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The ECHO Model® for Enhancing Assistive Technology Implementation in Schools

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Abstract

In this article, we describe the implementation of the ECHO model® for use in education to build capacity among educators and professionals to implement assistive technology. ECHO® is a professional development model that relies on video-conferencing, didactic trainings, and case presentations to improve professional capacity and ultimately student outcomes. This article describes how a large rural state is effectively using this technology to connect to rural school districts for the purposes of providing training, mentoring, and skills development for educators, administrators, and related professionals on emerging and promising practices in assistive technology. The data from our first full academic year of implementation, 2014-2015, shows that the ECHO model can be effectively used in educational settings, reaches large numbers of professionals, and improves self-reported knowledge and skills related to assistive technology.

Keywords: assistive technology, professional learning, capacity building, ECHO model®

Introduction

Most students with disabilities spend the majority of their time during the school day in the general education classroom (National Center for Education Statistics, 2016). Research suggests that appropriate assistive technology (AT) can provide critical tools to improve educational outcomes of all students, especially students with disabilities (Edyburn, 2013). However, education professionals and related service providers (e.g., speech-language pathologists, occupational therapists, and physical therapists) report that they lack the up-to-date knowledge and skills related to AT policies, procedures, devices and strategies, which limits their ability to implement AT for students (Bausch, Ault, & Hasselbring, 2015). Education professionals, therefore, have demonstrated a need to know specific technologies and strategies that will allow them to integrate AT in their classrooms and schools (Bausch & Hasselbring, 2004, Bausch, et. al, 2015). Unfortunately, in large rural states like Wyoming, few opportunities exist to increase educators' skills and knowledge related to AT.

To address this problem, the Wyoming Institute for Disabilities at the University of Wyoming adapted the components of Project ECHO® (Arora, Thorton, Komaromy, Kalishman, Katzman & Duhigg, 2011; Arora, Thorton, Murata, Deming, Kalishman, Dion, et. al, 2014; http://echo.unm.edu) for use in educational settings. ECHO was originally developed for interdisciplinary teams of health care professionals based in rural areas to increase their knowledge of specialty care and improve outcomes of patients in primary care settings. The four core components of the ECHO model™ provide a framework for strategically building capacity of health care professionals (Arora, et. al, 2011). These components include: 1) the use of technology to leverage scarce resources, 2) didactic training, 3) case presentation, comanagement and mentoring, and 4) rigorous outcome evaluation. The Wyoming Institute for Disabilities uses these same four components, but each has been adapted for use with interdisciplinary teams of educators interested in learning about AT.

Target Audience and Relevance

The target audience of this article includes education professionals such as educators, administrators, service providers and other educational professionals, and parents of children with disabilities. Educators will find this article relevant as they consider opportunities to learn about AT devices and strategies to improve student outcomes. Educational professionals will recognize the value of mentoring interdisciplinary teams of professionals engaged in implementing AT. The large returns on small investments of time and resources when utilizing videoconference technology will appeal to administrators and agencies looking to replicate the model. Parents will appreciate the timely manner in which AT can be considered, implemented, and evaluated for effectiveness through educators' participation in ECHO.

Literature Review

Assistive technology has been shown to improve functional capabilities of students (Marino, Marino, & Shaw, 2006) and allows greater student engagement and higher attainment in education (Murchland & Parkyn, 2010). To improve the use of AT in schools, education professionals should be trained in the assessment of student AT needs, the spectrum of technologies available to students, and effective implementations of AT in the classroom (Bausch et al, 2015). While both general and special education teachers acknowledge the potential of AT, they are daunted by the responsibilities of understanding and using AT with their students (Lee, Yuenoo & Vega, 2005). Indeed, numerous barriers often exist to adopting AT in school settings. These include cost, uncertainty about usability, and lack of training (Flanagan, Bouck and Richardson, 2013; Ertmer, Ottenbriet-Leftwich, Sadi, Sendurur & Sendurur, 2012). Effective integration of AT depends upon the knowledge and skills of teachers and related service providers. The expansion of AT capacity in diverse groups of professionals has the potential to provide significant benefits to students with disabilities.

While there is a demonstrated need for AT to improve outcomes for children with disabilities, most schools in rural areas lack trained personnel to make AT recommendations or provide necessary support when AT is needed (Bausch, et.al, 2004; Bausch, et.al, 2015). Given this challenge, the Wyoming Institute for Disabilities, the lead agency for the state's Assistive Technology Act program at the University of Wyoming, explored possible solutions that would build more capacity in AT skills and knowledge among educators who work within the context of rural and frontier communities. In 2014, we launched a virtual professional learning community of practice using the core components of the ECHO model (http://echo.unm.edu; Arora, et. al, 2014, Root-Elledge, Hardesty & Wagner, 2015-2016; Root-Elledge & Hardesty, 2015).

University of Wyoming ECHO in Assistive Technology (UW ECHO in AT)

The model, UW ECHO AT (http://www.uwyo.edu/wind/echo/assistive-technology), delivers professional learning opportunities and guided practice to increase the learners' capacity to provide AT to students within their schools and districts. The ECHO model is built upon a network of specialists and learners through a hub-and-spoke knowledge-sharing system. The "hub" of specialists guides conversations with learners throughout the state. Hub team members include certified AT specialists, occupational therapists, speech-language pathologists, audiologists, general and special educators, and vision and hearing specialists from the University of Wyoming and the Wyoming Department of Education. The "spokes" are the community of learners that join the training and mentoring through videoconference and/or phone connections from their schools and classrooms around the state of Wyoming. Learners include general and special education professionals, AT professionals, occupational therapists, physical therapists,

and speech-language pathologists. The ECHO network connects a community of learners via video conferencing to join a series of sessions that include short trainings (i.e., didactics) followed by case discussions presented by the learners (i.e., spoke participants). The hub of specialists provides oral and written recommendations for each case discussion. This model is unlike traditional AT training programs that rely on a fixed cohort participating in person at a physical location. Rather, ECHO allows learners to self-select topics of interest and engage virtually as their schedule allows.

