Accessible Voting Systems:
Can Demonstrations Improve Use?

Background

ATAP is a membership organization that represents the federally funded network of State Assistive Technology (AT) Programs. There is one State AT Program in each state and territory, 56 total grantees. The Assistive Technology Act is the federal law that funds State AT Programs and it mandates a number of activities including device demonstrations. In a device demonstration, individuals are provided with guided exploration of the access features of a device by someone who has technical expertise in the device and its features. Hands-on use of the device by the participant with support from the expert is a critical part of any demonstration. This allows the person to become familiar and comfortable with the access features and provides structure to support independent device use.

State AT Programs have staff with tremendous experience and expertise in providing device demonstrations for a wide variety of devices that address different functional limitations, vision, motor, hearing, intellectual, etc. Demonstrations have proven to be an effective mechanism for increasing consumer familiarity with and use of assistive technology devices. Based on this positive experience with demonstrations of AT devices, the RAAV-ATAP project proposed providing demonstrations of accessible voting systems to support voters with disabilities using those systems to vote privately and independently.

The ATAP-RAAV project to date has developed, implemented and gathered data on voting system demonstration activities in three states, Illinois, Missouri and North Dakota. In two states (Illinois and Missouri) a local jurisdiction was identified in which to provide voting system demonstrations as these states use different voting equipment at a county level. In North Dakota, the demonstrations were done statewide as that state uses the same voting system in all counties.

The voting system demonstrations were provided by experienced AT Program staff and were designed to familiarize voters with all types of disabilities with the accessible voting system used by their voting jurisdiction. A pre and post test was administered to each person participating in the demonstration asking them to

- rate their level of comfort using the accessible voting system on a scale of 1 to 10;
- indicate how they typically vote (at polling place, absentee, etc.); and
- indicate the reason why they vote absentee or not at all

Basic demographic data (e.g. age range, type of disability, prior AT use) was also reported on each individual participating in the demonstration. Observations by the person providing the demonstration were used to report the type of access feature(s) used, the amount of time it took for the voter to become comfortable and independent using these access feature(s), and what could have been done to improve the access features to better meet the voter's needs. Each demonstration participant was also asked to complete a relatively short standard ballot at the conclusion of the demonstration with data collected on the time

it took to complete that ballot. This ballot included 6 races with 5 to 15 candidate choices (5 races were vote for one and 1 race was vote for 3), 1 proposition and 1 amendment.)

The initial hypothesis for this project was -- *voters who participate in a quality demonstration/ training of the accessible voting system will be more confident and able to use the access features of the voting equipment and will be more likely to go to a polling place and use the accessible voting system (if they do not currently do so).* It was also postulated that there would be differences in the amount of time it took for individuals to become comfortable with and independent in using different access features and it seemed logical that more complex features would require more extensive demonstration/training time. If the results were positive, we hoped that the data collected along with informal feedback and discussion with those providing the demonstrations/trainings would provide insight into how to best implement more comprehensive demonstration/training activities at a local or state level to obtain the desired outcome of more voters with disabilities being able to use accessible voting systems to vote privately and independently (as was the vision of HAVA).

Demonstration Data Summary

A total of 178 demonstrations were completed during the initial project period of March 2012 through January 2013. The largest disability represented was vision limitations (52%) and about one third (33%) of the participants had a motor limitation. The next largest disability type was intellectual at 25% and the rest (hearing, speech, and other) were much smaller (from 13% to 6%). The category of "other" was primarily used when a participant refused to disclose their disability, or no accurate classification could be made based on observation, or the person had a combination of limitations that made it difficult to identify each individually.

The age of the demonstration participants included a majority of seniors (44%) and middle aged individuals (41%) with the remaining 15% young adults. Exact ages were not collected as it was anticipated that some participants would be reluctant or would even outright refuse to provide their age.

About 60% of the participants reported that they used assistive technology. However, when the list of AT used was analyzed, many of the devices used were rather "low tech" items in terms of consumer expertise in using them (e.g. canes, glasses, walkers, manual wheelchairs and similar items.) Only 8% of the participants were using computer adaptations or similar AT devices which would provide some transferable experience to the access features of a voting system. The most common AT devices used by this group were screen reader software, screen enlargement software or both which is consistent with the large number of participants with vision disabilities.

