ASSISTIVE TECHNOLOGY

CHARACTERISTICS OVERVIEW CHART

Verbal Skills	Grade Levels	Cognitive Level	Areas Addressed
☒Nonverbal	☐PK	☒Classic	☒ (Pre)Academic/Cognitive/Academic
☒Mixed	☒Elementary	☒High Functioning	☒Adaptive Behavior/ Daily Living
☒Verbal	☒Middle/High		☒Behavior
			☒Communication/Speech
			☒Social/Emotional

BRIEF INTRODUCTION

Most students with autism require strategies, equipment, and/or support to reach their potential (Schlosser, Blischak, Belfiore, Bartley, & Barnett, 1998). Research has shown that one such means of support, assistive technology (AT), is effective for students with this exceptionality.

DESCRIPTION

According to the IDEA Amendment (2004), AT is a broad term used to describe any item, piece of equipment, or product system that is used "to increase, maintain or improve the functional capability of a child with a disability." Furthermore, IDEA recognized that AT is a critical instrument in meeting the educational and overall developmental needs of students with disabilities in school (Smith, Murphy-Herd, Alvarado, & Glennon, 2005).

AT devices can be electronic or non-electronic. Three main types of AT, ranging from "low" to "high" technology, can be used with children with autism. Each type is described below.

> ***"Low" technology***. "Low" technology strategies do not involve any type of electronic or battery-operated device. These strategies typically include low-cost and easy-to-use equipment, such as dry-erase boards, clipboards, laminated photographs, photo albums, three-ring binders, PECS, etc. The strategies can be used to enhance expressive and receptive communication skills with autism.

"Mid" technology. These strategies use battery-operated devices or basic/simple electronic devices. Examples of "mid" technology are tape recorders, voice output devices, timers, and calculators. They are primarily used as a means to support expressive communication and enhance classroom participation, focus attention on various skill areas, and assist in the development of social skills.

"High" technology. "High" technology strategies are complex technological support strategies. They typically involve high-cost equipment, such as computers and adaptive hardware (touch window, software, and trackballs), accessory equipment (digital cameras and scanners), video cameras, and complex voice output devices.

Careful training of educators and students on the use of devices is essential to ensure that they are used correctly. AT should be incorporated into every aspect of daily living in order to improve the functional capabilities of children with autism. Thus, it is important to consider that all AT devices, from "low" technology to "high" technology, always be individualized to meet the unique needs of any child with autism. Most important, the optimal goal of AT strategies is to increase the child's independent functioning skills by decreasing the amount of direct support needed from another person.

STEPS

The Student, Environment, Tasks, and Tools (SETT) framework is increasingly used by educational personnel to identify and select AT devices that meet the specific needs of a student (Smith et al., 2005). This framework helps in the AT consideration process by involving team members in brainstorming and collaboration. Team members meet to evaluate (a) the student's needs, (b) the strength of the current learning environment and the availability of the materials, (c) the student's IEP goals, and (d) AT devices that are appropriate for the child.

The SETT Framework for Considering Assistive Technology		
SETT	**Questions**	**Responses**
Student	What does the student need to do? What are the student's special needs? What are the student's current abilities?	
Environment	What materials and equipment are currently available in the environment? What is the physical arrangement? Are there special concerns? What is the instructional arrangement? Are there likely to be changes? What supports are available to the student? What resources are available to the people supporting the student?	
Tasks	What naturally occurring activities take place in the environment? What is everyone else doing? What activities support the student's curricular goals? What are the critical elements of the activities? How might the activities be modified to accommodate the student's special needs? How might technology support the student's active participation in those activities?	
Tools	What no-tech, low-tech, mid-tech, and high-tech options should be considered when developing a system for the student with these needs and abilities doing these tasks in these environments? What strategies might be used to invite increased student performance? How might these tools be tried out with the student in the customary environments in which they will be used?	

Adapted Myles, B. S. (Ed.), (2005). *Children and youth with Asperger Syndrome: Strategies for success in inclusive settings.* Thousand Oaks, CA: Corwin.