To determine the impact of UW ECHO in AT, we measured the degree of participation in the network, learners' satisfaction with the program, their perceived change in AT knowledge and skills, and their desire for future ECHO sessions.

Method

Participants

During the 2014-2015 academic year, 157 (unduplicated) participants attended at least one ECHO session. As part of the weekly attendance data, participants were asked to report their contact information along with a simple set of demographics including school district and current role. The professionals who attended the sessions represented 26 of the 48 school districts in Wyoming (54%) and included numerous roles depicted in Table 1.

Table 1. ***Professional Roles of UW ECHO in AT Participants***

Role	Count (%)
General or Special Educator	31 (30%)
AT Specialist	16 (15%)
Expert Trainer	13 (13%)
Case Manager	10 (10%)
Occupational Therapist	9 (9%)
Speech Language Pathologist	9 (9%)
Special Educator, Director	6 (6%)
Principal	3 (3%)
Student	3 (3%)
Paraeducator	2 (2%)
Physical Therapist	1 (1%)
Family Mentor	1 (1%)

Table 1. Self-reported professional roles of participants in weekly UW ECHO in AT Network sessions.

In addition to the attendance data, we collected data from a more detailed questionnaire from a subset of these participants (n = 39) as part of a research study. All research activities were approved by the Institutional Review Board of the University of Wyoming prior to use and all participants were treated in accordance with the ethical standards of the American Psychological Association (American Psychological Association, 2002).

Procedure

In consultation with key stakeholders, UW ECHO faculty and staff planned training topics, developed trainings in their expertise area, recruited other speakers, solicited case presentations from the community of learners, provided facilitation and technology support during weekly 90-minute ECHO sessions, and provided oral and written recommendations for each case. To determine the impact of the UW ECHO in AT network on learners' self-reported satisfaction as well as professional knowledge and skills, a questionnaire, described in the methods section, was developed. Attendees who participated in at least one ECHO session were asked to complete the questionnaire during the last two weeks of network in May 2015. Questionnaires typically took 30 minutes to complete and the responses were recorded electronically.

Measures

Participation data. We measured the degree of participation in the network, learners' satisfaction with the program, and their perceived change in AT knowledge and skills during the 2014-15 academic year. Faculty and staff tracked attendance of each participant during the weekly sessions. Participants reported their names, phone numbers, current roles, and districts or agencies of current employment. These data are housed in an electronic database, iECHO, supported by the ECHO Institute™.

Questionnaire. The instrument used here was internally generated and consisted of 64 items, including both qualitative and quantitative questions. These items examined respondent demographics, network participation, satisfaction, knowledge and skills, as well as perceived knowledge related to (10) categories of AT (i.e. reading, access, writing, mobility/seating/positioning, augmentative communication, learning/studying, vision technology, math, activities of daily living, and hearing technology). These questionnaires were designed to capture the extent of participants' changes in knowledge and skills related to specific AT assessments, interventions and strategies, as well as overall quality and program improvement recommendations for the UW ECHO in AT network. Pre- and post-network participation AT knowledge and skills were assessed in a single questionnaire administration. Participants first indicated their perceived skill levels after completion of the academic year of the UW ECHO in AT network, then they rated their perception of skill level prior to participating in the network (i.e., retrospective pre-test). While not directly measuring change in skills or knowledge, the retrospective post-then pre-evaluation captures the participants' perceived changes (Rockwell & Kohn, 1989). This method has been shown to avoid the response-shift effect which occurs when a respondent's frame of reference regarding their knowledge changes significantly during an intervention (Howard, Dailey & Gulanick, 1979; Howard & Dailey, 1979). Further, this method is more convenient for respondents than a traditional pre- and post-test administered before and after the intervention; the retrospective pretest is administered just once (Pratt, McGuigan & Katzey, 2000).

Analysis Plan

To determine the impact of this program on participants, we analyzed the data in four ways. First, we wanted to understand how much participation the program received and the roles of those who used it. Therefore, we calculated weekly attendance and the numbers of participants with specific roles. Second, in order to understand the level of satisfaction participants had with the program, we calculated the proportion of individuals who reported the sessions were useful for each type of topic presented. Third, to understand the impact of the program on skills and knowledge about AT, we computed paired sample t-tests of self-reported skills and knowledge. Finally, to explore the desire for future trainings, we calculated the proportion of respondents who expressed an interest in additional training related to AT.

Results

Program Participation

The UW ECHO in AT network included 32 weekly sessions that ranged from 9/8/2014 to 5/18/2015. Overall network participation, as measured by the sum of attendance for each weekly session, was 481. As suggested by Table 2, these 481 contacts included participants who joined the ECHO sessions repeatedly over the year. According to weekly attendance records, most participants joined the weekly sessions via videoconference connection (*n* = 375), while some attended via telephone or audio only (*n* = 41) or as part of a UW ECHO faculty and staff hub team on the University of Wyoming campus (*n* = 65). Weekly attendance varied, but generally increased throughout the year (see Figure 1). Those who attended held a variety of professional roles, but most were from school districts throughout Wyoming (see Table 1). Most of the participants who responded to the questionnaire (56%) reported attending at least five or more of the 23 sessions (see Table 2).

