



Research Summary on Assistive Technology Interventions

A research synthesis reviewed 104 articles published from 1980 through 2004 on the use of assistive technology (AT) with infants and young children (Campbell, Milbourne, Dugan, & Wilcox, 2006). Of the 104 articles, 77 were descriptive studies or discussion-oriented articles about recommended AT practices and 23 reported the results of studies that focused on teaching children how to use AT¹. All of the studies focused on whether children could learn how to use AT rather than the effects of AT on children's learning and development.

How were AT practices defined and implemented?

Most of the 23 studies focused on teaching children switch activation use (e.g., to activate computerized toys). A number of studies examined strategies to teach young children to use power mobility devices (e.g., motorized wheelchairs) and computers. Only one of the 23 studies reported on the effectiveness of teaching young children to use augmentative communication devices. Information about who facilitated children's use of AT was not provided in the review. Therefore, it is unclear whether teachers, family members, or researchers implemented the AT practices with children who participated in this research.

What were the characteristics of the participants and settings?

Across all studies, the sample size ranged from 1-120 children. The infants and young children ranged in ages from 2.5 to 60 months and were reported as having cerebral palsy, severe multiple disabilities, physical disabilities, global developmental delays, mild mental retardation, speech and language delays, and Down syndrome. The review did not describe the characteristics of the settings in which children used AT.

What were the key findings related to children's use of AT?

As a whole, the studies provided relatively strong evidence that children as young as 12 months with various types of disabilities and developmental delays could be taught to operate switches to activate toys and other devices. The results of studies examining children's use of augmentative communication, power mobility devices and computers were inconclusive due to insufficient research or problems with the research design. Across all studies and AT devices, the review found that the primary teaching strategy was providing opportunities for children to access the device and to practice using it, either alone or with minimal adult involvement.

Bottom line

Research on AT has shown that even very young children with physical disabilities and developmental delays can learn how to use AT devices successfully. However, further research is needed to evaluate the intervention effectiveness of AT not just on performing isolated skills but for promoting children's successful participation and learning within the context of everyday activities.

Campbell, P. H., Milbourne, S., Dugan, L. M., & Wilcox, J. M. (2006). A review of evidence on practices for teaching young children to use assistive technology devices. *Topics in Early Childhood Special Education, 26*(1), 3-13.

ⁱ The majority of the 23 studies employed single-participant designs; one study used a group design with random assignment to treatment and control conditions; and the remaining studies used quasi-experimental designs, case studies, or qualitative methods.

Examples of Assistive Technology Equipment

The term assistive technology equipment refers to many different types of items such as: self-help devices, special toys and switches, assistive listening devices, augmentative communication devices, and mobility and positioning devices. The assistive technology available to young children is changing and expanding at a rapid pace. The lists on this handout provide examples, but should not be considered to be comprehensive.

1. Self Help Devices – devices to assist with self-help skills and functional abilities related to bathing, eating, dressing and other daily routines. Items may include but are not limited to: adaptive feeding utensils, non-slip matting, bath chairs, and weighted vests and blankets.



Angled utensils with built up handles provide several grasping positions and promote greater success in eating.



Cut out cups allow a child to drink without head or neck hyperextension and stimulate the corners of the mouth to facilitate lip closure.

2. Toys and Switches – switches and interfaces that can allow a child to activate toys in order to support engagement in developmental learning through play. Items may include but are not limited to: switch adapted toys, single-use switches, or toys adapted with visual, tactile and auditory materials.



The child uses the yellow switch to activate or turn on the toy cat.



The fire engine can be operated by 2 different switches or by the round remote control.

3. Assistive Listening Devices – devices to help with auditory processing. Examples include hearing aids and FM systems.



An FM system allows a teacher to talk into a microphone that transmits sounds directly to the child's hearing aid or headphones. The transmission occurs on a reserved radio spectrum.

4. Augmentative Communication – any device, system, or method that improves the ability of a child to communicate effectively. For young children, it is important to include a variety of different augmentative communication strategies such as devices, signing, gestures, and pictures. Equipment may include but are not limited to: picture or object communication boards, symbol systems, and voice output devices.



The child pushes a button on the device to say a pre-recorded word or message. The buttons are labeled with pictures or symbols to signify the recorded message.¹



Communication boards are often made using software (e.g., Boardmaker[®]) with a library of picture symbols to create boards of any shape or size to help a child access a wide range of vocabulary. Individual symbols or boards can be placed around a room for access during particular activities, or carried around in a binder to be available at all times.

