Using Mobile Technologies to Support Students in Work Transition Programs

Gillian R. Hayes[1], Michael T. Yeganyan[1], Jed R. Brubaker[1], Linda O'Neal[2], and Stephen W. Hosaflook[3]

[1]University of California, Irvine; [2]Irvine Unified School District; [3]Tiwahe Technology

INTRODUCTION

Supporting students with disabilities, particularly those with autism spectrum disorders (ASD), to transition from school into adulthood can be a difficult challenge (Schall & Wehman, 2008; Sitlington & Clark, 2006). The Individuals with Disabilities Education Act (1997) requires schools to promote transition planning: movement from school to post-school activities (*e.g.*, work, further education and training, and independent living). However, even with IDEA, transition planning has been somewhat unsuccessful in the face of four substantial challenges (Tomas and Dykes, 2011). First, youth with disabilities are significantly more underemployed or unemployed when compared to their peers in the general population (Lindstrom, Doren, Metheny, Johnson, and Zance, 2007). Second, youth with disabilities are far more likely to drop out of school (both high school and post-secondary education). Third, people experiencing disabilities participate in fewer community activities and social relationships and report feeling more isolated (Stancliffe et al., 2007; Wehman, Inge, Ravelle, and Brooke, 2006). Fourth, the majority of these individuals do not expect their low quality of life to improve, and 40% of them expect life to get worse (Wehman et al., 2006).

There are many strategies proposed for addressing transition planning. These include starting at a young age (Tomas and Dykes, 2011) and maximizing personal freedom and self-sufficiency through self-determination (Skouge, Kelly, Roberts, Leake, and Stodden, 2007; Steer and Cavioulo 2002) . Assistive and educational technologies have also been touted as a response

to the challenges of transition planning (Skouge et al., 2007; Tomas and Dykes, 2011). Computer-based instruction has been used to teach transition skills, such as shopping (Hansen and Morgan, 2008), scheduling (Gentry, Wallace, Kvarfordt, Lynch, 2010), and using public transportation (Mechling and O'Brien, 2010). Additionally, some classroom-based technologies designed for academic learning have resulted in teaching the social skills needed for transition (Cramer, Hirano, Tentori, Yeganyan, & Hayes, 2011). Adopting simple off-the-shelf hardware (*e.g.,* iPods, iPads, and mobile phones) has been suggested by both the media and researchers (Blood, Johnson, Ridenour, Simmons, & Crouch, 2011) to teach transition skills. These systems can support work (*e.g.,* scheduling, communication, and task management) and life skills (*e.g.,* wayfinding and socialization). In this chapter, we discuss our experiences with an intervention that introduces iOS devices and applications to students to support transition.

INTERVENTION

Technological interventions—such as computer-mediated communication (Burke, Kraut, & Williams, 2010), video modeling (Bellini and Akullian, 2007), and socially assistive robots (Feil-Seifer 2008)—have been used to help students with ASD become more independent and better prepared for adulthood. Building on these approaches, we developed Technology in the Workplace (TiW), a program for students with ASD, school staff, and their parents to support the transition from school to the workforce. The TiW program was designed in cooperation with five school districts and two county organizations using relatively low-cost off-the-shelf technologies. Due to an overall interest in standardization—particularly going forward as new devices are purchased year after year, the school districts made a choice to use iOS as the platform for the mobile intervention, including iPod Touch, iPad, and iPhone devices. The iOS

hardware involved in this intervention was less than $500 per student (and typically less than $200), and all downloaded content and applications were free.

<<Figure 1 about here>>

Figure 1: (left) During lecture and hands-on work, students and staff sat and worked together at small group tables. Likewise, independent small group activities(right) allowed hands-on learning of iOS mobile devices and applications.

The TiW program includes the development of individualized "action plans" for student transition (see Figure 2); use of iOS mobile devices during school, work, and personal time; attendance at training workshops focused on using these devices; and in most cases, on the job use of iOS devices. To further motivate students, a variety of strategies could be used, such as signing contracts around acceptable and regular use or incentive and token-based rewards programs. In general, strategies like action plans and incentive structures are often used in transition programs. What is unique about the TiW program is its emphasis on engagement with and use of mobile technologies, in this case iOS devices.

Participants: Across five public school districts and two county organizations, 61 students and 27 staff participated in the first year of the intervention and 61 students and 43 staff in the second year (Table 1). Staff included individuals working at the department of rehabilitation, regional centers, work transition specialists from individual schools, and teachers. Parents at times attended workshops during the first year, but they are not heavily represented in our data (n=9). Parents did not participate in the second year of the program.