BRIEF EXAMPLE

Simon is a 15-year-old boy with high-functioning autism. Simon has difficulty processing information presented orally, but has no difficulty comprehending information presented visually. In class, Simon always has a hard time following what the teacher says while he is taking notes. After evaluation, Simon's IEP team decides that an overhead projector and a personal

computer are appropriate AT devices to enhance Simon's learning in classes. In each class, the teacher will use the overhead projector to provide outlines and summaries of the topic that are covered in the class. In addition, a computer is provided so Simon can take notes electronically instead of using paper and pencil.

TIPS FOR MODIFICATIONS

Important tips in selecting and utilizing assistive technology with children with autism include the following:

- Always try less intrusive low-technology strategies first.
- Be sure that the technology matches the needs and abilities of the individual child.
- Analyze the environment to see which type of device will best support the child's participation.

SUMMARY

Utilizing AT devices can provide access to multiple environments, including the general education classroom and its related academic, social, and behavioral requirements.

RESEARCH TABLE

Number of Studies	Ages (year)	Sample Size	Area(s) Addressed	Outcome
38*	10-17	220+	Communication, matching, spelling, problem solving, alertness, motivation and behavior, task completion, self-help, social interaction, emotion recognition, joint attention	+

*Includes results of a review by Pennington, R.C. (2010).

STUDIES CITED IN RESEARCH TABLE

1. Gentry, T., Wallace, J., Kvarfordt, C., Lynch, K.B. (2010). Personal digital assistants as cognitive aids for high school students with autism: Results of a community-based trial. *Journal of Vocational Rehabilitation, 32,* 101-107.
This study evaluated the effect of providing training in PDA use to 22 high school students with ASD on their overall organization and use of the PDA to schedule appointments and reminders. 8-weeks following intervention, all 22 participants reported significantly higher

scores on a measure of organizational skills and satisfaction scales about the PDA and their ability to manage events. The PDAs all showed evidence of having been used (appointments in calendar, etc.) regularly during the 8 weeks following training in their use, and 18 of the 22 participants could still program their PDAs with no assistance.

2. Golan, O., Ashwin, E., Granader, Y., McClintock, S., Day, K., Leggett, V., Baron-Cohen, S. (2010). Enhancing emotion recognition in children with autism spectrum conditions: An intervention using animated vehicles with real emotional faces. *Journal of Autism and other Developmental Disorders. 40,* 269-279.
   The purpose of this study was to evaluate the effect of a cartoon designed to teach emotion recognition to children with ASD (The Transporters) on the understanding and recognition of emotions of 20 higher functioning children with ASD as compared to a matched non-treatment control group with ASD with 19 children, and a matched typically-developing control group of 18 participants. Results showed that the children with ASD who were regularly exposed to the cartoon for 4-wks performed better than the ASD control group and equivalently to the non-ASD control group on emotion recognition tasks at follow-up.

3. Lacava, P.G., Rankin, A., Mahlios, E., Cook, K., Simpson, R.L. (2010). A single case design evaluation of a software and tutor intervention addressing emotion recognition and social interaction for four boys with autism. *Autism, 14(3),* 161-178.
   This study investigated the effect of a software and tutor intervention package on the emotion recognition skills and positive social interactions of 4 boys with ASD between 7-11 yrs old. Tutors helped each boy navigate the Mind Reading software program. Following 7-10 wks of using the software all four participants showed increased ability to recognize emotions in basic tasks. None of the four participants showed any increase in positive social interactions with peers.

4. Pennington, R.C. (2010). Computer-Assisted instruction for teaching academic skills to students with autism spectrum disorders: A review of literature. *Focus on Autism and Other Developmental Disabilities, 25(4),* 239-248.
   15 articles about teaching academic skills using computer-based interventions were reviewed. All the articles utilized experimental or quasi-experimental designs and included a total of 52 participants. While all studies reported an increase in academic skills, the conclusion that CBI is a best practice must be tentative at this time based on the small number of studies and participants.

5. Tanaka, J.W., Wolf, J.M., Klaiman, C., Koenig, K., Cockburn, J., Herlihy, L., Brown, C., Stahl, S., Kaiser, M.D., Schultz, R.T. (2010). Using computerized games to teach face recognition skills to children with autism spectrum disorder: The Let's Face It! Program. *The Journal of Child Psychology and Psychiatry, 51(8),* 944-952.
   This study reports the results of a RCT of the effects of a computer-based game to teach facial recognition skills to children with ASD. Compared to a no treatment control group (n = 37), children in the treatment group (n=42) improved significantly in their ability to mouth and eye features in faces following 20 hours of interaction with the software.