Table 2. *Synchronous Attendance Data*

Attendance	Count (%)
No attendance	2 (5%)
1-2 Sessions	7 (18%)
3-4 Sessions	8 (21%)
5-10 Sessions	6 (15%)
11-20 Sessions	9 (23%)
21-32 Sessions	7 (18%)

Table 2. Unique participants by number of sessions attended, as reported in post-network assessment.

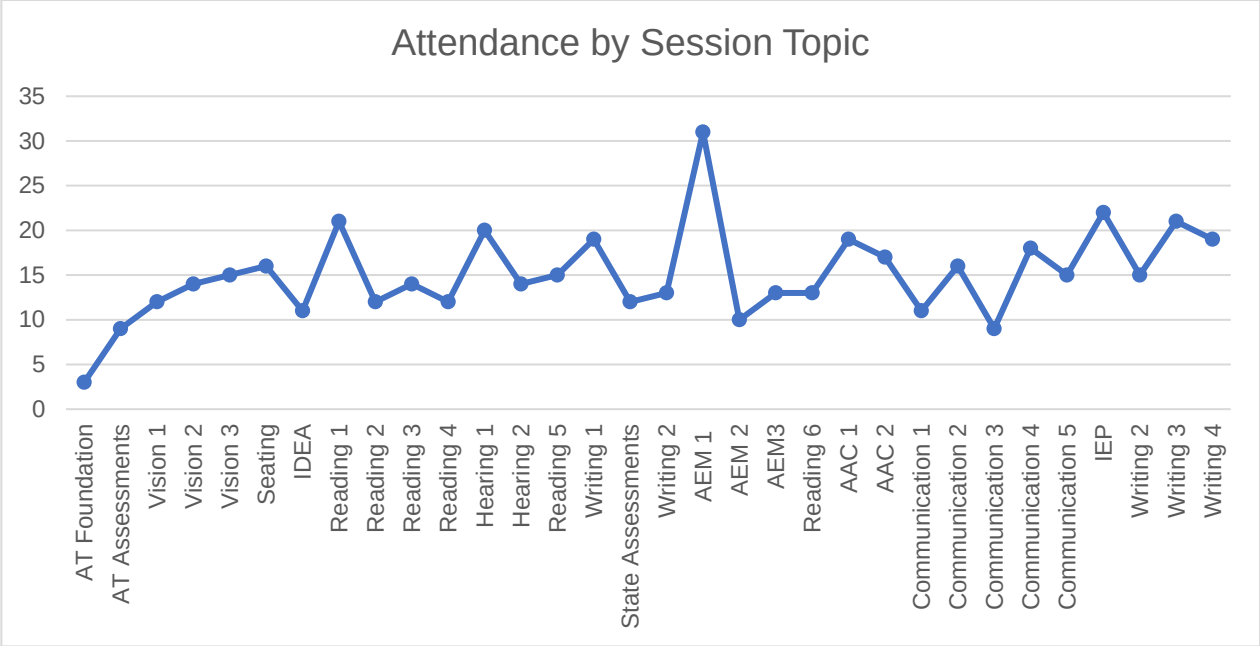

Figure 1. Attendance of UW ECHO in AT sessions by topics.
Note: Sessions range from 9/8/2014 on left and progress weekly to 5/18/2015 on right.

Thirty-nine of 157 individuals completed the research questionnaire, resulting in a 25% response rate. They reported a range of between one and 34 years of experience (M = 9.52, SD = 8.31) in their respective roles. Services provided by these professionals ranged from assessment and consideration, instruction, technical and device support to district policy and procedure creation and maintenance. The majority (74%) of individuals from this sample attended at least one of the live sessions. Of the remaining participants, five participants reported accessing the recorded materials asynchronously without attending a live session, four reported presenting cases or trainings, and one reported accessing the session through "other" means. Although a smaller number, this indicates that professionals are accessing the material through a variety of modalities.

Program Satisfaction

As shown in Table 3, the majority of participants reported that training provided during the ECHO sessions about Universal Design for Learning (90%), the availability of current AT devices (92%), strategies for using AT devices (95%), AT assessment (87%), AT referrals (79%), implementation in the classroom (92%), and specific AT device types or AT service delivery (90%) would be "useful" or "very useful." These data suggest an increase in confidence in the provision of AT within the participants' classrooms, schools, and districts. Supporting this interpretation was the finding that a number of participants provided comments about their changing role in AT since they began participation in ECHO, which included an increase in their scope of duties related to AT, providing new training opportunities for staff, and additional responsibilities related to AT teams in their schools and districts. A summary of these qualitative responses is available in Figure 2.

Table 3. *Perceived Reported Usefulness of Selected Training Topics*

Item	Response Chosen			
	Not Useful	Somewhat	Useful	Very Useful
Universal Design for Learning (UDL)	1 (2.56%)	3 (7.69%)	20 (51.28%)	15 (38.46%)
Information on AT devices available	-	3 (7.39%)	17 (43.59%)	19 (48.72%)
Information on the use of AT devices	-	2 (5.13%)	16 (41.03%)	21 (53.85%)
AT assessment	-	5 (12.82%)	17 (43.59%)	17 (43.59%)
AT referrals	1 (2.56%)	7 (17.95%)	17 (43.59%)	14 (35.90%)
AT implementation in classrooms	-	3 (7.69%)	12 (30.77%)	24 (61.54%)
Specific AT device types or aspects of AT service-delivery	-	4 (10.26%)	17 (43.59%)	18 (46.15%)

Table 3. Participant responses to an item included in the UW ECHO in AT post-network evaluation which asked the extent to which each type of training would be useful.