The data on access features demonstrated and used by participants; observations about how long it took for participants to become independent in using these access features; and how long it took to complete a standard sample ballot is summarized below.

Large Visual Display Output was used in 54% of the demonstrations. This access feature provides a larger text display on the screen of the accessible voting system. On most systems the size of the text in the large display mode is 6.3 to 9 mm or about like 18 point size font.

On average it took a little over 5 minutes of demonstration/training for a participant to become independent using the large visual display output. However, for some participants it took 20 minutes of demonstration/training for the person to become independent and 5 of the participants never became independent even after extensive demonstration/training. On average, it took a little over 10 minutes for individuals to complete the sample ballot using the large visual display output; but took some individuals 30 minutes to do so.

Speech Output with Tactile Input(Audio Ballot) was used in 41 demonstrations. This access feature provides a keypad or buttons that the voter can "feel" to control, navigate through and mark the ballot and provides speech output so the voter can listen to the ballot contents. Typically a voter uses a headset to listen to the speech output.

On average it took a little over 4 minutes of demonstration/training for a participant to become independent using the audio ballot. However, for some participants it took 15 minutes of demonstration/training for the person to become independent and 5 of the participants never became independent even after extensive demonstration/training. It took an average of 10 minutes for individuals to complete the sample ballot using the tactile/audio interface; but took some individuals 30 minutes to do so.

Synchronized Speech & Visual Display was used in 21 demonstrations. This access feature delivers speech output in real-time with the text and images displayed on the screen. In some systems, only the regular size text can be seen when the audio output is active. In other systems, a voter can use the large size text with speech output.

On average it took almost 5 minutes of demonstration/training for a participant to become independent using synchronized speech and visual display. For some participants it took 15 minutes of demonstration/training for the person to become independent; but all participants did become independent as a result of the extensive demonstration/training. It took an average of 10 minutes for individuals to complete the sample ballot using synchronized speech and visual display; but took some individuals 25 minutes to do so.

Switch Input was used in 3 demonstrations. This access feature allows an individual to use a dual switch (such as a pneumatic air switch or "sip and puff") to control, navigate and mark the ballot. Most accessible voting systems will allow a voter to plug in their own dual switch if they already have/use one. The output used with switch input is typically the regular text visual display.

Two of the three of the participants who used switch input were experienced switch users and the other was familiar with switch input. On average it took a little more than 2 minutes of demonstration/training for them to become independent with the maximum time of 4 minutes required. All these individuals became independent using the switch input and on average it took them a little over 12 minutes (25 minute max) to complete the sample ballot using switch input.

Other Input/Output was used by the remainder of the demonstration participants. These participants either used the standard features of the voting system and/or used their own AT (e.g. mouth stick) to interact with the voting system. It is important to note that for many voters with mild functional limitations, the standard interface of the accessible voting system was able to meet their needs. For example, the touchscreen had large enough "strike areas" (the place on the screen you touch to select) to accommodate their fine motor disabilities (perhaps mild hand tremors).

The amount of demonstration/training time for these individuals was not very different from those who used the previously described access features. On average it took about 4 minutes of demonstration/training time for them to become independent with the voting system. For some participants it took 15 minutes of demonstration/training to become independent, but all did do so. It took an average of 7 minutes for these participants to complete the sample ballot; but some required 22 minutes to do so.

A summary of the data described previously is provided in Table 1.

TABLE 1

Access Feature	N	Minutes to Independent		# Never Independent	Minutes Complete Ballot	
		Mean	Max		Mean	Max
Large Visual Display Output	97	5.48	20	5 (5%)	10.68	30
Speech Output & Tactile Keypad Input	41	4.29	15	5 (12%)	10.34	30
Synchronized Speech and Visual Display Output	21	4.76	15	0	10.14	25
Switch Input	3	2.67	4	0	12.67	25
Other	16	3.57	15	0	6.89	22

Aggregate data on the minutes of demonstration/training required to reach independent use of the access feature is summarized in Table 2

TABLE 2

Minutes to Independent Use	Never Reached	20-15 minutes	14-10 minutes	9-5 minutes	4-3 minutes	2-1 minutes
N	10	17	16	46	25	64
Percent	5.62%	9.55%	8.99%	25.84%	14.04%	35.96%

For each demonstration/training, the participant and/or staff provider was asked to report any recommendations they would make to improve the access feature(s) to better meet the needs of the demonstration participant.