5. Mobility and Positioning – devices to promote and enhance access to and functioning in a child’s natural environments. Items of equipment may include but are not limited to: ankle-foot orthotic braces and splints, adapted special needs car seats, floor mobility and positioning devices, feeder seats, walkers, and standers.



This scooter board allows the child to move in all directions with four switches or a special joystick.ⁱ



This walker allows children who struggle with balance and mobility to be more independent.

ⁱ Photos courtesy of: Enabling Devices/Toys for Special Children, 800-832-8697, www.enablingdevices.com
Note: This handout is adapted from part of the 2010 North Carolina Infant-Toddler Program Manual.

Examples of Assistive Technology Adaptations

Adaptations for young children often involve modifications of existing toys, learning materials, or other everyday items. These adaptations can serve a wide variety of purposes so that children can participate in all types of learning opportunities. Below are some examples of adaptations for self-help, toys and play areas, communication and literacy, and mobility and positioning.

1. Self Help



A zipper pull makes dressing easier for a child. You can buy zipper pulls or make one using a key chain as seen here.



Non slip shelf liner can be used to stabilize objects, such as a plate or bowl during mealtime.



A child can use a bath mitt to more easily participate in bathing. Washing with a bath mitt could be easier than holding onto a wash cloth. Bath mitts can also be used to assist in grasping objects. Secure Velcro to the object and the bath mitts will cling to the Velcro making it easier for the child to pick up the object.ⁱ

2. Toys & Play Areas



Confining toys to a box lid, hula hoop, or planter base keeps the toys within the child's reach and vision.^{i,ii}

Handout 5.3



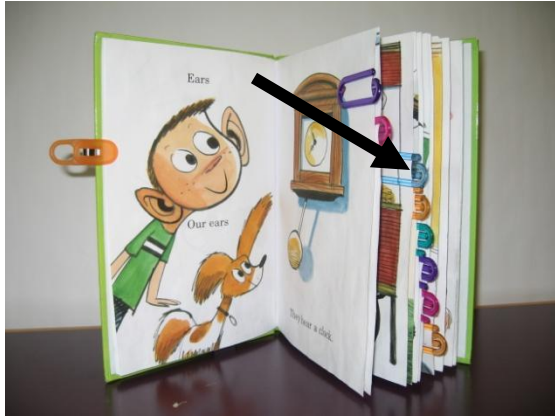
Knobs on puzzle pieces and foam around a rattle handle extend or build up the toy to allow a child to more easily grab and hold the toy.ⁱⁱ

3. Communication & Literacy



While many high tech commercially available augmentative communication devices are available, you can make your own low tech system using pictures of your own. Here is a photo of a homemade Picture Exchange Communication System (PECS). A child can choose what food he/she wants by pointing to or giving the photo to the care provider.ⁱⁱⁱ

Handout 5.3

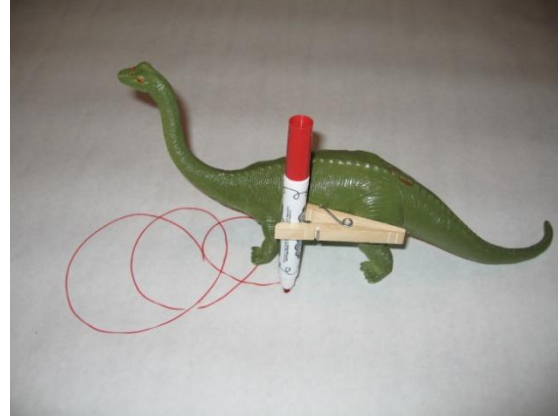


For children who struggle to turn the pages of books, large paper clips, binder clips, small chip clips, or self-adhesive index tabs can be used to give the child something to grasp to independently turn the page. Page fluffers allow for the same independence in reading by adding extra space between the pages. Use pieces of foam, peel and stick furniture protectors, or even just a dab of puff paint.ⁱ



Some children struggle to engage in reading activities, so providing interesting books is essential. For children with cognitive, motor, or sensory impairments, squishy books filled with a variety of materials can capture their interest and promote literacy. Books can be created with heavy duty zipper storage bags, a squishy filler (e.g., hair gel, lotion, sand, dirt, or packing materials), small toys or letters, and packing tape. Then words can be added by taping on strips of paper or writing on masking tape.^{iv}

