Social Predictors of Assistive Technology Proficiency among Teachers of Students with Visual Impairments

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Assistive technology (AT) is critical for K-12 students who have visual impairments to engage with their education, and is predictive of positive postsecondary outcomes and future employment. Teachers of students with visual impairments (TVIs) act as the primary gatekeepers of AT for these students. Unfortunately, only about 40% of TVIs integrate AT into their practice. Efforts to predict TVIs' AT proficiency based on their pre-service training have been unsuccessful. The current study proposes and confirms that TVIs' AT proficiency is related to their identification with a social community of practice (CoP) that values AT. Results from $n = 505$ North-American TVIs produced a Spearman's correlation of $\rho = 0.49$ between estimated AT proficiency and CoP identification. The relationship was strongest among TVIs with lower AT proficiency and CoP identification. Results have implications for industry, researchers, teacher preparation programs, personnel who administer and train assistive technologies, and policy makers concerned with ensuring that AT is available to students who have visual impairments. Mere availability of AT is insufficient to ensure its successful introduction to K-12 students with visual impairments, which relies on TVIs' AT proficiency for meaningful implementation. Developers and advocates of AT for K-12 students with visual impairments must consider the social context in which AT proficiency develops, and provide appropriate social supports.

CCS Concepts: •**Human-centered computing** → **Accessibility theory, concepts and paradigms;** •**Social and professional topics** → **People with disabilities;** *Computer and information systems training;*

Additional Key Words and Phrases: Accessibility, social networks, assistive technology, personnel preparation, special education, visual impairment, community of practice

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1. INTRODUCTION

K-12 students who have visual impairments rely on assistive technology (AT) to effectively engage with their education. AT refers to any device or system that is used to improve or maintain the function of individuals with disabilities (*IDEIA*, 2004, Sec. 602, 20 USC 1401, §300.5), and includes both general consumer products, such as tablets used as hand-held magnifiers, and specialized products, such as refreshable braille displays and screen readers. AT skills are predictive of improved postsecondary outcomes and future employment for K-12 students who have visual impairments [Kelly

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2009; 2011]. Therefore, it is extremely important that these students are introduced to and use AT as part of their school work, and this is the responsibility of teachers of students with visual impairments (TVIs) [Hatlen 1996].

It is estimated that only about 40% of TVIs integrate AT into instruction with their academic students who have visual impairments [Abner and Lahm 2002; Edwards and Lewis 1998; Kapperman et al. 2002]. Recent research confirms that low AT integration is an ongoing issue for TVIs [Wong and Cohen 2015]. Developers and advocates of assistive technology are and should be concerned, because the creation of assistive technology is unproductive if the technology is not available to students who would benefit from it. The current research proposes that TVIs' social context can explain successful implementation of AT.

Previous and ongoing efforts focus on pre-service training in teacher preparation programs, but have failed to improve TVIs' adoption of AT [Kapperman et al. 2002; Kelly 2009; 2011]. This may be because pre-service training provides limited value, due to the rapid speed at which new technologies are released and updated. Mastering a current technology may be beneficial for only a few years before that technology becomes obsolete. Furthermore, given the diverse set of needs of students, and a constantly changing caseload, it is impossible for a TVI to receive training in every AT device for every use case. Therefore, keeping abreast of AT developments might be better supported through exchanges with a pro-technology social network. Previous interview findings provide some anecdotal evidence that social networks can be a resource for improving TVI and student AT competencies [Wong and Cohen 2015].

While belonging to a network of teachers is relatively straightforward for general classroom teachers who work daily with one another in the same school, it is more difficult for TVIs. TVIs can have permanent positions in a school resource room or at a school for the blind, but the majority are itinerant. Most K-12 students who have visual impairments are educated in mainstream public schools, where they are typically the only student in the school who has a visual impairment [Ajuwon and Oyinlade 2008]. The high incidence of mainstreaming students with visual impairments is due to the Education for All Handicapped Children Act of 1975, which guarantees students who have disabilities access to public education [Public Law 94-142 1975]. Itinerant TVIs travel between mainstream schools to provide services to students with visual impairments, often being responsible for $15 - 20$ students [Griffin-Shirley et al. 2004; Correa-Torres and Howell 2004], from any grade and with a variety of visual and academic abilities. As a result, itinerant TVIs are typically short on time and connections to other teachers.