1. By far the most frequent suggestion was that the voting system needed to provide larger text size display. Most systems currently have only two text sizes, regular and large, with the large at about standard large print size. For many individuals with vision loss, it seems clear that this “large” size simply not large enough to be usable.

2. Another frequent recommendation was for the touchscreen and/or tactile keypad to have larger strike areas and adjustable sensitivity so that less or more pressure could be used to activate. This is a typical access feature for most assistive technology products that have a touchscreen interface. The highly variable range of motor skills and limitations makes it almost impossible to establish a “norm” to use for strike area size and sensitively. Thus if the touchscreen could be adjusted it would be usable by many more individuals with disabilities. One participant commented “the boxes need to be larger since I have to use my whole hand to tap the screen”.

3. Another suggestion frequently made was to improve the audio navigation and general instructions. For many voters who had experience with speech output systems,

they found the voting system "unsophisticated" when compared to the technology they routinely use. Conversely, voters who had no technology background found the audio navigation bewildering and overly complex. Obviously there is much room for improvement in these features, but it will be a challenge to meet the diverse needs of voters based on their differing levels of technology experience.

Even with the limited number of demonstrations that used the switch input a similar recommendation was made about the need to improve the navigation programming of the dual switch input. Since that is frequently simply a modification of the core software as the audio navigation, this concern was not unexpected.

While these recommendations suggest there is plenty of room for improvement in the access features of currently deployed voting systems, it is important to remember that almost all of the participants were able to become independent users after a short demonstration and training of about 5 minutes. In addition a good number of individuals were able to use the standard features of the voting system to complete the sample ballot independently. This indicates that the current equipment does provide a solid array of access features and has some good universal design features built into the voting interface that enable voters with different needs to vote independently provided they have the opportunity to interact with a system before hitting the door of the polling place.

Pre/Post Participant Self-Rating Results

Each demonstration participant was asked to respond to the following question prior to and after the demonstration/training.

On a scale of 1–10, how comfortable are you using the accessible voting system?

1 2 3 4 5 6 7 8 9 10

Not at all comfortable Somewhat comfortable Very comfortable

Since this data is self-reported by the participant, it is a subjective perception and could be influenced by any number of extraneous factors. For example, a participant might feel they should affirm the quality of the demonstration by reporting an increased comfort level. Or a participant that never achieved independence or one that struggled a long time to complete the sample ballot might be so frustrated by the time they complete the post survey that they report a decreased comfort level.

However, even with these potential external influences, the data was relatively consistent in showing an increase in comfort level. The mean comfort rating provided by participants prior to the demonstration/training was 5.46 and the post comfort rating was 8.41. This represents a 2.96 point increase in self-rating of comfort level after participating in a demonstration/training activity. Table 3 provides a summary of the change reported by demonstration/training participants.

TABLE 3

Ratings Change	Plus 9-7	Plus 6-5	Plus 4-3	Plus 2-1	No Change	Minus
N	21	29	36	58	30	4
Percent	11.80%	16.29%	20.22%	32.58%	16.85%	2.25%

Each participant was asked if the accessible voting system met their needs. A large majority (92.13%) indicated the accessible voting system did meet their disability needs, while 7.87% indicated the accessible voting system did not meet their disability needs. So even with the recommendations for improvements, struggles of some voters to become independent using access features and extended time required by some to complete the sample ballot, almost all the participants said overall the equipment met their needs.

Prior to participating in the demonstration, 81.46% of participants reported they voted at a polling place, 6.18% indicated they voted absentee and 11.24% indicated they did not typically vote. Post-demonstration, 88.20% of participants (a 6.74% increase) reported they would vote at their polling place. Some of those individuals indicated they would go to the polling place and use the accessible machine rather than voting absentee and others indicated they will go to the polling place rather than not voting at all. This suggests that the demonstration/training does increase voter comfort level sufficient to improve use of accessible voting systems at polling places.