Handout 5.3



Pencils, markers, and crayons can be adapted with balls or even a fun toy with a clothespin attached so the child can more easily grasp and manipulate the pencil.^v

4. Mobility & Positioning



If a child slides in a chair, try using bath decals to add friction and texture to a slippery chair seat. To give a child more support in sitting during floor time activities, create a bucket chair using a 5 gallon plastic pail and a round pillow.^v

ⁱ Demchak, M. (2007). *Tips for Home or School, Easy Adaptations for the Home or the Classroom*. Retrieved from Nevada Dual Sensory Impairment Project: <http://www.unr.edu/educ/ndsip/tipsheets/easyadaptationsforhome.pdf>

ⁱⁱ Center for Assistive Technology, University at Buffalo. (2003). *Let's Play! Projects*. Retrieved from <http://letsplay.buffalo.edu/>: <http://letsplay.buffalo.edu/toys/adapting-toys.pdf>

ⁱⁱⁱ Kideas.com. (2006). *Kideas Homemade PEC System*. Retrieved from <http://www.kideas.com/>: http://www.kideas.com/pdfs/kideas_PECs.pdf

^{iv} Pierce, P., Huston, C. & Franklin, J. (2009). *Fun Books for SHARED Reading*. Retrieved from <http://www.med.unc.edu/ahs/clds/files/early-childhood-resources/therm.funbooksfo.pdf>

^v *Tech n Tots*. (n.d.). Retrieved from Tech n Tots: <http://tnt.asu.edu/>



Policy Advisory

The Law Concerning Assistive Technology Interventions

How does the law define assistive technology for young children with disabilities? How do children, their families, and professionals such as you access the technology?

Bottom Line

The best methods for making assistive technology available to young children and their families and educators derive from the law itself. Below are your roles and responsibilities to better understanding the law as it relates to assistive technology (AT).

- (1) Know how Congress defines assistive technology devices and services.
- (2) Learn which types of devices and services are represented under assistive technology.
- (3) Understand the immediate and long-term purposes of AT and how it can increase a child's functioning and learning.
- (4) Know that IDEA and Sec. 504 provide that assistive technology devices and services are reasonable accommodations (Sec. 504) or related services (IDEA).
- (5) Identify the name and functions of the state assistive technology agency.
- (6) Identify which professions and disciplines are most expert in assistive technology for each child you serve and who the local experts are.

Definitions

Depending on who you ask and what context you are in, there are different definitions used for assistive technology.

A Practical and Basic Definition

The definition used in the module is practical and basic, the sort of definition educators and other professionals are well justified in using:

Assistive technology (AT) interventions involve a range of strategies to promote a child's access to learning opportunities, from making simple changes to the environment and materials to helping a child use special equipment. Combining AT with effective teaching promotes the child's participation in learning and relating to others.

A Legal Definition

Second is the legal definition, the sort of definition that Congress uses in the [Technology-Related Assistance Act of 1988](#), as amended and commonly known as the "[Tech Act](#)" (29 U.S.C. Sec. 3000 et seq.), the [Individuals with Disabilities Education Act](#), and the [Rehabilitation Act](#):

Handout 5.4

Assistive technology means technology designed to be utilized in an assistive technology **device** or **service** (29 U.S.C. Sec. 3002(3)).

Below is how Congress defines what AT devices and services are:

Device: *An assistive technology device is any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve the functional capacities of an individual with a disability (29 U.S.C. Sec. 3002(4)).*

Let's change the words a bit to make this definition of a device easier to understand. An assistive technology device consists of a thing or approach that is off the shelf, adapted, or individualized to address the ways in which a young child with a disability functions in an educational or other environment. Put another way, the device can be "low tech," "medium tech," or "high tech."