6. Van Laarhoven, T., Kraus, E., Karpman, K., Nizzi, R., Valentino, J. (2010). A comparison of picture and video prompts in teach daily living skills to individuals with autism. *Focus on Autism and Other Developmental Disabilities, 25(4),* 195-208.
   This study compared the effectiveness and efficiency of two types of visual prompt to teach two adolescents with ASD (13 and 14) two basic independent living skills. Both participants learned the skills in both picture and video prompt conditions. Video prompts were slightly more efficient to use.

7. LaCava, P. G., Golan, O., Baron-Cohen, S., & Myles, B. S. (2007). Using assistive technology to teach emotion recognition to students with Asperger Syndrome: A pilot study. *Remedial and Special Education, 28*, 174-181.
   This pilot study explored the use of assistive technology to teach emotion recognition (ER) to eight children with autism. The results indicated that after intervention, participants improved on face and voice ER for basic and complex emotions that were included in the software, as well as for complex voice ER for emotions not included in the Mind Reading software.

8. Myles, B. S., Ferguson, H., & Hagiwara, T. (2007). Using a personal digital assistant to improve the recording of homework assignments by an adolescent with Asperger Syndrome. *Focus on Autism and Other Developmental Disabilities, 22*, 96-99.
   A 17-year-old boy with AS was trained to use a personal digital assistant (PDA) to record homework assignments in his history, English, and science classes. Results revealed a marked increase in recording of homework assignments after treatment.

9. Robins, B., Dautenhahn, K., & Dubowski, J. (2006). Does appearance matter in the interaction of children with autism with a humanoid robot? *Interaction Studies: Social Behaviour and Communication in Biological and Artificial System, 7*, 479-512.
   Four children with autism participated in this study, which investigated the impact of the appearance of a robot on their interactions. The robots served as interactive toys to encourage and mediate interactions. The results indicated the children preferred in their initial response to interact with a plain, featureless robot over a human-like robot. Thus, the children's response towards the plain/robotic robot was notably more social and proactive than to a life-size theatrical robot.

10. Robins, B., Dickerson, P., Stribling, P., & Dautenhahn, K. (2004). Robot-mediated joint attention in children with autism: A case study in robot-human interaction. *Interaction Studies: Social Behaviour and Communication in Biological and Artificial Systems, 5*, 161-198.
    Three children with autism participated in this study, which examined the effectiveness of using a robot to increase joint attention skills. The data showed that the robot provided a salient object, or mediator, for joint attention.

11. Taylor, B. A., Hughes, C. E., & Richard, E. (2004) Teaching teenagers with autism to seek assistance when lost. *Journal of Applied Behavior Analysis, 37,* 79-82.
    Three teenage students with autism were taught to respond to the use of a vibrating pager to request assistance. Students generalized their requests across settings and individuals.

12. Dyches, T. T. (1998). Effects of switch training on the communication of children with autism and severe disabilities. *Focus on Autism and Other Developmental Disabilities, 13*, 151-162. The study examined the effects of switch training on the communication of four students. Results indicated that switch training implemented using a system of minimal prompts increased the number of communicative interactions of all participants.

13. Schlosser, R. W., Blischak, D. M., Belfiore, P. J., Bartley, C., & Barnett, N. (1998). Effects of synthetic speech output and orthographic feedback on spelling in a student with autism: A preliminary study. *Journal of Autism and Developmental Disorders, 28*, 309-319. This study evaluated the effects of speech output and orthographic feedback on the spelling performance of a 10-year-old boy with autism. Specifically, he was taught to spell words under three feedback conditions using a voice output communication aid. Findings suggested that speech output contributed to efficient spelling.

14. Kennedy, C. H., & Haring, T. G. (1993). Teaching choice making during social interactions to students with profound multiple disabilities. *Journal of Applied Behavior Analysis, 26*, 63-76. Four students were taught to use a micro-switch communication system to request a change in recreational stimuli during social interactions with peers. Three of them learned to use the micro-switch and increased their level of alertness.