<<Table 1 about here>>

Action Plans: Work transition specialists from each school district who work hands-on with students to place them in jobs, known as job coaches, regularly prepare action plans for

students in their programs. These plans include tasks and goals focused on work transition, academic education, and daily living challenges. Action plans are highly individualized—like other curricula for students with disabilities—and matched to varied ability levels, work duties, and education plans. Common work-related duties include updating the student's resume, securing applications for work, preparing for interview questions, etiquette reminders, and destination check-in points. Common education goals include enrolling in classes and completing homework on a daily basis. Common daily living goals include attending specialist appointments, transportation coordination, and hygiene care. During the first month of the intervention each year, job coaches developed action plans related to technology use alongside other skills.

<<Figure 2 About Here>>

Figure 2: Front page of an action plan

iOS Devices: Each TiW student uses an iOS device provided by a variety of sources (*e.g.,* schools, the department of rehabilitation, parents, and private donors). Most students use iPod Touches, but in special cases, a different platform may be substituted. For example, due to his involvement in the program, we learned that one student had a significant visual impairment (neither his parents nor any teacher had previously recognized the problem) and so provided him with an iPad in the second year with a larger screen size that he could view. Staff in the program also use mobile devices, including iPhones, iPods, iPads, and Android phones. Nearly all of the staff members were using personal devices.

Training: All TiW program participants also participate in monthly training workshops lasting approximately two hours (see Figure 3 for overall program timeline). The first two workshops each year focus on administrative topics and staff training and included only staff.

Students then join staff during the following months. These workshops focus on two objectives: first, they establish a core set of iOS applications and usability skills across all districts, and second, they serve to motivate and interest participants while providing the support needed for those struggling to use and to understand the technology.

<< Figure 3 About Here>>

Figure 3: Timeline of TiW program and evaluation activities

In the first two years of the program, we experimented with two different models of instruction. In the first year, each session typically started with a short classroom lecture covering the specific topics for that month (Table 2). Once the participants were familiar with the overall information, they were encouraged to use these skills at hands-on, topic-specific stations positioned around the room, each of which was staffed by a researcher (Fig 1). During this time, participants learned topic-specific application functions and were encouraged to explore other applications with similar functionality (see Appendix for list of apps used). Participants moved between stations, spending as much or as little time as needed to feel competent.

In the second year, we took more of a lab model for the hands-on learning. In this model, we again began with a short lecture for each type of activity, but between these lectures, rather than allow open experimentation, participants practiced with specific activities. To facilitate these activities, participants completed monthly challenges leading up to the workshops (*e.g.,* create a list of tasks needed for a job interview, collect email addresses for three people). At the workshops, participants discussed specifics regarding the implementation of specific tasks using the information and materials prepared as part of the monthly challenges.

During both years, the workshops then concluded with small group discussions (5-10 participants, including both students and staff) around what was learned, strategies for using

devices, and so on. Finally, in a large group, participants shared conversation highlights from their small group discussions, with students being encouraged to speak on behalf of their groups.

<<Table 2 About Here>>

EVALUATION

We used a mixed methods approach to understand the effectiveness of this intervention, including participant observation, interviews, and surveys. Our observations during workshops focused on how the students and staff interacted with each other and with their devices during the training, as well as specific challenges and successes during the hands-on work sessions.

We administered a repeated cross-sectional survey at the beginning and end of the first year to measure differences in attitudes, awareness, and perceptions of technology among participants. The majority of questions used a 5-point Likert scale for which pre vs. post scores were analyzed using two-tailed T tests. This survey also queried participant demographics and overall views on transition activities (see Appendix for survey questions).

At the end of the first year, we conducted phone interviews with 10 participants (5 students, 5 staff) for approximately 30 minutes each. Interview topics included reasons for joining the program, favorite topics, interesting experiences within and outside the workshops, and any issues and challenges. All interviews were audio-recorded and transcribed. The transcripts were then coded to uncover themes for understanding participant experiences, attitudes, perceptions, and challenges within the workshops. We noted which iOS applications participants explored and how useful they found these tools to be in their experiences outside of the workshops. These themes were used to inform the quantitative analysis of the survey data (and vice versa), as well as evidence from the field notes.

RESULTS

Our multi-pronged approach adapted to the various needs of program participants. It also drove motivation for participants to become and to stay involved in the program. The intervention increased participant confidence and competence in their abilities. In this section, we present these results in more detail and describe the open challenges that remain for this and similar technology-based interventions.