Examples of the devices are:

- power or manual wheelchairs, scooters, canes, walkers, and standing devices
- augmentative communication devices that generate speech, voice amplifiers, and speech recognition devices
- durable medical equipment and supplies such as patient lifts and incontinence supplies
- orthotics and prosthetics such as hearing aids and electric larynxes
- accessibility adaptations to a home or school, such as ramps, stair glides, lifts, grab bars, flashing smoke detectors, level doorknobs, and environmental controls
- special equipment to help a child learn, such as enlarged computer keyboards, reachers, amplified telephones, magnifiers, voice recognition software, and adaptive sports equipment
- accessibility modifications in the schools, such as audio systems in a classroom

Service: *An assistive technology service is that which assists the individual to select, acquire, or use an assistive technology device.*

Again, let's change the words a bit to make this definition of a device easier to understand. The service is the human side of the "thing" – the contribution by an individual that makes the thing useful for improving a child's functioning. This legal definition justifies the practical and basic definition provided above: a service or equipment that helps the child access and participate in education.

Congress makes it clear that assistive technology services include:

- evaluating a child's need for assistive technology, including an evaluation in the child's "customary environment," which includes early intervention and education
- purchasing, leasing, or otherwise acquiring devices
- selecting, designing, fitting, customizing, adapting, applying, maintaining, repairing, replacing or donating an assistive technology device
- coordinating and using necessary therapies, interventions, or services with assistive technology devices such as therapies, interventions, or services in education and rehabilitation
- training or technical assistance for the child, the child's family, guardians, advocates, or authorized representatives on how to use a device or system
- training or technical assistance for the professionals involved in the child's education
- expanding the child's, family's and professionals' access to assistive technology

What is the History of the Tech Act and What is its Future?

Senator Tom Harkin (D. Iowa) was the principal sponsor of the Tech Act, as he was for the Americans with Disabilities Act. (Congress enacted the Tech Act in 1988 and ADA in 1990.) His brother is profoundly deaf and greatly influenced Sen. Harkin to be one of the nation's leading advocates for individuals with disabilities. Sen. Harkin persuaded many of his colleagues in both the Senate and House of Representatives by conducting a two-day demonstration of low, medium, and high technology – in the lobby of the Hart Senate Office Building.

The future of the Tech Act seems secure. Congress reauthorized the 1988 Act in 1994, 1998, 2004, and 2010. In the 2010 reauthorization, Congress stated eight “findings” that describe how important technology, especially assistive technology, is to individuals and the country. In its last finding, it said that the 2002 amendments to the Elementary and Secondary Education Act made under the name of the No Child Left Behind Act, and “the rapid and unending evolution of technology require a Federal-State investment in State assistive technology systems to continue to ensure that individuals with disabilities reap the benefits of the technological revolution and participate fully in life in their communities” (20 U.S.C. Sec. 3001(a)(8)). In a word, technology is here to stay, especially in the lives of individuals of all ages and especially from their youth through their adulthood.

Access to Assistive Technology

One of the purposes of the Tech Act is to support states' efforts to “improve the provision of assistive technology...through comprehensive statewide programs” and provide financial assistance to states to support those programs (29 U.S.C. Sec. 3001(b)).

The statewide systems are operated under health or education agencies and are designed for individuals of all ages to do the following:

- increase the availability, funding, access, and provision to assistive technology
- increase the ability of individuals of all ages to secure and possess devices as they transition from one service system to another (such as from early intervention to early education and then to school)
- increase the ability of public and private agencies to provide and pay for devices and services
- increase the ability of individuals and their families or other representatives to be involved in making decisions about devices and services
- increase the coordination among state, local, and private agencies to carry out the Tech Act
- increase individuals', families', and professionals' awareness of the laws, practices, and benefits of assistive technology (29 U.S.C. Sec. 3001(b)).

Who Should Advise Professionals and Families about Assistive Technology?

The people most capable of advising about the devices and services are those who have developed them or are trained to use them to increase the child's functioning and learning. They include professionals in such fields as rehabilitation medicine, rehabilitation engineering, occupational therapy, physical therapy, visual and hearing interventions, and special educators. The key is to connect the professional knowledge about devices and services to the functioning and learning the child needs.

Handout 5.4

Who Pays for Assistive Technology Devices or Services?

There are many, but not enough, sources of funding for assistive technology. The state's AT program may be a source of funding, in whole or part, for AT. However individuals who seek to use AT, and professionals who advise individuals about the state's AT program, should determine, in advance of committing to purchase or lease AT, whether the state's AT program is a source of funding. Other sources include federal-state programs such as IDEA, Medicaid, and the Rehabilitation Act. And they also include a family's own resources or health care insurers.