Analysis / Discussion

The overall data for this first group of demonstrations is positive in many ways. Some of the findings are consistent with expectations and others more challenging to explain. As hypothesized (and hoped for) there was an increase in the rating of comfort level with the accessible voting system after participation in the demonstration/training. There was also an increase in voters reporting they would to their polling place to vote post demonstration. This would support the use of demonstration/training activities to increase effective use of accessible voting systems by many individuals with disabilities.

However, the data also clearly indicates that demonstration/training will not be successful with all individuals with disabilities. The fact that some individuals never became independent using the access features even after extensive demonstration/training confirms this strategy will not be a panacea for ensuring effective use of accessible voting systems.

The most unexpected results are found in the data comparisons of the access features. One would anticipate that the more complex access features would take a longer period of demonstration/training to enable voters to become independent users. However, on average the two most complex access features (switch input and speech output and tactile keypad input) took relatively fewer minutes of demonstration/training than the less complex access features (large visual display output and synchronized speech and visual display output).

The most logical explanation for this finding is that the many of the individuals who participated in demonstration/training for the more complex access features were already familiar with similar assistive technologies and were able to use previous experience to support learning these access features more quickly. Conversely, it seems possible that participants with minimal experience with similar AT were those who needed to learn about using the less complex access features and thus took a longer demonstration/training time period. This seems to be supported by the perceptions of the AT experts doing the demonstration /trainings. They reported that the audio ballot and switch input were the more complex features to demonstrate and challenging to ensure that voters were able to them independently but more participants who needed this access feature had “high tech” AT experience and were able to learning the access feature fairly quickly.

While there was no valid way to do a statistical correlation (since no ordinal data was collected related to prior AT usage), the demonstration providers did anecdotally confirm that participants with prior experience with "speech output devices" for example required much less demonstration time as did individuals without such experience. In addition, they noted that "technology phobia" seemed to be a strong determining factor in whether or not the person would be able to become independent using the access feature and the relative ease (or struggle) that would be required to get there. So it seems likely that the shorter demonstration minutes needed are attributable to participants who had prior experience and there were more of those individuals who used the more complex access features.

A statistical correlation was run between the number of demonstration/training minutes required for the voter to become independent using the needed access feature and the quantified change in comfort rating in using the accessible voting system. There was a negative .26 correlation between these two data elements which is not statistically significant. It appears that the degree to which a voter reported an increase in comfort level was due to factors other than the length of time they required in demonstration/ training to become independent.

The fact that some individuals were not able to become independent at all even with extensive demonstration/training does raise questions about what access features and training/support systems will be necessary to allow them to vote privately and independently. If the current equipment is simply too complex for some individuals to use, is there a viable alternative?

What is very clear from the demonstration experiences so far is that most voters can become independent through hands-on demonstration/training support. It is also quite clear that these demonstrations will require far more time and expertise than typical poll workers will be able to provide especially on an election day in a busy polling place. The data indicate that it is unreasonable to expect voters with disabilities to show up at a polling place and "intuitively" be able to use the access features of a voting system without any prior demonstration and training. The data also suggest that supports like demonstration /training should be provided for voters with disabilities before they go to the polling place and attempt to use accessible voting systems -- or those systems will continue to be poorly utilized.

Even with some of the data inconsistencies, the overall results support the use of demonstrations as a mechanism for increasing the effective use of accessible voting systems. Rather than the old idiom "familiarity breeds contempt" – in this case the data supports the supposition that familiarity through demonstration/training produces a greater level of comfort with accessible voting systems and a greater number of individuals who will go to their polling place and use the accessible voting system. Comments from those doing the demonstrations included stories of voters who were now well versed enough with the accessible voting system to not only go to the polling place and vote independently but also to help their local poll workers better understand how to use the accessible equipment.

Challenges

A number of unforeseen challenges were faced in implementing these project activities.

1. Obtaining voting equipment to use for demonstration/training was more problematic than anticipated. Local voting jurisdictions place legitimate restrictions on "lending" out equipment because it will have to be returned for an election; there are liability fears;

and other concerns that make it difficult to use jurisdiction owned equipment for demonstration/training purposes. While the three voting officials this project worked with were exceedingly cooperative there were still bureaucratic issues that had to be addressed to obtain the systems, get the sample ballot programmed, etc. Doing this kind of demonstration/training activity on a wide scale basis in states that use different voting systems would make obtaining the voting equipment a significantly difficult barrier to overcome.