Learning through Workshops and Social Interaction

Students with ASD often struggle to develop social skills and engage in meaningful social interactions (Volkmar, Lord, Bailey, Schultz, & Klin, 2004; Wing 1981). They report loneliness and having fewer friends than their peers as a result of their disabilities (Bauminger and Kasari, 2000). Much effort has gone into helping students with ASD build these highly needed social skills from an early age (Kamps, Leonard, Vernon, Dugan, & Delquandri, 1992; Laushey, Heflin, Shippen, Alberto, & Fredrick, 2009; Sasso, Peck, & Garrison-Harrell, 1998) to enable greater independence and social activity in adulthood (Matson, Dempsey, & Fodstad, 2009; Orsmond, Krauss, & Seltzer, 2004). Thus, social skills development is a core component in transition planning. In the intervention, we emphasized building social skills through use of collaborative iOS applications (*e.g.,* calendar sharing) as well as by using a breakout style model of instruction that emphasized small group interaction.

Topic-specific work

In the first year, we used a workstation approach for specific topics. In this model, a researcher led each topic-specific workstation to help participants learn to use features and functionality of various iOS applications. Participants moved from one station to the next in a self-organized fluid manner. At each station, the researcher provided participants a set of tasks (*e.g.,* creating a

Google calendar and sharing that calendar with someone else). During these activities, they would ask questions of both the researchers and other participants about setup, usage, and functionality. Participants were also encouraged to continue exploring features and functionality of the specific application being taught and to investigate similar types of applications downloaded on their own.

In the second year, we used a similar approach in terms of having participants work hands on in small groups. The primary difference however was the use of more of a lab model and less free form interactivity. In this model, an instructor explained a particular activity, and participants then practiced that activity in small groups. In both models, participants were encouraged to explore on their own and bring new "apps" they had found to the attention of their small groups.

"I learned a lot more about the apps, the apps store, it got me exploring more than I did on my own... that's definitely one thing it [workshops] did." - [staff - RB]

As participants explored applications they downloaded on their own, they shared ideas and daily life scenarios with each other, leading to searching and discovery of other useful applications. Some students were surprised and excited to find tools that they never thought existed. These applications included support for better shopping strategies, health awareness, and fitness training. Often, these applications were introduced to the students by other students, not by researchers or school staff. The desire to learn about more applications and to share with one another enabled students to overcome many of the barriers that might have prevented them from interacting socially in other contexts.

Collaborative Learning with Peers and Staff

Survey results indicate that participants felt more confident in their ability to "teach other people about apps [they] have used for mobile devices" (Pre M=3.37, SD=1.03; Post M=3.74, SD=1.18, p=0.007). The small group instruction model supported our goal of increased socialization and social learning. In this model, when students struggled, staff could either help them resolve issues or communicate with the research team for further assistance. In practice, however, we observed a surprising result. Not only did the support flow in this expected direction, students also helped each other and staff. Interviews also support this finding:

"... there's like other people like me, just like me who are curious and like need assistance with their future careers and stuff like that…it really made me feel comfortable that I get to be around students who are kind of like are on the same level and position as me." - [student - AC]

"... the people were really nice there, and they were allowing us to share our inputs, and that's the main thing that stood out to me... it's not all just take, it's like give and take... and like communications." - [student - JM]

Student peer interaction is particularly important to develop due to the inherent challenges to socialization experienced by students with ASD (Cotugno 2009; Tse, Strulovitch, Tagalakis, Meng, & Fombonne, 2007; Williams, Koenig, & Scahill, 2006).

"I liked that it actually allowed them to converse with one another… sometimes that's hard… I was really excited to hear the knowledge that some of them had regarding the app and the tool and how they were able to share that knowledge… in a different role." - [staff - DD]

"... my students, they go out on the weekends together and so they're using their iPhones more and more. I watched a student in the workshop that actually shares his iPhone with another

student for looking up bus routes and looking up movie times and organizing how to get there and what time they're going to meet and all of that.... it's just phenomenal." - [staff - CH]

Staff can also benefit from social interaction and social learning. In a relatively non-threatening group setting, they explored applications with other participants, tried new methods to achieve work related goals, and conversed with other staff about different techniques of supporting their students.