We propose that belonging to a supportive community may be the best way a TVI can become a proficient technology teacher. AT proficiency is more than being able to use a particular AT, but also requires being able to choose appropriate AT, find funding to acquire a chosen AT, and integrate the AT into student lessons [Siu and Morash 2014; Smith et al. 2009]. In our previous work, we defined and validated four dimensions of AT proficiency [Siu and Morash 2014], based on an existing list of 111 AT competencies for TVIs [Smith et al. 2009; Zhou et al. 2012]:

— Choose: Willingness and resources to choose AT to overcome an accessibility issue.
— Fund: Willingness and resources to find funding for chosen AT.
— Ability/Use: Willingness and ability to learn, use, and troubleshoot AT.
— Integrate: Willingness and ability to integrate AT into student lessons.

The voluntary relationship between a TVI and a professional network through which continued professional development and support can be achieved is well-described as a *community of practice* (CoP) [Wenger et al. 2002; Siu and Morash 2014]. A TVI's identification with a pro-technology CoP includes three dimensions:

— Practice: Members share a "toolkit" of tools and resources. The community nurtures this body of knowledge, and leverages it to inform the domain of interest.
— Domain of interest: Members invest in a shared collection of knowledge, goals, and purpose that inform their actions.
— Community: Members interact by sharing anecdotes, posing questions, and responding to others' issues.

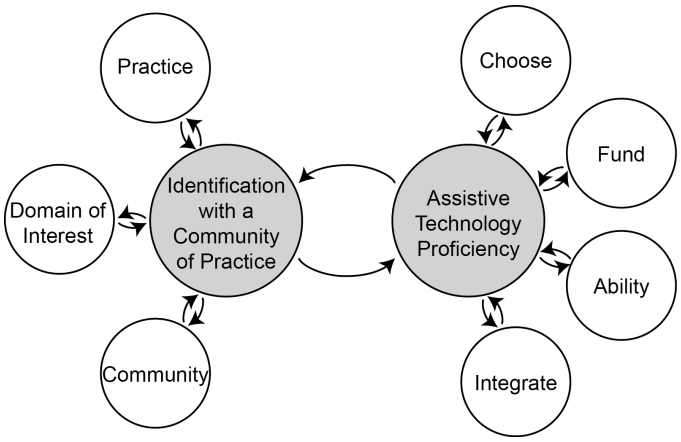

Fig. 1. Proposed relationship between identification with a community of practice and assistive technology proficiency.

We expect that identification with a community of practice will predict a TVI's AT proficiency through the proposed relationship shown in Fig. 1. We initially posited this relationship in [Siu and Morash 2014], where we developed a survey tool to measure these constructs. We established content and response process validity for the AT and CoP constructs using expert review and talk-aloud procedures, and piloted the survey with 33 Californian TVIs, to determine that the survey scores' internal reliability was good (Cronbach's Alpha 0.80) for AT proficiency, and acceptable (Cronbach's Alpha 0.70) for CoP identification items. Prior work could not investigate the relationship between AT proficiency and CoP identification survey scores due to small sample size [Siu and Morash 2014]. Therefore, the current research deployed the survey to a large sample of North American TVIs ($n = 505$), to examine the relationship between TVIs' CoP identification and AT proficiency.

2. METHODS

2.1. Survey

A survey was developed to gather participants' demographic information and to measure participants' AT proficiency and their identification with a CoP that values AT. Survey development and initial validity and reliability results with 33 pilot participants were reported in [Siu and Morash 2014]. The construct maps (discussed below) used to generate survey questions and the survey are included in the Appendix.

