<td>• little direct experience with writing</td>
<td>• predictable books, poetry, rhymes, music (Koppenhaver &amp; Coleman, 1991; Rogow, 1988)</td>
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<tr>
<td>observe others reading (Light &amp; Kelford-Smith, 1993; Teale, 1986)</td>
<td>• cannot incidentally observe others reading</td>
<td>• cannot independently move or bring print closer</td>
<td>• bring close, enlarge, describe (Landau &amp; Gleitman, 1985; Stratton &amp; Wright, 1991)</td>
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<td>belief in literacy (Koppenhaver et al., 1991)</td>
<td>• why not?</td>
<td>• why not?</td>
<td>• tactile supplements (Miller, 1985; Stratton &amp; Wright, 1991)</td>
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<td>• hand-over-hand or adapted writing device (Doherty, 1987)</td>
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<td>• story and journal dictation (Beringer &amp; Gans, 1986; Katims, 1993)</td>
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<td>• text-to-speech potential of VOCA (Bevers &amp; Hallinan, 1990)</td>
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<td></td>
<td></td>
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<td>• encourage phonemic analysis and blending, sound-letter correspondence, spelling and invented spellings (Catts, 1991; Hiebert, 1986; Foley &amp; Eule, 1992; Katims, 1993)</td>
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sight before searching and reacting in response to auditory input. Thus, a child with a visual impairment not only may experience delays in reaching for and interacting with objects, but also is restricted in the ability to see objects and persons as others in the environment talk about and/or interact with them (Landau & Gleitman, 1985). Thomas was at an even greater disadvantage because he was unable to both move independently toward and reach for objects, severely restricting his sensorimotor experiences (Hogg & Sebbia, 1987).

Landau and Gleitman (1985) suggested that objects be brought in close to a child with a visual impairment in order to encourage visual and physical exploration, along with appropriate language input. Although it is difficult to provide these types of experiences as frequently throughout the day as those enjoyed by a child without a disability, Thomas’s family and others have made intensive efforts to bring objects and persons closer to him and/or describe what is happening. For example, Thomas’s mother might describe a situation with his younger brother and then involve Thomas through her language input and physical interaction (i.e., “Phillip is crying because he is cranky and needs a nap. I can’t find his blanket. Do you want to hold him while I look for it?”).

Another potential obstacle in developing language competency for children with visual impairment involves the tendency of family members to modify their language input. Kekelis and Anderson (1984) found that others provided young children with visual impairment with a high number of imperatives (e.g., Take off your coat) and labels, perhaps to compensate for the child’s inability to identify and respond to environmental cues. Child-centered topics also predominated. However, Thomas appears to be spared from these modifications, in part, because the severity of his physical disability made following directives difficult, if not impossible. Thus, communication partners had the “luxury” of providing rich descriptions and monologues to Thomas during such activities as taking off his coat, an interaction style that may be more typical of AAC users and their partners (Light, 1988).

Thomas’s natural desire to speak and ask questions during these activities of daily living (e.g., dressing, transfer, toileting) frequently creates excessive spasticity, which interferes with task completion. To compensate for this, Thomas is encouraged to remember his question or comment for later. His communication partner typically does not discontinue speaking, but rather continues the monologue, describing a prior or upcoming event. Generally, when the activity is completed, either Thomas or his communication partner remembers to return to his earlier communication attempt.

One final point about Thomas’s language development concerns his ability to ask questions. Erin (1986) suggested that children with visual impairment be encouraged to ask questions in order to seek information that may be readily available to a child with sight. Asking questions becomes even more important for Thomas, whose physical impairment further impedes his ability to independently discover the information he may be seeking. Family members have encouraged his asking questions by first modeling one word at a time, eventually repeating his spontaneous speech attempts as he is understood. In fact, questions are among the most frequent of Thomas’s spontaneous utterances, for social interaction (“How are you?”), to find out what is expected of him (“What do we do today?”), to ask permission/request (“May I please have a drink?”), to anticipate (“What are we having for supper?”), and to gain information (“Do you have a dog?”).

Occupational, physical, and speech-language therapy also have enhanced Thomas’s ability to learn and participate actively in both natural and therapeutic settings. Responding to his natural signals (Mills, 1983; Rogow, 1988) and early introduction of eyegaze (Carlson, 1987) provided opportunities for Thomas to exercise control over his environment and laid the groundwork for the eventual use of a voice output communication aid. His opportunity to use powered mobility also has contributed to his experiences and independence.