"I think when you get into the smaller groups or the breakout session, it gives people the ability to work with your knowledge and to help us learn more things to teach our students and to help us." - [staff - DD]

Regular communication between job coaches and students is critical for supporting transition activities. Applications, such as email or chat, introduced through the TiW program allowed job coaches and students to communicate more easily "through the Cloud" than using previous strategies that relied heavily on phone calls and face-to-face meetings. As students became more comfortable with these tools, they began staying in contact with their peers through social network or instant messaging applications. These tools allowed students to increase social interaction amongst each other, potentially promoting social skills and reducing feelings of being alone.

No single learning style meets all the needs of anyone grappling with incorporating new technologies into their daily living. For students with ASD transitioning into adulthood, this need for multiple approaches to teaching and supporting exploration becomes even more important. The combination of topic-specific stations, small groups, large groups, and extended support at a distance enabled participants to build on basic skills and to improve confidence in their abilities to both use mobile technologies and to teach others about them.

Motivation and Sustained Engagement

Often, interventions to support transition activities suffer from a lack of interest or motivation by both staff and students. In particular, sustained engagement following the initial novelty effects of technology-based interventions can be challenging (Bouxsein, Tiger, & Fisher, 2008; Lerner, Mikami, & Levine, 2011).

For students, key motivating factors for participating in the program included using technologies in and learning skills for the workplace. For individuals with disabilities, assistive technologies can often be stigmatizing (Kaliouby and Goodwin, 2008; Mankoff, Hayes, & Kasnitz, 2010; Morris, Kirschbaum, & Picard, 2010). The opportunity to use iOS devices, however, which are not only mainstream but "cool", garnered interest in the program.

"... I was really interested, because I get to use an iTouch, which I thought I would never get. So, it was a good chance to use it and I know, everyone uses it. I heard it was a good opportunity for me to use it in my work, work for the future stuff." - [student - AC]

"I wanted to learn something new and how to make working in a work environment easier using technology." - [student - KG]

Staff, likewise, were initially motivated by the novelty of the TiW program and the ability to learn more about how technologies can improve their own work practices and those of their students.

"I volunteered because it seemed like a really neat project that I wanted to be involved in. I sort of wanted to learn more about what was out there." - [staff - RB]

Continued staff participation indicates that like the students, the workshops were meeting their initial goals. However, sustained engagement appears also to be related to their ability to see the effect the program had on their students.

"... it surprised me probably how quickly and easily they [students] were able to do things on the device... but it was fun to watch students, how quickly they adapted to using the iPod Touches which they hadn't had prior use with." - [staff - CH]

Throughout the program, both staff and students acquired domain knowledge and expertise. Participants reported significantly higher scores regarding their knowledge of "how to find answers to questions…about mobile technologies" (Pre M=3.6, SD=0.98; Post M=3.9, SD=0.75, p=0.04) following the program. This understanding builds confidence and motivation to use these tools.

"... I changed with my actual working knowledge of the device 'cause I had an idea of what it was [before the program] but I just didn't have it in my hands to play with it as much. I'm having the opportunity now through the workshops... just actually gaining that practical hands on knowledge." - [staff - RB]

In survey responses, a general trend echoes the statements made during interviews. Even before beginning the intervention, participants agreed strongly with statements like "I enjoy working with mobile devices and other technologies" (Pre M=4.24, SD=0.75). Even with this initial affinity towards technology, however, the program met participant goals of teaching new information, as evidenced by sustained participation and changes in attitudes measured on the pre and post surveys. This same question, for example, indicated participants enjoyed working with the devices more by the end of the program (Pre M=4.24, SD=0.75; Post M=4.47, SD=0.55, p=0.02).

Despite the high levels of motivation and interest from both students and staff, as they began to explore more advanced topics, some substantial hurdles emerged around continued use. In particular, staff noted the need for extended training, a common problem in adoption of

educational technologies in schools (Swallow, Petrie, & Power, 2010), and one that is incredibly expensive to overcome. For these kinds of interventions to be sustained long-term, staff members need to be experts in not only their domain of special education and disabilities services, but also in information technologies.

"... [training] allowed me to assist them [students] or kind of trouble shoot something or know what if a parent had a question about an app, or I could go to look for those kinds of things. I mean you gave me that knowledge that would allow me to help the student with the limited amount that I have, but at least a stepping stone, if that makes sense, to help them." - [staff - DD]

Growing Confidence in Use of Technological Tools

"I'm getting a lot more confident... with some of the different technology." - [student - SN]

Barriers to learning how to use the technology and deploy it in new and creative ways to support specific needs and goals can challenge both educators and their students (Hayes et al., 2010; Hirano et al, 2010) By building both confidence and knowledge, we hoped to improve the capacity of participants to solve problems creatively using the technologies provided. Following the program, participants reported agreeing more strongly with statements like, "I have valuable ideas about using technology to transition to the workplace" (Pre M=3.2, SD=0.91; Post M=3.5, SD=0.88; p=0.02). Likewise, participants described viewing technologies, including laptops and mobile phones they had used prior to the program, differently after their experiences with the intervention.