Demographic information was collected on whether participants worked as itinerant, in a resource room, at a school for the blind or for special education, or other TVI occupation. Participants were also asked for the number of students with visual impairments that were currently on their caseloads, how many years they had worked with students with visual impairments, the number of other TVIs working in their

district or school for the blind, the types of tech support available to them, and what type of pre-service AT training they had received.

The remainder of the survey was created based on construct maps that defined the different levels of AT proficiency and CoP identification constructs for each of their dimensions [Wilson 2005], similar to a rubric. The AT proficiency construct map defined what it meant for a TVI to be at the highest, high, medium, low, ambivalent, and aversive levels for choose, fund, ability, and integrate AT-proficiency dimensions. The identification with a CoP construct map defined what it meant for a TVI to be at contributing, seeking, ambivalent, non-identifying, and opposed levels for practice, domain of interest, and community CoP-identification dimensions (see Appendix for detailed construct maps).

Within the survey, four accessibility scenarios were posed,

(1) A high-school student with low vision needing access to printed classroom handouts.
(2) An elementary student with low vision completing weekly projects in the school's computer lab.
(3) A middle school student who needs braille textbooks, which won't arrive for 6-8 weeks.
(4) A middle school student who is blind and using a Windows computer once a week to do library internet research.

Each scenario represented a typical instructional challenge for students who are blind or have low vision, such as access to: completing printed class handouts, engaging in computer lab activities, reading assigned textbooks, and conducting internet research. Scenarios were developed with feedback from experts in the field, including active teachers of students of visual impairments in itinerant and resource room settings and faculty in teacher preparation programs. Each challenge could be addressed using both AT (mainstream and specialized technology) or low-tech solutions (such as support of a paraprofessional). Care was taken to not over-represent specific professional contexts or experiences so that scenarios would be relevant to TVIs' varied settings and caseloads [Siu and Morash 2014].

Within each scenario, a question was asked for each of the four AT proficiency and three CoP identification dimensions. Multiple choice answers to these questions corresponded to levels on the construct maps. Answers were ordered from high to low on the AT proficiency items, but low to high on the CoP identification items. Therefore, a positive correlation between AT proficiency and CoP identification could not result from participants choosing the same answer (e.g., the first) on every question.

Participants were prompted to answer two open-ended questions at the end of the survey. Unlike the demographic and scenario questions, responses to the open-ended questions were optional. These questions were,

(1) Please describe a typical lesson with an academically oriented student. Please explain how you utilize high tech assistive technology, or low-tech solutions.
(2) If you are *not* currently using assistive technology with students, what resources or changes would be necessary to change your teaching practice to include use of assistive technology? If you *do* use assistive technology, what supports/resources enable you to use assistive technology with students?

The survey was implemented in online-format using LimeSurvey, was available in a paper format, and could be completed over the phone.

2.2. Participant Recruitment

A recruitment message was circulated through TVI professional email lists and on professional online bulletin boards in the United States and Canada. The solicitation included a link to the online survey, instructions for requesting a paper survey, and information on how to contact the researchers to complete the survey over the phone. It stipulated that the survey was only for practicing TVIs in the United States and Canada, and requested forwarding to eligible individuals. The message was also sent to Ex-Officio trustees responsible for maintaining and administering federal quota funds used by districts to purchase materials through the American Printing House for the Blind (APH) for their students with visual impairments. Ex-Officios were asked to forward the solicitation to the TVIs in their districts and schools for the blind. Paper surveys were distributed at national special education conferences. After completing a survey, the participant could contact the researchers with proof of TVI status to receive a $15 gift card as compensation.

Surveys were rejected if they were incomplete, or if the participant wrote-in that his/her occupation was something other than a practicing TVI, e.g., a student in a TVI pre-service training program. For confidentiality reasons, the researchers did not have access to the lists of individuals who were contacted through email lists, received forwarded emails, or received paper surveys. Therefore, it was not possible to know how many individuals received the survey. Confidentiality was also maintained through anonymous collection of survey data. No names or other identifying information were collected in the surveys. The University of California, Berkeley's Institutional Review Board reviewed and approved the study procedures, and waived the requirement for obtaining informed consent.