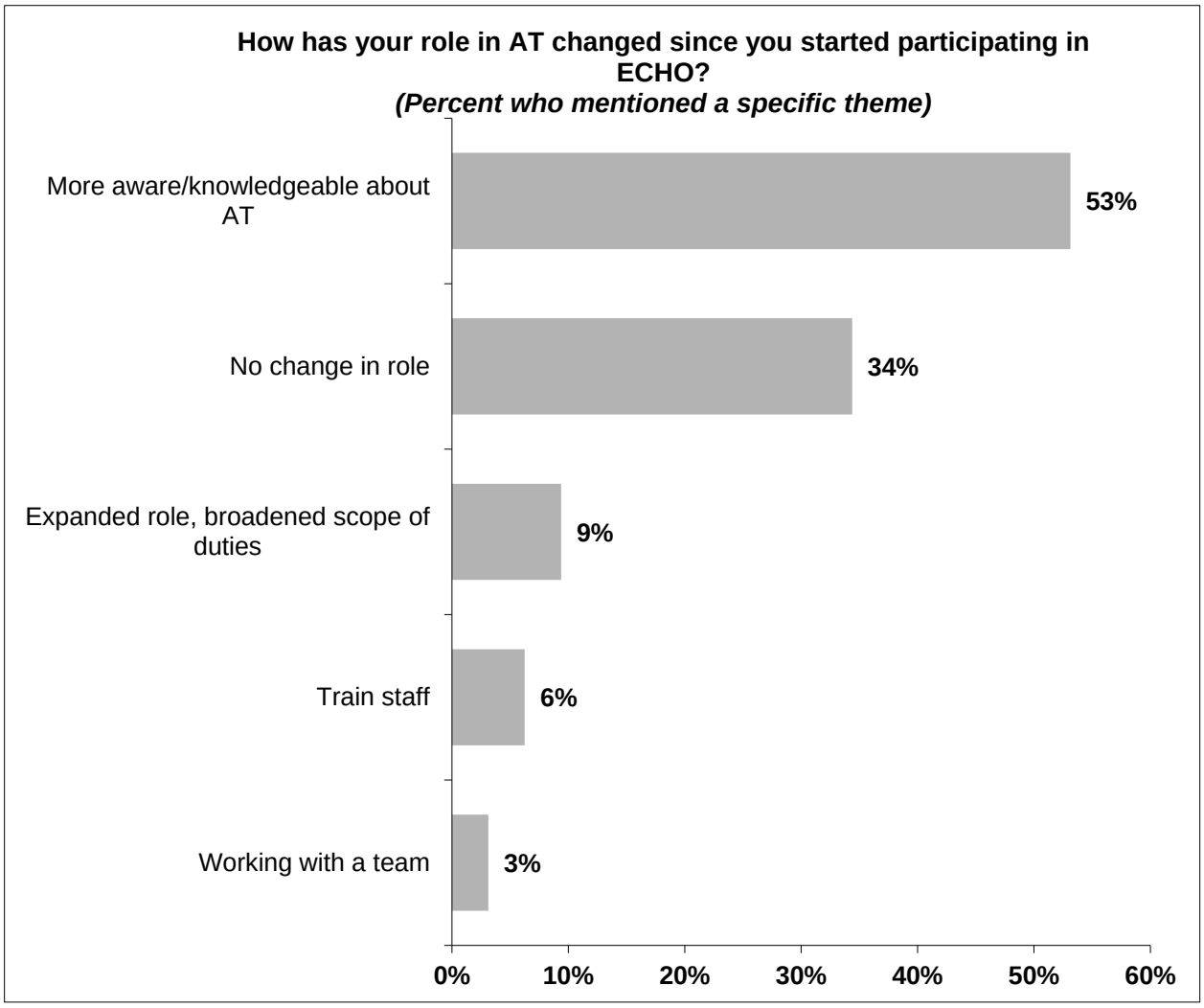

Figure 2. Summary of qualitative responses.

Program Impact on Knowledge, Skills and Other Professional Outcomes

Participants' AT skillset was measured using 36 items which assessed a variety of AT domains and uses. Table 4 provides a full list of the questionnaire items, as well as the mean and standard deviation. The full instrument formed a single, reliable scale for both retrospective pre- (α = .99) and post-network (α = .98) skill assessment. As such, these items were averaged together to form two single scores (i.e., pre- and post-network skill level). A paired sample t-test was then conducted to compare participants perceived skills prior to UW ECHO in AT participation (M = 2.82, SD = 1.20), with their perceived skills following participation (M = 3.63, SD = 3.75). Results indicated significant improvement in overall skills (t = 6.04, p < .0001) from pre- to post-network. Further, the observed effect was large (r = .76), which highlights the impact potential for AT professional development training using the ECHO model.

Table 4. ***Descriptive Statistics for Retrospective Pre- and Post- ECHO Skill Assessment***

Item	Retrospective Pre-Test	Post-Test
	M (*SD*)	*M* (*SD*)
Determine a way for students to access toys, games, and other materials through enlarging, stabilizing, use of switches, etc.	3.25 (1.5)	4.00 (1.03)
Determine an effective way for a student to operate/access a computer and/or other AT.	3.46 (1.48)	4.18 (1.17)
Select and use a variety of low tech aids to position and stabilize items (e.g., for eating, drinking, dressing, hygiene, and cooking).	3.27 (1.56)	3.87 (1.17)
Identify a child's need for greater control of his/her environment.	3.14 (1.36)	3.72 (1.07)
Design opportunities to use aids to daily living and select appropriate AT.	3.17 (1.34)	3.77 (1.09)
Adapt or select and use adapted toys, games and recreational sports equipment.	3.16 (1.26)	3.69 (1.08)
Select and use a variety of AT, including software, for access and interaction.	3.16 (1.34)	4.08 (1.22)
Identify important features of AAC devices.	3.16 (1.66)	3.79 (1.40)
Match student needs with features of AAC devices.	2.86 (1.65)	3.72 (1.39)

