Janice Myck-Wayne, Scott Ramirez

California State University, Fullert

Assistive Technology and Social Skills

Everyday new technology is changing the lives in ways we never imagined. For individual with autism spectrum disorder (ASD), some new technologies can improve communication, assist in the development of social skills and enhance the ability to learn. This paper discusses the concepts of Universal Design for Learning as a context for exploring the use if assistive technology in supporting the developmental of social skill training for children with ASD.

KEY WORDS: autism, technology, development of social skills.

Universal Design for Learning (UDL)

Universal design for learning (UDL) is the design of projects and environments to be usable by all people. As technology develops rapidly, it is important to understand the role technology can play in assisting a wide range of users to access their environment (Rose & Gravel 2010). The goal of universal design is to make everyone, regardless of ability and age to feel comfortable in their environment (Mistrett 2004). Examples of universal design, in which we all benefit include: automatic doors, keyless entry systems, curbside

ramps, easy-grip kitchen utensils, public signs with internationally recognized colors, shapes and symbols, closed captioning devices built into televisions, audio texts, and voice to text software. For children with disabilities, UDL provides a systematic approach to designing the environment, curricular content, materials and learning activities. This approach serves to accommodate the needs of children with the widest range of abilities as well as provides children with a range of functional abilities and access to everyday learning experiences (DEC/NAEYC 2009).

Concepts of UDL

The concepts of UDL are essential in the support of inclusive education. The use of new technologies and universally designed curriculum can respond to a variety of individual learner differences in a variety of learning environments (Meo 2008). UDL provides a method to teach a group of diverse learners in the same classroom, without creating more tension for the teacher or compromising the curriculum. It is important to note that diversity does not refer only to children with exceptional needs, nor does it refer only to ethnic, racial, or linguistic diversity. Diversity encompasses all children.

While the framework and guidelines for UDL are not developed from the principles of architecture, they are based on research and practice from multiple disciplines within the learning sciences. These disciplines include education, developmental psychology, cognitive science, and cognitive neuroscience (Rose & Gravel 2010). According to Rose and Gravel, the research in those disciplines guides the two foci of pedagogy that UDL address. UDL addresses both the important elements of teaching and learning and individual student differences.

UDL encompasses three basic principles (CAST 2008). The first principle is providing multiple means of representation. This principle includes providing options that customize the display of in-

formation, and provide alternatives to auditory information, and visual information. In addition, providing multiple means of representation includes incorporating a variety of options for language and symbols in instruction. The second principle of UDL is providing multiple means of action and expression. This principle supports effectively designed curricular materials that provide a seamless interface with common assistive technologies. This interface requires that technology allow for individuals with motor disabilities or language disabilities be able to navigate or interact with a single switch and express what they know. The third principle of UDL is providing multiple means of engagement. This principle means that instruction and the environment provides options for recruiting interest and engages the learner in their interests. A key instructional goal is to build the individual skills in self-regulation and self-determination that will equalize such learning opportunities

Assistive Technology

Assistive technology (AT) is one aspect of UDL. Figure 1 below illustrates the relationship between AT and UDL. Assistive Technology is defined in the Technology-Related Assistance Act (Tech Act) as "any item piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (Tech Act 1988). According to Campbell, Milbourne, Dugan and Wilcox (2006), assistive technology includes both adaptations to readily available items (e.g., spoons, car seats) and the use of specialized devices (e.g., switch interfaces, power wheelchairs).

Assistive Technology is generally described in terms of complexity. Low technology devices are usually defined as low-cost items that are relatively easy to use. Low-technology items are less sophisticated and often people do not realize that these modifications
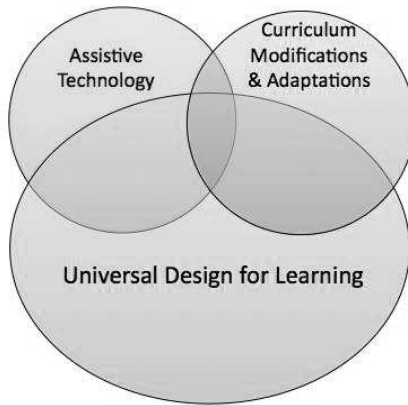
Fig. 1. Understanding UDL

tions are within the definition of AT. Medium-technology tools include battery operated devices or simple electronic devices. Medium-technology devices include simple mechanical devices. High-technology devices incorporate sophisticated electronics or computers. In making decisions about the type of technology tools a particular person might require, a good approach is to start with the no-tech solutions and then work up the continuum, as needed.