2.3. Participants

Participants ($n = 505$ retained surveys) were mostly American ($n = 494$), with a few being Canadian ($n = 11$). Most participants, 80%, were itinerant teachers ($n = 406$), while 5% worked in a school resource room ($n = 24$), 11% worked at a school for the blind or for special education ($n = 55$), and 4% worked in other professions ($n = 20$), such as visual-impairment consultants. The distributions of TVIs' caseloads and number of colleagues are shown in Fig. 2.

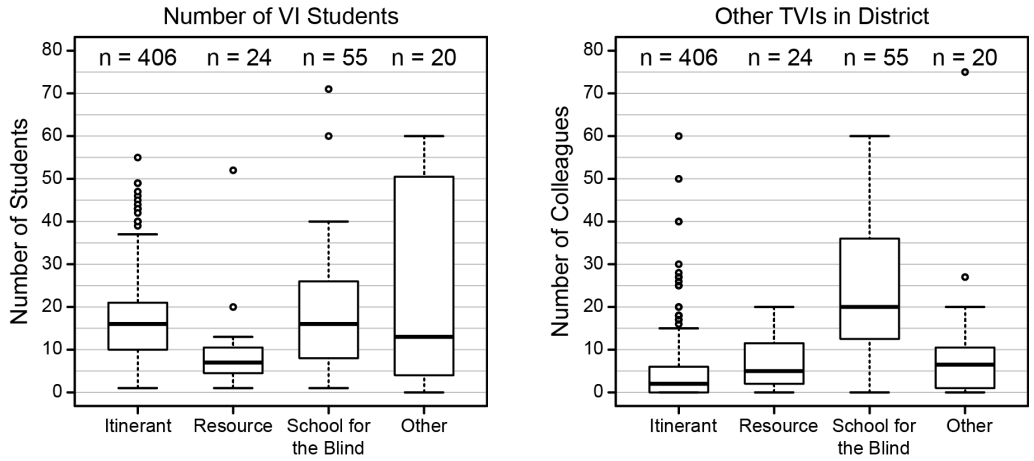

Fig. 2. Box plots of participants' number of students with visual impairments on their caseloads, and number of other TVIs in their districts.

The average number of years participants reported working as TVIs was 13.69 years (median = 10.00 years, SD = 10.42 years). Participants reported their pre-service AT training as 49% ($n = 248$) none, 13% ($n = 70$) an intensive course of less than one semester, 25% ($n = 127$) one semester, 7% ($n = 34$) two or more semesters, and 5% ($n = 25$) did not remember. Participants reported the technical support available to them, with categories being non-exclusive, as 5% ($n = 21$) none, 72% ($n = 364$) general tech support, 42% ($n = 212$) special education tech support, and 26% ($n = 130$) visual-impairment specific tech support.

2.4. Quantitative Analyses

Separate partial credit models for ordinal polytomous data, under the item response theory approach, were fit for CoP and AT item responses [Mair and Hatzinger 2007] as was done in [Siu and Morash 2014]. The relationship between participants' estimated levels of AT proficiency and CoP identification was quantified using Spearman's rho (ρ) non-parametric correlation, and visualized using local polynomial regression (degree = 2, span = 0.75) with Wald 95% confidence intervals [Cleveland 1979]. This exploratory visualization suggested a segmented regression model (two linear regression lines joined at a model-determined breakpoint), which was compared to polynomial regression models (quadratic and cubic) using the Akaike information criterion (AIC). A linear model did not meet model assumptions, while all other models were acceptable based on regression diagnostics (residual qq-plots, etc.).

The relationship between participants' model-estimated AT proficiency and level of pre-service AT training was investigated using using a one-way ANOVA with levels of training: none, less than one semester, one semester, two or more semesters (model assumptions were confirmed with regression diagnostics). The relationship between participants' model-estimated AT proficiency and years in service was calculated using a non-parametric Spearman's ρ correlation.