Operate/utilize a variety of AAC devices from simple to complex	2.97 (1.62)	3.82 (1.47)
Determine the best format of vocabulary representation (e.g., pictures, symbols, words), select, and organize vocabulary in a usable system.	2.84 (1.46)	3.67 (1.30)
Train communication partners	2.68 (1.63)	3.46 (1.33)
Identify when amplification of sound may be necessary for a student in an educational setting.	2.78 (1.33)	3.31 (1.26)
Operate/use assistive technology for telecommunications, assisted listening and alerting.	2.81 (1.33)	3.18 (1.16)
Develop and use a variety of print and picture schedules.	3.53 (1.58)	4.24 (1.28)
Select and use a variety of aids including hand-held and on line tools to locate, highlight and track information.	3.11 (1.55)	3.95 (1.41)
Use software to highlight, manipulate and/or organize information.	3.19 (1.58)	4.05 (1.41)
Identify and use a variety of math aids and low tech AT.	2.75 (1.48)	3.31 (1.56)
Select and use a variety of voice output aids for math operations (e.g., counting, measuring, computation).	2.67 (1.53)	3.29 (1.52)
Select and use software to provide cueing assistance in math operations.	2.47 (1.50)	3.05 (1.53)
Recognize and analyze the impact of seating/positioning on the child's attention, energy, and ability to access AT devices.	2.46 (1.34)	3.26 (1.27)
Determine when and why a child may benefit from assisted mobility.	2.43 (1.24)	3.05 (1.19)
Identify important features of mobility devices.	2.37 (1.31)	2.97 (1.18)

Select and utilize AT for mobility or stabilization.	2.23 (1.19)	2.87 (1.14)
Design and implement a sequenced intervention to teach a child to operate/use an assisted mobility device.	2.11 (1.13)	2.76 (1.20)
Identify need for and use an array of low tech solutions to assist with reading text (changes in color, size, font, use of guides, etc.)	3.14 (1.56)	4.10 (1.33)
Create and use pictures with text to support reading.	3.17 (1.54)	4.23 (1.35)
Use a variety of tools to speak text to accompany the printed words (talking books, software, eReaders, etc.)	3.06 (1.61)	4.31 (1.38)
Use low-tech vision aids to enlarge text.	3.06 (1.51)	3.79 (1.32)
Operate and use text-to-speech, screen reader and screen enlarger/magnification software.	2.93 (1.54)	3.82 (1.35)
Operate and use Braille printers, Braille translation software, refreshable Braille, Braille keyboards and Braille notetakers.	2.19 (1.17)	2.59 (1.19)
Identify and use a continuum of AT solutions from low to high tech for composing written material.	3.11 (1.63)	4.03 (1.37)
Complete informal assessment techniques (e.g., environmental inventory, interview, observation) to determine need for AAC.	2.86 (1.48)	3.66 (1.40)
Identify and use a continuum of AT tools from low to mid tech for difficulties with motor aspects of writing.	2.92 (1.65)	3.72 (1.36)
Identify and use software to decrease or change the motor demands of writing.	2.94 (1.66)	3.87 (1.44)
Understand and use tools to augment writing skills such as word-prediction, macros, and electronic word walls.	3.00 (1.66)	3.79 (1.44)

Table 4. Retrospective pre- and post- ECHO Network Skill evaluations. Participants responded to each item using a 1 to 6 scale, where 1 = Unfamiliar: This is new to me. What is it? 2 = Awareness: I have heard about it, but I need basic information. 3 = Knowledge: I know what it is, but I'm not ready to use it. I need training. 4 = Beginning Application: I am able to apply this but need some support. 5 = Advanced Application: I am able to apply this with little support. 6 = Mastery: I am ready to work with other people to help them learn this. I feel confident enough to demonstrate this to others

In addition to this formal measure of change, participants also answered a single item which asked the extent to which they felt their AT-related knowledge had increased as a result of participation in the UW ECHO in AT. Of the 39 questionnaire participants, 33 (85%) reported at least “some” increased knowledge. Other reported benefits included improved motivation (at least “some” = 85%), increased skills, (at least “some” = 74%) and most importantly 74% stated that they would make at least “some” change to what they did in their profession as a result of participating in UW ECHO in AT (see Table 5).

Table 5. ***Perceived Changes Resulting from Participation in UW ECHO in AT***

Item	Response Chosen					
	Did Not Participate Enough to Have an Impact	Hardly At All	A Little Bit	Some	Quite a Bit	A Lot
Has your AT-related knowledge increased?	2 (5.13%)	-	4 (10.81%)	10 (27.03%)	14 (37.84%)	9 (24.32%)
Have your AT-related skills increased?	5 (12.82%)	2 (5.13%)	3 (7.69%)	11 (28.21%)	13 (33.33%)	5 (12.82%)
Has your AT-related motivation increased?	2 (5.13%)	1 (2.56%)	3 (7.69%)	7 (17.95%)	11 (28.21%)	15 (38.46%)
Will you change what you do back on your job?	4 (10.26%)	2 (5.13%)	4 (10.26%)	12 (30.77%)	10 (25.64%)	7 (17.95%)

Table 5. Participant responses to self-perceived change items included in the UW ECHO in AT post-network evaluation.

Results also indicate that participants benefitted professionally from attending ECHO networks sessions (see Figure 3). Benefits, measured by single items, included improved professional satisfaction (82%), diminished professional isolation (77%), formation of a virtual community of support (82%), and expanded access to AT implementation for students (71%).