As a preschooler and during his early school years, Thomas also had many opportunities to observe and participate in experiences that promote literacy (Teale, 1986). A number of authors have described experiences across a range of levels of language production and processing (discourse, syntactic, phonemic) that impact literacy development. Thomas was read to by all family members and listened to books on tape (Stratton & Wright, 1991). Although he could not benefit from seeing print or asking questions about it (Hiebert, 1986; Stratton & Wright, 1991), family members encouraged his active participation in reading and book experiences by giving him choices of books; reading predictable books, rhymes, and poetry (Koppenhaver & Coleman, 1991; Rogow, 1988); and encouraging him to repeat phrases and sentences. Although book handling also was extremely difficult for Thomas, family members and clinicians brought books in close and provided tactile supplements (e.g., objects) (Hiebert, 1986; Landau & Gleitman, 1985; Miller, 1985; Stratton & Wright, 1991).

Thomas’s participation in language and literacy experiences has been enhanced by his inclusion in a second grade classroom in which a whole-language approach to learning is followed. Thus, he receives the benefit of meaningful, experientially based literacy instruction with a variety of persons, objects, and materials. Individual and small group instruction by and with peers has facilitated his active participation; using prestored selections in the Talking Screen to recite poems and journal entries has allowed his independent participation. Thomas is an ardent learner and can be fiercely competitive—qualities shared by many of the literate AAC users reported by Koppenhaver and Yoder (1992).

Talking Screen

Use of auditory scanning for access to voice and print output was considered to be the only viable option for Thomas, yet its disadvantages had to be considered. Whereas in visual scanning, the user can see an entire array of items simultaneously, auditory scanning allows

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only one item to be presented at a time. This factor, combined with the memory demands required of the user, makes auditory scanning a slower access method than visual alone (Beukelman et al., 1985; Fried-Oken, 1988). During the initial trial session with the Talking Screen, Thomas appeared to have memorized the location of messages on an array with few large message areas (approximately six) and used his vision as his primary means to follow the scanning. However, with screens of up to 32 items and additional messages added over time, Thomas has returned to using auditory scanning primarily.

Another disadvantage to the use of auditory scanning is its potential to annoy, distract, or confuse communication partners. This generally has not been the case with familiar communication partners, who appear to quickly acclimate to the Talking Screen after an explanation and demonstration of its operation. Further, successful use of auditory scanning requires the user to have good auditory figure-ground discrimination and uninterrupted attention to the scanning voice. For a person with a visual impairment who is accustomed to monitoring the environment auditorily, attention to this sometimes time-consuming process may be distressful. This appears to be the case when Thomas is in his classroom, particularly during group activities. Thomas’s communication partners tend to follow his lead and not insist that he use the Talking Screen when it may interfere with his listening and learning, and instead have encouraged its use during recess, individual work, teacher-directed activities (e.g., story reading), and social conversation.

In therapy sessions, the letter page of the Talking Screen has been used for developing independent writing skills. At the beginning of each session, Thomas accesses the letter page and is given 5 “warm-up” minutes to practice using his switch, troubleshoot his system, and type whatever he chooses. Although Thomas has not typed complete, correct words, the clinician occasionally can determine his intended spelling (TMM = tomorrow). Invented spellings are encouraged to promote creativity and independence, and also to provide Thomas with spoken output for his created text. Such use of the letter page is not intended to be an end system for Thomas, but rather to prepare him for eventual independent word processing with auditory scanning or Morse code input. Composing text with these methods often is tedious and time consuming (see Koppenhaver & Yoder, 1992 for a review), yet important for allowing children with visual impairments the independence and private editing that dictation does not permit (Beever & Hallinan, 1990). It is expected that Thomas will continue to dictate much of his written work and use word processing as he develops speed and accuracy. It also is conceivable that technical advancements in voice recognition may create available options in the future (Coleman & Meyers, 1991; Noyes & Frankish, 1992).

**CONCLUSIONS**

Like many of the literate adult AAC users described in a retrospective study by Koppenhaver, Evans, and Yoder (1991), Thomas grew up in a language- and literacy-rich environment and received individually oriented instruction where he and others believed in his achievement of literacy. Not only did he frequently observe family members reading, but he also was given opportunities to interact with books and writing at an early age within natural, meaningful experiences that promoted his active participation. Thomas’s enthusiasm for literacy appears unbounded. Although it is likely he may have gaps in his language and literacy development, he appears to have acquired a firm foundation for eventual independent writing.

It is intriguing to consider that although communication competency can be quite difficult to achieve for individuals with impairments as severe as Thomas’s, in reality, he is quite dependent on effective communication to overcome his physical and visual limitations. Thomas relies heavily on his language and literacy skills for social contact, learning about his world, and actively participating in life around him. Communication is his key to independence. Thus, he can make effective use of multimodal communication (eye gaze, body language, natural speech, assistive communication device) not despite, but rather because of, the severity of his impairments.

Thomas’s case study represents the experiences and achievements of one child who is still in the process of developing language and literacy competency. However, it is hoped that the documentation of his progress will inspire others to attempt interventions with similar children and spur additional research in the literacy development of AAC users.

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Contact author: Doreen M. Blischak, Department of Audiology and Speech Sciences, Heavilon Hall, Purdue University, West Lafayette, IN 47907.