References

Individuals with Disabilities Education Act of 2004 (IDEA), Pub. L. No. 108-446. For complete source of information, go to <http://idea.ed.gov/>

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Assistive Technology Planning Tool

Learning or Participation Goal

What is currently happening?

What would you like to see happen?

Ideas for Assistive Technology

1. How can we change the environment?

2. What equipment can we provide?

3. How can we change the activity?

4. How can we change the materials?

5. How can we change the schedule?

6. How can we adapt the instructions?

Teaching Strategies

How will you support the child in using AT? (e.g., modeling, hand-over-hand assistance)

Adapted from: Campbell, P.H., Milbourne, S. & Wilcox, M. J. (2008). Adaptation interventions to promote participation in natural settings. *Infants and Young Children*, 21(2), 94-106.



Sophie's Assistive Technology Plan

Learning or Participation Goal

Sophie will make requests, express thoughts and share information with others throughout the day.

What is currently happening? Sophie has a few words, and uses some noises, and gestures to make requests. She gives hugs and is affectionate when she is happy and cries when she is upset. She generally does not interact with the other children at Ms. Mary's.

What would you like to see happen? The team would like Sophie to be able to make choices and requests during daily routines and activities, such as mealtime, playtime, outside time, story time, and bedtime. They would like Sophie to make comments about herself, others, and her environment.

Ideas for Assistive Technology

<p>1. How can we change the environment?</p> <p>Place picture boards throughout the home and at Ms. Mary's house.</p>	<p>2. How can we change the activity?</p> <p>Encourage siblings at home and peers at Ms. Mary's to model and use the communication boards with Sophie.</p>	<p>3. How can we change the materials?</p> <p>Holly and Ms. Mary will provide pictures of family members, peers, and some of Sophie's other "favorites" for use on her communication boards.</p>	<p>4. What equipment can we provide?</p> <p>Communication boards will be created for individual activities and routines (mealtime, outside time, story time, doll play, block play, arts & crafts, and bedtime). A general or "core" board will also be created. The boards will be in a binder for Sophie to carry.</p>	<p>5. How can we change the schedule?</p> <p>NA</p>	<p>6. How can we adapt the instructions?</p> <p>NA</p>
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Teaching Strategies

How will you support the child in using AT? Holly and Ms. Mary will use **aided language stimulation** to model how to use the communication boards in as many opportunities as possible with Sophie. Initially, Holly and Ms. Mary can use hand-over-hand assistance to take Sophie's finger and help her make a choice. Then that can fade to a more subtle pointing or to verbal cues as Sophie gains competence in using the boards.

Adapted from: Campbell, P.H., Milbourne, S. & Wilcox, M. J. (2008). Adaptation interventions to promote participation in natural settings. *Infants and Young Children*, 21(2), 94-106.



AT Implementation and Evaluation Checklist

Child's Name

Date

Activity/Routine: _____

What does the child want to do or what does the team want the child to do?

We will use the following checked () adaptations, AT, or instruction so that the child will be successful:

<input checked="" type="checkbox"/>	Adaptation/AT Strategies	Describe what will occur	What will the child be expected to do?	How will the device be created/ obtained and by who?	Date we started using this strategy	Date Ended	How did this work?*
	Environmental Changes						
	Equipment						
	Schedule						
	Activity						
	Materials						
	Adapted Instructions						
	Teaching Strategies						
	Demonstration						
	Hand-over-Hand assistance						
	Time Delay						
	Other						
	Other						

*Rate the effectiveness of the strategy with + (worked well), - (did not work well), +/- (worked sometimes but not always)

Comments:

Handout 5.7

Activity/Routine: _____ Child's name: _____ Date: _____

When will the plan begin? _____

What does the child want to do or does the team want the child to do?

Check off the steps you implemented:

<input checked="" type="checkbox"/>	
	Wrote a goal focused on participation or skill learning
	Described what we want to see happen
	Outlined various ideas for using adaptations and AT in environmental modification, equipment, schedule, activity, materials, instruction
	Described possible teaching strategies
	Decided which ideas to use to begin programming
	Determined who will create or obtain any adaptations/AT and when they will be completed
	Began programming
	Implemented a plan for measuring progress and monitoring how well the child is doing
	Interpreted the progress data and adjusted programming based on the data
	Continued reviewing data and making adjustments until the child is successful

Developed by Philippa Campbell, Ph.D.

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