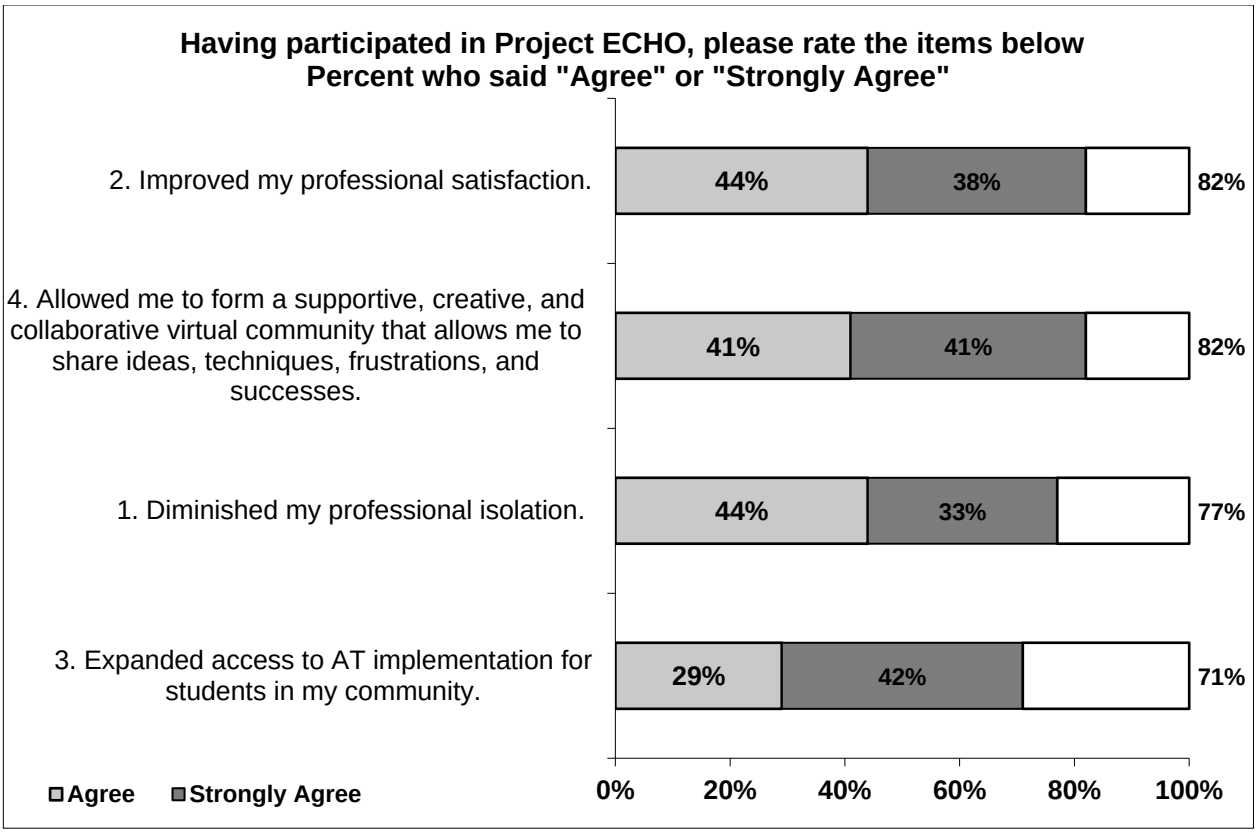

Figure 3. Summary of professional benefits.

The Need for Further Training

Finally, in order to develop training for subsequent years and to gauge current and future practices of participants, a series of questions related to professional goals was also included in the post then pre-test. More than one-third (36%) of questionnaire participants indicated that they wanted to learn how to better screen and implement AT for students with special needs and 33% reported that they wanted to act as a local source of AT education for students, families, and other educators. Goals related to learning how to act as a local AT provider for students (26%), as well as AT assessment (18%), were also endorsed, although at a somewhat lower rate. These results are shown below in Table 6.

Table 6. *Perceived Reported Current or Future Professional Goals*

Item	Response Chosen		
	Currently Doing	Hope to Learn	Not Interested
Assessing students' AT needs	27 (69.23%)	7 (17.95%)	5 (12.82%)
Screening and referring students with special needs to AT specialists	19 (48.72%)	14 (35.90%)	6 (15.38%)
Acting as a well-trained local provider for students with AT needs	25 (64.10%)	10 (25.64%)	4 (10.26%)

Acting as a local source of AT education for students, families, and other educators	25 (64.40%)	13 (33.33%)	1 (2.56%)

Table 6. Participant responses to items included in the UW ECHO in AT post-network evaluation which asked the extent to which each listed goal referred to a current practice or future goal in AT service.

Discussion

Outcomes and Benefits of UW ECHO in AT

The data suggested that UW ECHO in AT was able to reach a large number of professionals across an expansive geographic area. UW ECHO in AT reached 157 professionals during 32 synchronous sessions and provided 48 hours of continuing education credits. In its first full year, UW ECHO in AT reached education professionals in more than half the school districts in Wyoming. Hub attendance during the sessions included core faculty and specialists from the University of Wyoming Assistive Technology Act program and Division of Communication Disorders along with AT experts throughout the country. Spoke sites included a wide range of education professionals from general and special education, paraeducators, and related service providers, such as speech-language pathologists, occupational therapists and physical therapists participating in weekly, virtual sessions. This suggests that a diverse group of professionals who join the ECHO network could benefit from this modality for learning and could exponentially increase the rates of implementation of AT for students. Although not directly marketed to parents and students, a small number from these groups attended the sessions with their interdisciplinary teams to engage in the case presentation portion of the session. Self-reports from these participants indicate a need to continue to enhance the opportunities for families and students to engage with professionals using this model of coaching and mentoring. Our findings align with the impacts related to increases in learners' knowledge skills and abilities for implementation of best practices observed with the ECHO model for health (Arora et. al, 2011, Arora, et. al, 2014).