Table 1. Examples of Low Tech to High Tech

Low Assistive Technology	Medium Assistive Technology	High Assistive Technology
Simple	More Complex	Specialized
Easy to create	Some Training	Online/Apps
No electronics	More Electronics	Complex Electronics

Tablets, such as the Apple iPad® are a high AT device that is gaining prominence in the field of special education as an efficient and usable tool. Mobile Devices such as iPad®, which interface with an abundance of available applications (apps) easily supports UDL.

Although iPad® ® have been used as assistive technology for students with communication disorders (Flores et al. 2012), the use of iPad® with children with disabilities continues to be an emerging area of research. Little research has explored the use of iPad® as instructional tools in special education, especially for students with moderate to severe developmental disabilities (Kagohara et al. 2013). Although the use of tablets in the classroom is a relatively new concept, several researchers have found them to be a powerful learning tool for students. Ellis (2011) reported that students were highly motivated on task when completing assignment on the iPad®.

The iPad® offers numerous apps that are engaging for students. In addition, some apps help to scaffold learning, and motivate children to learn new concepts in a fun way. Tablets offer students a colorful, large, and intuitive interface which makes it accessible to all students and allows them to quickly understand how to interact with the device (Ellis 2011; Shah 2011). Aside from the iPad being well-received by students, teachers have had a positive response to the device. Results from a special education teacher questionnaire found that teachers appreciate the ease of use and organization features that the iPad® had to offer (Price 2011). Teachers appreciated that each iPad could easily be individualized to meet the unique needs of every student. Shah (2011) adds that the iPad® can be used as a cost effective form of assistive technology. Aside from being a respected learning tool, many individuals use the iPad as an alternative communication device.

From an informal and lifelong learning perspective, it is a general notion that mobile devices accompany their users in their everyday experiences and represent a convenient source of information or means of communication that assists with learning, Mobile devices can be used for fieldtrips and outside classroom experiences to make recordings, take notes, draw pictures and take photos and videos. From a support perspective, portable devices are available at all times and everywhere, and can be used for activities engaged in by teachers at numerous times during a during the school day

including tracking progress or collecting data on behavior or skill learning (Sandvik, Smørdal, Østerud 2012).

The simplicity of touch interactions and the portability of these devices have lowered the barriers for interacting with computers (Hourcade et al. 2013*).* Some of the benefits of utilizing iPad® and mobile touchscreen devices include the lower costs than laptops and other communication devices. The mainstream use of mobile devices contributes to a "coolness factor" in having the latest technology in your hand. These devices are multi-functional and the number of Apps that support learning and communication are increasing. According to the AAC-RECR (2011), mobile devices utilize technology that has the capacity to support diverse opportunities that current AT devices cannot support. As the general population has embraced mobile technology, more people now consider this form of AT easier to access and easier to embed into their daily lives. Apps, continue to be developed that are innovative and less difficult to learn (AAC-RECR).

The numerous apps that are being developed to support learning and communication increases the usability and functionality of mobile devices. Apps provide support for instructional areas such as reading, number recognition, science and social science to supporting behavioral interventions and communication (Shah 2011). O. Malley, Lewis and Donehower (2013) explored the advantages and challenges of using iPad® for classroom instruction. Their research identified advantages to teaching and learning. Study participants indicated that utilizing iPad® supported differentiated instruction for students with moderate to severe disabilities, and noncompliance declined during academic intervention. The teachers who participated in the study rated the iPad as effective for classroom instruction and the participants noted that the students made progress towards learning goals using the iPad®.

Mobile devices are increasingly used to support people with ASDs in their social interactions (Hourcade et al. 2013). Specifically, research by Hourcade et al. (2013) examined app activities with children with autism spectrum disorder (ASD). The study took ad-

vantage of children with ASDs' interest in computers and technology to have them engage in social activities. This interest is understandable given the difficulty children with ASD have with social interactions. Hourcade et al. (2013) found that in their conversations with participants, the participants' main source of anxiety comes from uncertainty or unexpected events. Interacting with computers is much more predictable and controllable than interacting with people. Social interactions in the app activities were easier and more comfortable for participants because they happened in the context of an enjoyable activity with a computer. This made the children more confident, less anxious, and led to increased engagement. In the study, children with ASDs spoke more sentences, engaged in more verbal exchanges, and were more physically engaged with the activities when involved in app-based activities than when conducting similar activities that did not involve tablet apps. The results suggest that using tablet activities may have a positive effect in children with ASDs' social interactions.

Using iPad® to Support Social Skill Training

Social skills training (SST) involves group or individual instruction designed to teach learners to appropriately interact with typically developing peers. According to Fetig (2013), most social skills trainings instruction is focused on basic concepts, role-playing or practice, and feedback to help learners acquire and practice communication, play, or social skills to promote positive interactions with peers. A review of evidence-based studies on SST concludes that this intervention has been effective for children with ASD in all age ranges including young adults (Fetig 2013). Research shows that possessing effective social skills in preschool and elementary school is a leading indicator of academic achievement (More, Sileo, Higgings, Tandy, Tannock 2013).