In addition to challenges when the voting official is supportive of demonstrations/ training, in initial efforts to expand this project there have been those officials who are simply "uninterested" in having anyone do demonstration/training with their accessible voting system. If voting equipment cannot be readily obtained for demonstration/ training purposes, then there is no reason to even consider using this activity to increase the effective use of accessible voting systems.

One solution to this problem would be for the manufacturers to create machines that were specifically designed to be used only for demonstration/training purposes (ones that did not tabulate or have other features that create security concerns by being widely available). If these devices could be obtained by State AT Programs or other disability organizations that were willing and had the expertise to do demonstrations, the challenge of borrowing equipment from election officials would be greatly reduced. (This would be especially true when the device borrowed is part of the pool of equipment that will actually be used in an election).

2. One of the goals of doing demonstrations/trainings was to ensure that data was collected on a reasonable number of individuals who used each of the access features. Each state used a variety of techniques to reach demonstration participants. All used their contacts within existing disability organizations to reach specific groups. Some of the less common groups that were used to solicit participants included junior college disability student service offices, low income and senior housing projects especially when those sites are also used as a polling place, and hospital support groups for various disabilities. For the current project data, voters with all types of disabilities were well represented except those who used switch input. These individuals have been more difficult to reach than anticipated. Better strategies will need to be developed to reach this population to better understand the need for and benefit from demonstration/ training.

3. Getting demonstration participants to agree to complete the sample ballot was an unanticipated challenge. Even though a voter actively participated in the demonstration and became independent using the access features, some were reluctant and/or refused to complete the sample ballot. The most logical explanations are –A) individuals have something like "performance anxiety" or "test anxiety" where they do not want to have to demonstrate their mastery of the accessible features in a more real situation or B) individuals have already spent time participating in the demonstration/ training and they simply do not want to devote any more time to the activity (e.g. they don't see any return on their investment of more time). Strategies will be developed for future participants to better explain the need for the data collection part of the activity.

Future Activities/Further Research

While there are many potential future research activities that could be developed based on this data, the short term plan is to expand the activities into the states of New Jersey and

Oklahoma. Oklahoma has been able to obtain a voting system to use for their demonstration by renting it from the vendor (they were unable to secure a system any other way). The accessible voting system used by Oklahoma is different from those used by Illinois, North Dakota and Missouri so this will add data on a new system. New Jersey is continuing to work on obtaining an accessible voting system to use in that state. It will likely be another new system different from those used previously in demonstration. Illinois will continue in the project expanding into additional counties.

Attempts will be made in future demonstration/training activities to reach younger voters with disabilities and individuals with severe motor disabilities who use alternative input such as switch input. The same data elements will be collected through the online data reporting system to provide a more robust total N in these areas.

An attempt will also be made to identify a jurisdiction in which all voters use an electronic interface for voting to conduct future demonstration/trainings and collect data. The need for "special" demonstration/training for individuals with disabilities using the accessible voting systems is intensified at least somewhat in jurisdictions where no one is using an electronic interface for voting unless it is the "accessible" system. (All of the jurisdictions so far use paper based voting outside of the accessible voting system.) When HAVA was signed into law, the general assumption was that the accessible voting system would have an electronic interface just like the voting systems used by everyone in that voting jurisdiction. In this situation, it is possible that learning a few "extras" about access features would not be so daunting since there would already be a baseline familiarity with the electronic interface. Future research should test the hypothesis that in jurisdictions where all voters use an electronic interface, the general orientation and training provided to support use of the standard electronic interface provides a knowledge foundation that lessens the amount of demonstration /training needed to use access features of the accessible voting system.

A resource guide is also under development that will describe the range of functional limitations that individuals with disabilities have that impede voting privately and independently along with descriptions of the access features of current accessible voting systems that can be used to address those limitations. Our goal is for this guide to be helpful for election officials along with voting system developers and others better understand the relationship between access features and functional limitations and how to best reach a broad spectrum of individuals with disabilities.

Questions

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For more information about Research Alliance for Accessible Voting see http://www.accessiblevoting.org/

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