Further, participants reported this training model was a satisfactory way to deliver training in AT. Participants reported improved professional satisfaction, diminished professional isolation, the opportunity to form a virtual community of support and expanded access to AT implementation for students because of their participation in UW ECHO. Indeed, attendance increased throughout the year by both professionals, parents, and students which suggests growing interest in this program and an opportunity to engage parents along with professionals in learning and mentoring opportunities. This suggests that participants are interested in ways to improve their knowledge about AT strategies and that this model is meeting their goals.

Additionally, self-reported AT knowledge and skills increased, suggesting that educators and education professionals in rural communities may be better able to implement AT in their professional settings as a result of their participation in the UW ECHO in AT. Moreover, the majority of participants (74%) reported that they would make changes in how they deliver services. This

finding is interesting given the nature of the ECHO model. That is, best practice for training AT is built upon exploration of theory, modeling of the skills, opportunity for peer coaching and on-going feedback through direct observation (Joyce and Showers, 2002). While, the ECHO model provides many of these components, it does not rely on in person coaching. Rather, brief virtual opportunities for mentorship and case consultation are offered. Given this modality of professional support is associated with high rates of reported intention to change practice, it may be far more effective in large rural states in that it can be delivered over video-conferencing. That is, it is potentially more appropriate and cost-effective for this environment.

Taken together, these results suggest that the UW ECHO in AT network is an effective tool for building the skills and knowledge of education professionals related to AT devices and strategies for students and is highly acceptable to participants.

Limitations

Despite these positive findings, several limitations should be noted. First, although there was a large number of participants that attended one or more ECHO sessions over the course of the year, only a small percentage of them responded to the questionnaire. Given that this is the first implementation of this program, these preliminary results are promising. In future research, we will explore different ways to increase the number of responses and collect additional demographic information from our learners. As we continue to implement this program, our body of data will increase and permit more detailed analyses.

Also, our measure of skill and knowledge change also may not reflect true change in these domains. That is, we used a retrospective self-assessment of skills and knowledge. This was necessary because the program was initiated prior to approval from the University of Wyoming Institutional Review Board (IRB) for research related to outcomes of the ECHO model for AT. The necessary approvals were granted during administration of the network. Therefore, we could question participants only after completion of the program. Although this method may suffer from recall bias or memory effects, retrospective pre-tests are also known to be less prone to over-estimation of knowledge before a program. That is, respondents often overestimate their skills and knowledge using traditional pre-measure (Howard, Dailey, & Gulanick, 1979; Howard & Dailey, 1979; Pratt, McGuigan & Katzev 2000). Clearly, additional research is needed to understand the impact of this program on practitioners' ability to use AT, but these results are, at least, suggestive.

Future Directions

To further explore the utility of UW ECHO in AT, we intend to extend this work in several ways. First, we will attempt to increase the number of respondents to the questionnaire and examine learner factors that might influence participation. As the sample sizes increase, we will have additional statistical power to estimate the amount of learning and skill acquisition that occurs

as a result of the UW ECHO in AT. Further, we will be able to better determine the learners' baseline skill level, which will allow us to better understand if learners are using ECHO to build new skills or refine existing skills, and may relate to improved educator self-efficacy, job satisfaction, and job retention.

We also plan to explore how the skills taught in this program are actually used with students and the impact this has on student outcomes. While our current data are only self-reported perceptions of knowledge and skills, it is possible that actual skills use may have improved as well. If so, this could lead to increased rates of implementation of AT in school settings and this could ultimately impact student outcomes. Further, the skills educators gain could ultimately impact a large number of students if the educators are able to apply them in subsequent years. This could lead to broader system change throughout the state; however, additional research will be needed to determine how educators are actually using these new skills, and how training through ECHO compares to more traditional professional development modalities (Joyce and Showers, 2002).

Finally, we plan to explore how UW ECHO can be effectively used with other populations. For example, we had a small number of parents and students join this network. While this network was specifically designed and marketed to educators, the involvement of parents and students indicates that there are needs for these groups to learn about AT. Given this, the University of Wyoming is already examining ways to expand ECHO for use with other groups and professional learning needs. Specifically, we have developed ten ECHO networks (http://www.uwyo.edu/wind/echo) that focus on a variety of issues of interest to educators and families. We have also developed a first of its kind ECHO network specifically for parents of children with autism. This highlights the flexibility of the ECHO model and its potential to positively impact those with disabilities in rural areas; although, future research is needed to better understand the best use of the ECHO model across situations.

Conclusion

As a result of participation in UW ECHO in AT, professionals reported that AT knowledge and skills increased, their professional satisfaction improved and their professional isolation diminished. This is the first adaptation of the ECHO model to professionals working with students in education settings, and demonstrates the use of the ECHO model improves education professionals' knowledge and skills of AT.

UW ECHO in AT is an innovative and effective way to deliver professional learning and provide ongoing mentoring to large numbers of education professionals in rural and frontier communities. Previous to our ECHO implementation, these professionals had relied heavily upon one-time visits to national conferences and with AT vendors. Now UW ECHO provides inexpensive, time-

efficient, weekly didactics and expert case recommendations to a learning community in AT. These results show that ECHO in AT can be used on a large scale to transform the practice of AT implementation.

Declarations

This content is solely the responsibility of the authors and does not necessarily represent the official views of ATIA. The authors disclosed financial relationships with the University of Wyoming, and the University of New Mexico. No non-financial disclosures were reported by the author(s) of this paper.