Social Stories™ is a teaching strategies being used to teach students with disabilities about social concepts and skills. Social Sto-

ries™ identify social cues and common responses in order to describe a situation and teach new skills. In addition, these stories can be used to decrease challenging behaviors such as aggression, crying, hitting, screaming, and off-task behaviors (Vanderborght et al. 2012). Over the past 15 years researchers have been evolving the original protocol for creating and teaching Social Stories™. Today professionals have Carol Gray's *Social Stories™ 10.0: The New Defining Criteria and Guidelines* (2004) to guide their creation of Social Stories™ with the 10 principles discussed in the book. Some of the 10 principles include using pictures, using descriptive and directive sentences with a 2 : 1 ratio, titling Social Stories™, and provide a rationale for the actions of other people (Test et al. 2011; Gray 2004). They can be used to teach almost any social skill that a student may encounter, such as knowing how to introduce yourself, how to politely refuse to play, and how to share. These stories attempt to describe what is going to happen in a social situation, why these events may be taking place, and how to respond (More 2012).

Social Stories-Resources

Multi-media based Social Stories™ have become very popular in recent years. Teachers, parents and researchers have utilized a variety of mediums to create and present Social Stories™, Using iPad® as an AT tool to teach social stories is emerging as an evidence-based practice. The scant research that has been conducted demonstrates that the universal design of mobile devices is a promising practice for use with children with ASD.

The lists of applications are too vast to include here, although Apple has developed a section of special education applications. Educators, parents and researchers are encouraged to explore the array of apps that include apps for creating your own social stories or using prewritten social story apps. Table 2 has a list of sample applications that are free to users.

Table 2. Examples of free social story applications

Prewritten Social Stories	Apps for Creating Social Stories
iSee-quence	Social Stories Creator
Model Me Going Places	Demibooks Composer
The Social Express Lite	Our Story
Life Skills Sampler	Social Stories Creator and Library for Preschool, Autism and Special Needs

A Few Words of Caution

While there are some apps that are more specific to use with children with autism (like AAC apps), all apps can provide developmental experience depending on how they are used and the child's own developmental trajectory and interests. You can't have a "Top 10 Autism Apps". The iPad® is an attractive digital device. It can be used for children with a disability as an effective developmental transition tool. But don't confine a child to an iPad. If they start drawing on the iPad, think about having another go with the crayons. Digital tools are revolutionizing many lives, in many ways. But to do this well, we need to be sure that we continue to think about how we can best use the technology. An iPad® does not replace the need for children with autism to engage in a wide range of therapies that will support their development.

References

AAC-RERC The Rehabilitation Engineering Research Center on Communication Enhancement, AAC-RERC white paper on Mobile devices and communication Apps [White Paper], 2011, retrieved from http://aac-rerc.psu.edu/index.php/pages/show/id/46.

CAMPBELL P.H., MILBOURNE S., DUGAN L.M., WILCOX M.J., *A review of evidence on practices for teaching young children to use assistive technology devices*, "Topics in Early Childhood Special Education", 2006, 26, p. 3–13.

CAST, *Universal Design for Learning guidelines version 1.0*, Wakefield MA 2008.

Center for Applied Special Technology (CAST), *Planning for all learners (PAL) Toolkit*, Wakefield MA 2004.

DEC/NAEYC, *Early childhood inclusion: A joint position statement of the Division for Early Childhood (DEC) and the National Association for the Education of Young Children (NAEYC)*, The University of North Carolina, FPG Child Development Institute, Chapel Hill 2009.

ELLIS S., *Teaching the future*, "Screen Education", 2011, 63, p. 60–64.

FETIG A., *Social Skills training (SST) fact sheet*, The University of North Carolina, Frank Porter Graham Child Development Institute, The National Professional Development Center on Autism Spectrum Disorders, Chapel Hill 2013.

FLORES M., MUSGROVE K., RENNER S., HINTON V., STROZIER S., FRANKLIN S. et al., *A comparison of communication using the Apple iPad and a picture-based communication system*, "Augmentative and Alternative Communication", 2012, 28, p. 74–84.

GORDON D.T., GRAVEL J.W., SCHIFTER L.A., *A policy reader in universal design for learning*, Harvard Education Press, Cambridge MA 2009, p. 209–218.

GRAY C., *Social stories 10.0: the new defining criteria and guidelines*, "Jenison Autism Journal", 2004, 15(1), p. 1–26.