15. Battenberg, J. K., & Merbler, J. B. (1989). Touch screen versus keyboard: A comparison of task performance of young children. *Journal of Special Education Technology, 10*, 24-28. This study compared the effectiveness of a touch-sensitive screen and keyboard in improving the task performance of 40 children with developmental delays and 40 typical children. Results indicated that the use of touch-sensitive screen significantly improved the task performance of all children, with and without developmental delays. Furthermore, the children with autism performed best using a touch screen rather than a keyboard.

16. Colby, K. M. (1973). The rationale for computer-based treatment of language difficulties in nonspeaking autistic children. *Journal of Autism and Childhood Schizophrenia, 3*, 254-260. Seventeen participants with autism were involved in computer-based interventions that addressed language skills. Positive outcomes and improvement in spontaneous speech use were found in 13 participants.

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Moor, D., Cheng, Y., McGrath, P., & Powell, N. J. (2005). Collaborative virtual environment technology for people with autism*. Focus on Autism and Other Developmental Disabilities, 20*, 231-243.

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RESOURCES AND MATERIALS

- Able Data: http://www.abledata.com/
  This website provides information about AT products and offers to help locate companies for specific product needs. No direct selling.

- Assistive Technology for Children with Autism. Cooperative Educational Service Agency No. 7, Green Bay, WI, Special Education Services. Autism Interventions and Strategies for Success.: http://www.specialed.us/autism/assist/asst10.htm
  This article is full of ideas for teachers and parents and includes examples of low-, mid-, and high-tech assistive technology.

- Assistive Technology Fundamentals. National Assistive Technology Research Institute: http://natri.uky.edu/resources/fundamentals/funmenu.html
  This is a resource that teachers, families, and administrators can use to develop a plan for using assistive technology.

- Assistive Technology Internet Modules: http://www.atinternetmodules.org/
  These modules were developed to provide information on assistive technology. The modules cover a wide range of topics.

- Closing the Gap: Assistive Technology Resources for Children and Adults with Special Needs: http://www.closingthegap.com/index.lasso
  This site offers information about AT resources, a conference devoted to AT, and AT-related publications.

- What Is Assistive Technology? National Center on Accessible Information Technology in Education. University of Washington: http://www.washington.edu/accessit/articles?109
  This article provides a clear, printable definition of AT and a link to the Access Board's standards for use of assistive technology.

General Resources

- Autism Internet Modules (AIM) www.autisminternetmodules.org. The Autism Internet Modules were developed with one aim in mind: to make comprehensive, up-to-date, and usable information on autism accessible and applicable to educators, other professionals, and families who support individuals with autism spectrum disorders (ASD). Written by experts from across the U.S., all online modules are free, and are designed to promote understanding of, respect for, and equality of persons with ASD.

- The Autism Web Course: http://cdd.unm.edu/swan/autism_course/about/index.htm.
  This web course was developed out of materials from the Interactive Collaborative Autism Network (ICAN). The Autism Programs at the University of New Mexico has updated and added information to this web course.
  - Characteristics
  - Assessment
  - Academic Interventions
  - Behavioral Interventions
  - Communication Interventions
  - Environmental Interventions
  - Social Interventions
  - Family Support Suggestions

- Indiana Resource Center for Autism (IRCA)
  http://www.iidc.indiana.edu/irca/fmain1.html. The Indiana Resource Center for Autism staff's efforts are focused on providing communities, organizations, agencies, and families with the

knowledge and skills to support children and adults in typical early intervention, school, community, work, and home settings.

- IRCA Articles: http://www.iidc.indiana.edu/index.php?pageId=273

- Texas Statewide Leadership for Autism www.txautism.net. The Texas Statewide Leadership for Autism in conjunction with the network of Texas Education Service center with a grant from the Texas Education Agency has developed a series of free online courses in autism. Please check the training page, www.txautism.net/training.html, for update lists of courses, course numbers and registration information. Current courses include the following:
  - Asperger Syndrome 101
  - Augmentative and Alternative Communication and the Autism Spectrum
  - Autism for the General Education Teacher
  - Autism 101: Top Ten Pieces to the Puzzle
  - Classroom Organization: The Power of Structure for Individuals with ASD
  - Communication: The Power of Communication for Individuals with ASD
  - Futures Planning for Students with Autism Spectrum Disorder
  - Navigating the Social Maze: Supports and Interventions for Individuals with ASD
  - Solving the Behavior Puzzle: Making Connections for Individuals with ASD