"I love it, once I started using the [iPhone] I was like 'How did we live so long without it? What were we doing before?'... It's amazing how there is so many functions to it and there is so many ways to connect with people and things to learn about and I think everyday it's just like 'wow!!'... It's so addicting..." (sic) - [staff - RM]

"... do I view technology differently? I always viewed it as helpful. I guess I view it as more beneficial and seeing how to implement it... in more settings... with more students." - [staff - RB]

Through exposure to the tools in workshops and use of them in school, work, and personal activities, students with ASD and the staff who support them were able to explore iOS mobile devices and applications with greater ease. These approaches should be used in the deployment of other assistive and educational technology interventions to limit stress and anxiety for both students and staff.

OPEN CHALLENGES FOR TECHNOLOGY ADOPTION AND USE

Several open challenges remain for use of mobile devices to support transition and for other types of assistive and educational technology interventions. These challenges include the struggle between the need for a comprehensive, individualized curriculum and the additional overhead of learning and understanding to use a wide variety of technologies. Additionally, technology challenges require skills and resources that educators lack, even with additional training. Finally, concerns around personal data, privacy, and security are not yet well addressed for technology-based school interventions. In this section, we describe some of these open challenges.

Software systems built for a broad audience, such as those available for iOS devices, do not always match student goals and capabilities. Job coaches typically work with several students with individualized action plans making it labor intensive to find applications that each student can use effectively.

"... there's no way that you can hand someone or 10 people the same apps and expect all 10 to love them so it's still going to be a matter of exploring... test and trail. It's kind of complicated!" - [staff - RM]

"... it's tough to figure out what would work well with or like what kinds of applications would work well with different students." - [staff - LM]

Universal design, a key tenant of much of the research and efforts in technology use for individuals with disabilities, stresses the idea of designing for *all* people. The Higher Education Opportunity Act of 2008 notes that universal design for learning should provide "flexibility in the ways information is presented" and "appropriate accommodation and supports" for students with disabilities. This emphasis on flexibility allows for curriculum—and technology—designers to develop solutions that work for all while supporting individualized needs. iOS tools are an excellent example of technologies that have been universally designed for all people while allowing for individualization and personalization through the choice of which apps to use, how to use them, and the use of some personalization features on these devices. However, in practice, the variety of applications available with similar functionality and descriptions became challenging for participants for a variety of reasons. More "apps for autism" show up in the iTunes app store every day, and almost none of them have any scientific testing of their efficacy. More research is needed to explore iOS devices as a flexible platform for substantial engagement and learning across a variety of students and contexts.

Second, limitations on devices and available infrastructure act as barriers for sustained use of mobile devices in schools, homes, and the workplace. For example, many applications participants found most useful for transition activities (*e.g.,* email and mapping) require network connectivity. However, student participants rarely had the resources for mobile phone data plans and instead relied on WiFi access, which was inconsistent and sometimes required remembering password information, which many found challenging—an issue we describe in more detail below. Likewise, applications tended to work differently across the various platforms students

had, leaving job coaches responsible for learning how to use the applications across multiple devices and troubleshooting issues for several students.

"... most surprising thing for me was just that even though the equipment was all made by the same maker, they all do something a little bit different." - [staff - DD]

This difference in functionality created confusion and frustration for both students and staff. Given the limited resources available in schools, rapid technological change is likely to continue to be a challenge.

Third, although security of school networks and student computational devices is a concern in most schools, current practices and policies are not comprehensive enough to address all of the potential issues. In our observations, students and job coaches had difficulty remembering usernames and passwords for multiple applications and WiFi hotspots, which reduced application usability and usefulness. In response to this challenge, at each workshop, we set up a station in addition to the task and topic-specific stations to handle password resets and other support issues.

"... that's probably one of the things I had trouble with. I'm not too fond of having to create the usernames and passwords for everything... " - [staff - RM]

Job coaches, attempting to support students with these issues, responded in a wide variety of ways. Some encouraged students to store login information in unencrypted to-do list applications on their devices, potentially exposing them to security vulnerability issues if someone else accesses their devices. Other job coaches, however, recognized the potential security risks of such a solution and expressed concerns about vulnerabilities. In particular, they were often worried about students losing devices due to the personal information stored on them.