Item functioning was investigated for the AT and CoP items separately. Internal consistency on each construct's items were inspected by calculating Cronbach's Alpha, with 95% confidence intervals (CIs) estimated using Efron's nonparametric bias-corrected and accelerated (BCa) bootstrap method and 1000 iterations [Efron 1987]. Fits of the item responses to the partial credit models were assessed using infit mean square (infit MSQ). The expected infit MSQ value for each item is 1, with higher values indicating more randomness in response patterns than expected, and lower values indicating less randomness than expected (redundancy). Large infit values are more concerning than low infit values [Wilson 2005].

Question/item difficulties (more difficult questions had fewer high responses) were calculated and plotted. To investigate whether some scenarios or some dimensions of the constructs were more difficult than others, we compared scenario item difficulties within a construct using unequal variance Welch's t-tests with Bonferroni adjustment for multiple comparisons. Similar comparisons were made for the construct dimensions across scenarios. These analyses were done separately for AT proficiency and CoP identification items.

2.5. Qualitative Analyses

Open-ended responses were analyzed for evidence of CoP membership and AT use with students, to provide further validation of the quantitative results. Answers were coded independently by the researchers, one coding all responses and the other coding 60 of each question's responses (approximately 16% of completed responses), chosen randomly for each question. Answers to question 1, describing a typical lesson, were coded for use of: (1) no technology, (2) low technology, such as basic keyboarding and computer skills, and (3) high technology. Answers to question 2, whether TVIs used

AT and with what supports, were coded on two dimensions, use of AT with students: (1) no technology use, and (2) yes technology use; and AT support from a CoP: (1) no CoP support, (2) no, but wishing for CoP support, and (3) yes CoP support. Unclear responses were also coded, and regarded omitted from further analyses. Numeric response codes (taking on values 1 and 2, or 1, 2, and 3 as shown above) were compared to model estimates of CoP identification and AT proficiency using Spearman's ρ.

3. RESULTS

3.1. Relationship between Assistive Technology and Community of Practice

There was a significant positive relationship between participants' estimated levels of AT proficiency and identification with a CoP that values AT, $\rho = 0.49$, $p < 0.001$ (Fig. 3). A segmented regression model ($AIC = 1999$) fit the data better than quadratic ($AIC = 2000$) and cubic models ($AIC = 2002$). While the segmented regression model was only weakly preferred over the quadratic and cubic models based on AIC values, we selected this model due to its ease of interpretation.

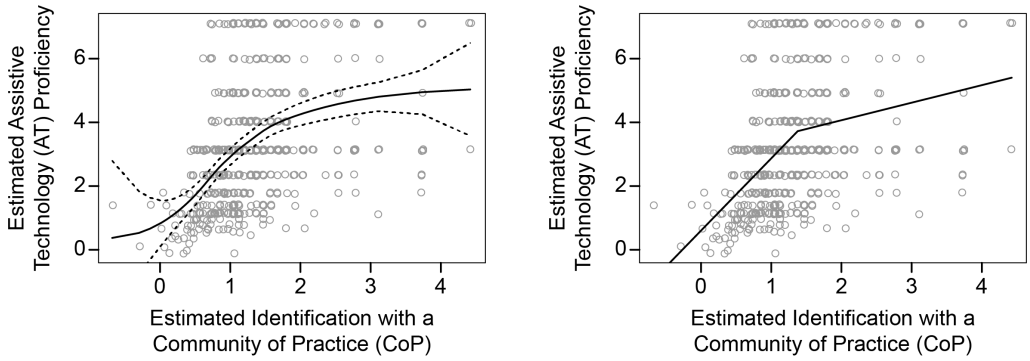

Fig. 3. Participants' estimated identification with a community of practice (CoP) that values assistive technology, and estimated assistive technology (AT) proficiency. Observations are shown slightly jittered to prevent overlap. Left lines represent local polynomial regression (with Wald 95% confidence intervals), right lines represent segmented regression fit.