HOURCADE J.P., WILLIAMS S.R., MILLER E.A., HUEBNER K.E., LIANG L.J., *Evaluation of tablet apps to encourage social interaction in children with autism spectrum disorders*, Honorable Mention, ACM, New York NY 2013, p. 3197–3206.

KAGOHARA D.M., VAN DER MEER L., RAMDOSS S., O'REILLY M.F., LANCIONI G.E., DAVIS T.N., RISPOLI M., LANG R., MARSCHIK P.B., SUTHERLAND D., GREEN V.A., SIGAFOOS J., *Using iPods and iPad® in teaching programs for individuals with developmental disabilities: A systemic review*, "Research in Developmental Disabilities", 2013, 34, p. 147–156.

MEO G., *Curriculum planning for all learners; applying universal design for learning (UDL) to a high school reading comprehension program*, "Preventing School Failure", 2008, 52(2), p. 21–30.

MEYER A., ROSE D.H., *The future is in the margins: The role of technology and disability in educational reform*, [in:] *The universally designed classroom: Accessible curriculum and digital technologies*, ed. D.H. Rose, A. Meyer, C. Hitchcock, Harvard Education Press, Cambridge MA 2005, p. 13–35.

MISTRETT S., *Assistive Technology helps young children with disabilities participate in daily activities*, "Technology In Action", 2004, 1(4), p. 1–7.

MORE C., *Social stories and young children: Strategies for teachers*, "Intervention in School and Clinic", 2012, 47(3), p. 167–174.

MORE C., SILEO N., HIGGINGS K., TANDY R., TANNOCK M., *The effects of social story interventions with preschool age children with and without disabilities*, "Early Child Development and Care", 2013, 183(1), p. 1–16.

O'MALLEY P., LEWIS M.E.B., DONEHOWER C., *Using Tablet Computers as Instructional Tools to Increase Task Completion by Students with Autism. Paper presented at the Annual Meeting of the American Educational Research Association (San Francisco CA, Apr 27 – May 1, 2013)*, 2013, retrieved from http://eric.ed.gov/?id=ED541157.

PRICE A., *Making a difference with smart tablets*, "Teacher Librarian", 2011, 39(1), p. 31–34.

ROSE D.H., GRAVEL J.W., *Universal design for learning*, [in:] *International Encyclopedia of Education*, 3rd Ed., ed. E. Baker, P. Peterson, B. McGaw, Elsevier, Oxford 2010.

ROSE D.H., MEYER A., *Teaching every student in the digital age: Universal Design for Learning*, Association for Supervision and Curriculum Development, Alexandria VA 2002.

SANDVIK M., SMØRDAL O., ØSTERUD S., *Exploring iPad® in practitioners'repertoires for language learning and literacy practices in kindergarten*, "Nordic Journal of Digital Literacy", 2012, 7(3), p. 204–220.

SHAH N., *Special Ed. Pupils Find Learning Tool In iPad Applications*, "Education Week", 2011, 30(22), p. 1–17.

Technology Related Assistance for Individuals with Disabilities Act of 1988, 29 U.S.C. § 2202 (West 1988), http://www.iidc.indiana.edu/?pageId=2504#sthash. HPKtipnA.dpuf.

TEST D., RICHTER S., KNIGHT V., SPOONER F., *A comprehensive review and meta-analysis of the social stories literature*, "Focus on Autism & Other Developmental Disabilities", 2011, 26(1), p. 49–62.

VANDERBORGHT B., SIMUT R., SALDIEN J., POP C., RUSU A., PINTEA S., LEFEBER D., DAVID D., *Using the social robot probot as a social story telling agent for children with asd*, "Interaction Studies", 2012, 13(3), p. 348–372.

WONG C., *Social narratives (SN) fact sheet*, The University of North Carolina, Frank Porter Graham Child Development Institute, The National Professional Development Center on Autism Spectrum Disorders, Chapel Hill 2013.

Technologie wspomagające a umiejętności społeczne

Streszczenie

Codziennie nowe technologie zmieniają życie w sposób, w który nikt sobie nie wyobrażał. Dla osoby z zaburzeniami ze spektrum autyzmu (ASD), niektóre nowe technologie mogą poprawić komunikację, pomóc w rozwoju umiejętności społecz-

nych i zwiększyć zdolności do uczenia się. W artykule omówiono „Uniwersalną Koncepcję Nauczania" (Unversal Design for Learning – UDL) jako kontekst do badania użycia technologii wspomagających w zakresie wspierania rozwoju umiejętności społecznych dla dzieci z zaburzeniami ze spektrum autyzmu.

SŁOWA KLUCZE: zaburzenia ze spektrum autyzmu, technologie wspomagające, komunikacja, rozwój społeczny