"...it's so scary, because as much as and as useful as they are, to know that someone can get into your phone and have access to every single contact, messages, voicemails, personal anything, pictures, all of it...." - [staff - RM]

In light of these concerns, some staff members described being eager to learn more about the underlying working of the technologies so they can make knowledgeable decisions. In particular, the individual who expressed the most concerns during interviews also expressed the most interest in learning more about what could be done to keep students "safe":

"... I would be probably interested in… safety and security and making sure that the students are and staff are being careful and learning the capabilities of locking passwords and all that kind of stuff so I'm still interested in that..." - [staff - RM]

Thus, in the second year, we developed modules around staying safe online—including appropriate presentation of self in social networks, protecting passwords, and so on. Although these lessons were well-received, particularly by staff members, it is unclear how much of a difference they actually made. Much like with the general population, students who could not remember their various passwords would write them down on a piece of paper, often placed in the case with the iOS device. Likewise, rather than safely differentiating passwords among different systems, almost every workshop participant used the same or similar passwords across all applications.

These practices are not entirely surprising—after all, the general population tends to behave in the same way—but they are worrying, particularly for a group of people who may have a harder time differentiating "spammers" and "hackers" from others in their social networks. These results indicate that strategies and solutions for securing personal data must be developed that are appropriate for individuals with cognitive disabilities. Thus, we leave as an

open challenge the development of additional curriculum focused not only on the appropriate behaviors to protect privacy and security online but also the underlying motivation and need for such protection. Additionally, expanded curriculum and more care in the creation and implementation of school-based acceptable use policies would help address some of the risk for schools associated with encouraging both staff and student use.

CONCLUSIONS

Participants in a technology based transition program must initially learn to use a standard suite of tools applicable to independent living and workplace support. As their confidence grows, however, they can begin to explore other applications, as participants did in this work. These newly discovered applications might include games and entertainment, social networking, and nutrition and fitness, and a variety of other topics, many of which are not on the surface work or transition-related but speak to a greater familiarity with and enjoyment of technology that can help foster successful use of other systems and improve social and life skills. Likewise, staff who are encouraged to take devices home with them, explore on their own, and use them for their own goals, may begin to learn about a variety of technologies that could be helpful for students. A curriculum that emphasizes hands-on, discussion-oriented, exploratory work can facilitate this kind of self-directed learning. However, the sheer volume of available applications, as mentioned in the results section, could be overwhelming.

The trend in this space is often to develop custom solutions for specific needs. This path raises barriers for schools trying to limit costs through standardization across particular platforms. Using low-cost off-the-shelf components presents opportunities for applications that can be individualized at lower costs than using the more traditional custom hardware solutions.

However, despite the numerous “apps for autism” in the Android Marketplace and iOS App Store, very few have empirical evidence of efficacy.

At the same time, although many schools have begun to standardize on single provider platforms for a variety of basic services (*e.g.,* Google for calendaring, mail, and task and document management), the requirement to have network access on all devices and to enable access to these cloud services through otherwise restrictive school networks can be too high a barrier for usage in everyday school settings. At the same time, continuing the current trend of using only custom applications and one-off solutions is untenable in a digital schooling model. Thus, designers and developers of assistive and educational technologies should consider how to balance the benefits of low-cost off-the-shelf solutions and those of custom, personalized systems to meet the individual needs of students, especially those with disabilities.

Technological interventions have the opportunity to support students with ASD and other disabilities during transition planning and transition activities. However, they require a comprehensive approach that includes development of individualized plans for students and training for both staff and students, as in the intervention we developed and evaluated in this work. Our experiences over two years of offering technology for transition workshops indicate that these kinds of comprehensive interventions can support students and staff in transition by engaging them in both self-directed and social learning around the use of technologies. Using this model, confidence in the ability to use technologies in transition efforts can improve, and participants are likely to share knowledge, not only with each other, but also with those not participating in the program.

ACKNOWLEDGMENTS

We are greatful to the numerous sources of funding for this work, including NSF CAREER Grant 0846063, support from the California Department of Rehabilitation, Orange County Department of Education, and the Regional Center of Orange County. Additionally, we appreciate the in kind donation of time from Tiwahe Technology to support this work. Meg Cramer, Lynn Dombrowski, Erick Custodio, Sen Hirano, and the numerous students, staff members, and parents who participated in this program were essential to the completion of this work. Finally, we thank Katharina Boser and Matthew Goodwin for their support, encouragement, and critique in the writing of this chapter.