References

American Psychological Association. (2002). Ethical principles of psychologists and code of conduct. *American Psychologist, 57*(12), 1060-1073.

Arora, S., Kalishman, S., Thornton, K., Dion, D., Murata, G., Deming, P., Parish, B., Brown, J., Komaromy, M., Colleran, K., Bankhurst, A., Katzman, J., Harkins, M., Curet, L., Cosgrove, E., Pak, W. (2010). Expanding access to hepatitis C virus treatment-Extension for Community Healthcare Outcomes (ECHO) project: Disruptive innovation in specialty care. *Hepatology, 52*(3), 1124-1133. doi:10.1002/hep.23802.

Arora, S., Thornton, K., Murata, G., Deming, P., Kalishman, S., Dion, D., Parish, B., Burke, T., Pak, W., Dunkelberg, J., Martin, K., Brown, J., Jenkusky, S., Komaromy, M., Qualls, C. (2011). Outcomes of treatment for hepatitis C virus infection by primary care providers. *New England Journal of Medicine, 364*(23), 2199-2207. doi:10.1056/nejmoa1009370.

Arora, S., Thornton, K., Komaromy, M., Kalishman, S., Katzman, J., & Duhigg, D. (2014). Demonopolizing medical knowledge. *Academic Medicine, 89(*1), 30-32. doi:10.1097/acm.0000000000000051.

Bausch, M. E., Ault, M. J., & Hasselbring, T. S. (2015). Assistive technology in schools: lessons learned from the National Assistive Technology Research Institute. In *Efficacy of Assistive Technology Interventions* (Vol. 1, pp. 13-50). Bingley, U.K.: Emerald Group Publishing Limited. doi: 10.1108/S2056-769320150000001013.

Bausch, M. E., & Hasselbring, T. S. (2005). Assistive technologies for reading. *Assistive Technologies for Reading, 63*(4), 72-75. Retrieved April 27, 2017, from http://www.ascd.org.

Department of Education: National Center for Educational Statistics. (2013). Table 204.60. Percentage distribution of students 6 to 21 years old served under Individuals with Disabilities Education Act (IDEA), Part B, by educational environment and type of disability: Selected years, fall 1989 through fall 2011. Retrieved from https://nces.ed.gov/programs/digest/d13/tables/dt13_204.60.asp.

ECHO MODEL™. Program website. *University of New Mexico.* Available at: http://echo.unm.edu.

Edyburn, D. L. (2013). Critical issues in advancing the special education technology evidence base. *Exceptional Children, 80*(1), 7-24. Retrieved April 27, 2017, from http://journals.sagepub.com/toc/ecxc/80/1.

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education, 59*(2), 423-435. doi:10.1016/j.compedu.2012.02.001.

Flanagan, S., Bouck, E. C., & Richardson, J. (2013). Middle school special education teachers' perceptions and use of assistive technology in literacy instruction. *Assistive Technology, 25*(1), 24-30. doi:10.1080/10400435.2012.682697.

Howard, G. S., & Dailey, P. R. (1979). Response-shift bias: A source of contamination of self-report measures. *Journal of Applied Psychology, 64*(2), 144-150. doi:10.1037/0021-9010.64.2.144.

Howard, G. S., Dailey, P. R., & Gulanick, N. A. (1979). The feasibility of informed pretests in attenuating response-shift bias. *Applied Psychological Measurement, 3*(4), 481-494. doi:10.1177/014662167900300406.

Joyce, B. & Showers, B. (2002). Student achievement through staff development. In B. Joyce & B. Showers (Eds.), *Designing training and peer coaching: Our need for learning.* Alexandria, VA: Association for Supervision and Curriculum Development.

Lee, Yeunjoo., & Vega, L. A. (2005). Perceived knowledge, attitudes, and challenges of AT use in special education. *Journal of Special Education Technology, 20*(2), 60-63. Retrieved April 27, 2017, from http://www.tamcec.org/publications/jset.

Marino, M. T., Marino, E. C., & Shaw, S. F. (2006). Making informed assistive technology decisions for students with high incidence disabilities. *Teaching Exceptional Children, 38*(6), 18. Retrieved April 27, 2017, from http://journals.sagepub.com.

Murchland, S., & Parkyn, H. (2010). Using assistive technology for schoolwork: the experience of children with physical disabilities. *Disability and Rehabilitation: Assistive Technology, 5*(6), 438-447. doi:10.3109/17483107.2010.481773.

National Center for Education Statistics. (2016). The digest of education statistics, 2015, (NCES 2016-014). Retrieved from https://nces.ed.gov/fastfacts/display.asp?id=59.

Pratt, C.C., McGuigan, W.M., & Katzev, A.R. (2000). Measuring program outcomes: Using retrospective pretest methodology. American Journal of Evaluation, 21(3), 341-349.doi:10.1177/109821400002100305.

Rockwell, S. K., & Kohn, H. (1989). Post-then-pre evaluation. *Journal of Extension, 27*(2). Retrieved from https://www.joe.org/joe/1989summer/a5.php.

Root-Elledge, S., Hardesty, C., Wagner, S. (2015, 2016). Demonstrating the possibilities: University of Wyoming ECHO in assistive technology is building capacity and demonstrating positive outcomes in Wyoming and beyond. *Closing the Gap Solutions.* December/January.

Root-Elledge, S., & Hardesty, C. (2015). Wyoming's novel approach to building capacity in assistive technology: University of Wyoming ECHO in Assistive Technology. *Closing the Gap Solutions.* October/November.

UW ECHO IN AT. Program website. *University of Wyoming.* Available at: http://www.uwyo.edu/wind/echo/assistive-technology.