The segmented regression (Fig. 3) indicated that the effect of CoP identification differed for "low CoP" (CoP breakpoint $= 1.37$, $SE = 0.146$) and "high CoP" participants. The majority of participants, 59% ($n = 298$), were in the "low CoP" range. Participants with low CoP had a significantly larger relationship between CoP identification and AT proficiency ($\beta = 2.26$, $SE = 0.32$, $r = 0.40$, $p < 0.001$) than did participants with high CoP (CoP > 1.37, $\beta = 0.55$, $r = 0.20$, $p = 0.004$; $\Delta\beta = -1.71$, $SE = 0.36$, $p < 0.001$). The segmented model produced an adjusted $R^2 = 0.22$.

An ANOVA did not reveal a significant relationship between estimated AT proficiency and amount of AT pre-service training, $F(3) = 0.89$, $p = 0.445$. We also did not find a significant relationship between participants' estimated AT proficiency and number of years working as TVIs $\rho = 0.06$, $p = 0.206$.

3.2. Assistive Technology (AT) Proficiency Item Functioning

Cronbach's Alpha for the AT item responses was estimated at 0.77, 95% CI = (0.73, 0.81), which was in the acceptable (0.7-0.8) range for research purposes [Kaplan and Saccuzzo 2008; Nunnally and Bernstein 1994]. All AT items had infit MSQ values between 0.80 and 1.12, which fell within the conservative (best acceptable) range of 0.80

- 1.2 [Wright et al. 1994]. Average item difficulties (Fig. 4) were not significantly different across scenarios (all adjusted $p > 0.684$), but funding questions were significantly more difficult than ability ($t(5.15) = 4.71$, adjusted $p = 0.030$) and integration questions ($t(3.80) = 5.85$, adjusted $p = 0.030$; other comparisons' adjusted $p > 0.377$).

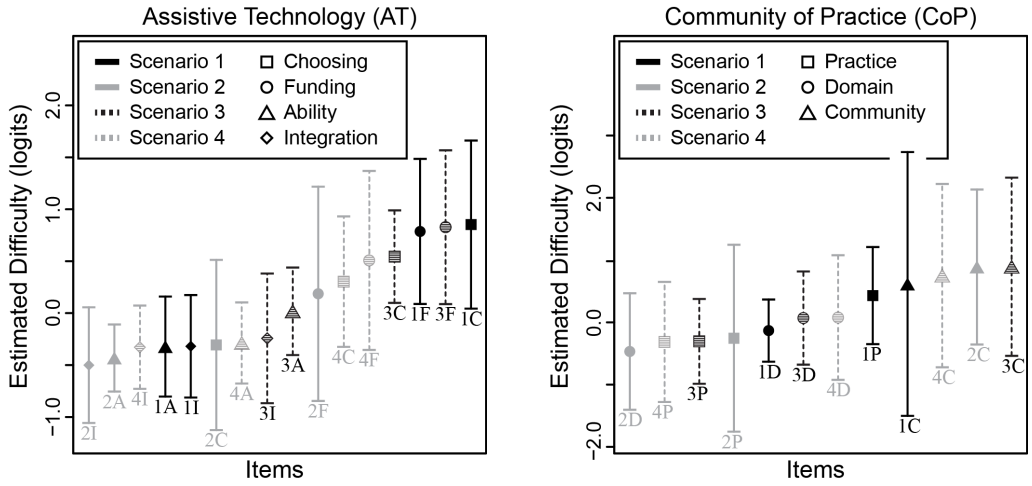

Fig. 4. Item difficulties (with SEs) in logits. Text labels are redundant with legends.