REFERENCES

1. Bauminger, N., & Kasari, C. (2000). Loneliness and friendship in high functioning children with autism. *Child Development*, 71, 447–456.
2. Bellini, S., & Akullian, J. (2007). A meta-analysis of video modeling and video self-modeling interventions for children and adolescents with autism spectrum disorders. *Exceptional Children*, 73, 261–284.
3. Blood, E., Johnson, J. W., Ridenour, L., Simmons, K., Crouch, S.(2011). Using an iPod Touch to Teach Social and Self-Management Skills to an Elementary Student with Emotional/Behavioral Disorders. *Education and Treatment of Children 34.3,* 299-321. *Project MUSE*. Web. 21 Jul. 2011.
4. Bouxsein, K. J., Tiger, J. H., & Fisher, W. W. (2008). A comparison of general and specific instructions to promote task engagement and completion by a young man with Asperger's syndrome. *Journal of Applied Behavior Analysis*, 41, 113 - 116.

5. Burke, M., Kraut, R., and Williams, D. Social use of computer-mediated communication by adults on the autism spectrum. *In Proceedings of the 2010 ACM Conference on Computer Supported Cooperative Work* (Savannah, Georgia, USA, Feb 06 - 10, 2010). ACM, New York, NY, 425-434.
6. Cotugno, A. J. (2009). Social competence and social skills training and intervention for children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 39, 1268-1277.
7. Cramer, M., Hirano, S.H., Tentori, M., Yeganyan, M.T., & Hayes, G.R. (2011). Classroom-Based Assistive Technology: Collective Use of Interactive Visual Schedules by Students with Autism *Proc. CHI 2011*. Vancouver, BC, Canada. May 7-12, 2011.
8. Feil-Seifer, D. (2008). Socially Assistive Robot-Based Intervention for Children with Autism Spectrum Disorder. *Presented at the NEWHRI Workshop*, Pasadena, CA, 2008.
9. Gentry, T., Wallace, J., Kvarfordt, C., Lynch, K. (2010). Personal digital assistants as cognitive aids for high school students with autism: Results of a community-based trial. *Journal of Vocational Rehabilitation, Volume 32*, 101-107.
10. Hansen, D.L. & Morgan, R.L. (2008). Teaching grocery store purchasing skills to students with intellectual disabilities using a computer based instruction program. *Education and Training in Developmental Disabilities*, 43, 431-442.
11. Hayes, G.R., Hirano, S., Marcu, G., Monibi, M., Nguyen, D.H., Yeganyan, M. (2010). Interactive visual supports for children with autism. *Springer Personal and Ubiquitous Computing,* 14(7), 663-680.
12. Hirano, S., Yeganyan, M., Marcu, G., Nguyen, D., Boyd, LA., Hayes, G.R. (2010). vSked: evaluation of a system to support classroom activities for children with autism. *In*

Proceedings of the 2010 Conference on Human Factors in Computing Systems (Atlanta, GA, USA, April 12–15, 2010). *CHI'10.* ACM, New York, NY, 1633-1642.

13. Individuals with Disabilities Education Act (IDEA) 0f 1997. § 20 U.S.C. § 1401 (1997).
14. Kaliouby, R. and Goodwin, M. S. (2008). iSET: interactive social-emotional toolkit for autism spectrum disorder. *In Proceedings of the 7th international Conference on interaction Design and Children (Chicago, Illinois, June 11 - 13, 2008). IDC '08*. ACM, New York, NY, 77-80.
15. Kamps, D. M., Leonard, B. R., Vernon, S., Dugan, E.P., & Delquandri, J. C. (1992).Teaching social skills to students with autism to increase peer interaction in an integrated first grade classroom. *Journal of Applied Behavior Analysis*, 25, 281-288.
16. Laushey, K. M., Heflin, L. J., Shippen, M., Alberto, P., & Fredrick, L. (2009).Concept mastery routines to teach social skills to elementary school children with high functioning autism. *Journal of Autism and Developmental Disorders, 39*, 1435 –1448.
17. Lerner, M.D., Mikami, A.Y., Levine, K. (2011). Socio-dramatic affective-relational intervention for adolescents with Asperger syndrome and high functioning autism: pilot study. *Autism*, Vol. 15, no. 1,21-42.
18. Lindstrom, L., Doren, B., Metheny, J., Johnson, P., & Zance, C. (2007). Transition to employment: Role of the family in career development. *Exceptional Children*, 73,348-366.
19. Mankoff, J., Hayes, G.R., and Kasnitz, D. (2010). Disability Studies as a Source of Critical Inquiry for the Field of Assistive Technology. *In Proc. Assets 2010*, 3-10.
20. Matson, J. L., Dempsey, T., & Fodstad, J. C. (2009). The effect of autism spectrum disorders on adaptive independent living skills in adults with severe intellectual disability. *Research in Developmental Disabilities*, 30,1203–1211.

21. Mechling, L., & O'Brien, E. (2010). Computer-Based Video Instruction to Teach Students with Intellectual Disabilities to Use Public Bus Transportation. *Education and Training in Autism and Developmental Disabilities.* 45(2),230-241.

22. Morris, R., Kirschbaum, C., Picard, R. (2010). Broadening accessibility through special interests: A new approach for software customization. *In: ASSETS 2010*, pp. 171–178.

23. National Organization on Disability. The State of the Union for People with Disabilities, (2007), http://www.nod.org/about_us/our_history/annual_reports/2007_annual_report/.

24. Orsmond, G. I., Krauss, M. W., & Seltzer, M. M. (2004). Peer Relationships and Social and Recreational Activities Among Adolescents and Adults with Autism. *Journal of Autism and Developmental Disorders*, 34(3), 245-256.

25. Sasso, M. G., Peck, J., & Garrison-Harrell, L. (1998). Social interaction setting events: Experimental analysis of contextual variables. *Behavioral Disorders*, 24, 34–43.

26. Schall, C., & Wehman, P. (2008). Understanding the transition from school to adulthood for students with autism. In P. Wehman, M. D. Smith, & C. Schall (Eds.) *Autism and the transition to adulthood: Success beyond the classroom (pp. 1–14)*. Baltimore, MD: Paul H Brookes.

27. Sitlington, P. L., & Clark, G. M. (2006). *Transition education and services for students with disabilities* (4th ed.). Boston: Allyn & Bacon

28. Skouge, J.R., Kelly, ML, Roberts, KD, Leake DW, stodden, RA. (2007). Technologies for self-determination for youth with developmental disabilities. *Education and Training in Developmental Disabilities*. 42, 475-482.

29. Stancliffe, R.J., Lakin, C., Doljanace, R., Byun, S.Y., Taub, S., & Chiri, G. Loneliness and Living arracngements. (2007). *Intellectual and Developmental Disabilities*, 45, 380-390.

30. Steer, D.E., Cavioulo, D.(2002). Connecting outcomes, goals, and objectives in transition planning. *Teaching Exceptional Children.*, 34, 54-59.

31. Swallow, D., Petrie, H., & Power, C. (2010). Understanding and Supporting the Needs of Educational Professionals Working with Students with Disabilities and Mature Age Students. *In Computers Helping People with Special Needs*, Vol. 6179, 489-491.

32. Tomas, SB and Dykes, F. (2011). Promoting Successful Transitions: What Can We Learn from RTI to Enhance Outcomes for All students? *Preventing school failure*, 55(1), 1-9.

33. Toppo, G.(2009). iPhone applications can help the autistic, *USAToday*, http://www.usatoday.com/news/health/2009-05-27-iphone-autism_N.htm.

34. Tse, J., Strulovitch, J., Tagalakis, V., Meng, L., & Fombonne, E. (2007). Social skills training for adolescents with Asperger's syndrome and high functioning autism. *Journal of Autism and Developmental Disorders*, 37, 1960–1968.

35. Volkmar, F. R., Lord, C., Bailey, A., Schultz, R. T., & Klin, A. (2004). Autism and pervasive developmental disorders. Journal of Child Psychology and Psychiatry, 45, 135–170.

36. Wehman, P., Inge, K.J., Ravelle, W.G., Brooke, V.A. (Eds). (2006). Real work for real pay: Inclusive employment for people with disabilities. *Baltimore: Brookes*.

37. Williams, S. K., Koenig, K., & Scahill, L.(2007). Social skills development in children with autism spectrum disorders: A review of intervention research. *Journal of Autism and Developmental Disorders,* 37:10, 1858-1868.

38. Wing, L. (1981). Language, social and cognitive impairments in autism and severe mental retardation. *Journal of Autism and Developmental Disorders*, 11, 31-44.