3.3. Community of Practice (CoP) Identification Item Functioning

Cronbach's Alpha for the CoP item responses was estimated at 0.79, 95% CI = (0.75, 0.82), which fell within in the acceptable (0.7-0.8) range for research purposes [Kaplan and Saccuzzo 2008; Nunnally and Bernstein 1994]. All CoP items had infit MSQ values between 0.63 and 0.99. This was slightly below the typical acceptable range of 0.70 - 1.30, but was within the liberal acceptable range of 0.60 - 1.40 [Wright et al. 1994]. Additionally, these lower infit values, which reflected less randomness (more redundancy) than expected, were less concerning than would be high infit values [Wilson 2005]. Average item difficulties (Fig. 4) were not significantly different across scenarios (all adjusted $p = 1.000$), but community questions were significantly more difficult than practice ($t(3.78) = 4.67$, adjusted $p = 0.033$) and domain of interest questions ($t(4.48) = 6.27$, adjusted $p = 0.007$; other comparisons' adjusted $p = 1.000$).

3.4. Relationship between Quantitative Estimates and Open-Ended Response Codes

Open-ended responses were coded for use of AT with students and AT support from a CoP, using a ordinal coding scheme, shown in Table I. Agreement between two independent coders (coding the same 16% of responses) produced 100% agreement.

Table I. Open-ended question response codes and their frequencies ($n = 505$).

(Ordinal Numeric Codes) Code Descriptions & Frequencies			Missing Data & Frequencies	
Question 1, Describe a Typical Lesson				
(1) No Technology	(2) Low Technology	(3) High Technology	Unclear	Unanswered
15	41	343	36	70
Question 2, Using AT with Students?				
(1) No	(2) Yes		Unclear	Unanswered
60	312		11	122
Question 2, Receives AT Support from a CoP?				
(1) No	(2) No, Wishes To	(3) Yes	Unclear	Unanswered
96	29	247	11	122

In describing a typical lesson (question 1), examples of answers corresponding to the ordinal numeric codes for use of AT with students were,

(1) **No Technology**: "I do not teach assistive technology with my students. I have a tech guy/teacher that comes in and does that with them."
(2) **Low Technology**: "For all my visually impaired / blind academic students, I teach touch-typing and the use of short-cut keys."
(3) **High Technology**: "I use technology on a daily basis with all my students. We use iPads with the Join Me app, we use them to take pictures and then enlarge the pictures. We use CCTV's for near and distance viewing. We use Zoomtext Express, Zoomtext, JAWS and MUCH, MUCH more. My school district is VERY big on technology."

In describing use of AT with students (question 2), example participant answers for each code were,

(1) **No, Not Using AT**: "I would like to use the Talking Tactile Tablet, but the computer it goes with does not recognize the program. I need to find the time to contact the company to problem solve. As for another student, I would like to use VisioBook, but am currently looking for funds to provide it."
(2) **Yes, Using AT with Students**: "I currently use Zoomtext, Jaws, Talking Typer, Victor Streams, magnifiers, CCTVs, and many more in my classroom."

Finally, in describing supports the teachers had for AT use with students (question 2), example answers for each code were,

(1) **No CoP Support**: "I need training on other types of assistive technology. I do have several students that use CCTV's but that is all I know. I did take a two week course on technology but that was several years ago and I do not remember what they are or how to use them."
(2) **Wishes for CoP Support**: "I would love access to online trainings on technology use. My class on technology was over 15 years ago, before IPads even existed!"
(3) **Has CoP Support**: "I do use assistive technology. I am always searching for information to help me more effectively teach it. I read manuals, search the internet, take classes (I wish more were available locally), and talk to colleagues."

When comparing each participant's quantitative (scenario) and qualitative (numerically coded open-ended questions) data, Spearman's correlations revealed a significant relationship between model estimates of AT proficiency and CoP identification with response codes from open-ended questions. The correlation between model-estimated AT

proficiency and codes for AT use in a typical lesson (question 1) was $\rho = 0.17$, $p < 0.001$; and codes for using AT with students (question 2) was $\rho = 0.30$, $p < 0.001$. The correlation between model-estimated CoP identification and codes for CoP support (question 2) was $\rho = 0.14$, $p = 0.007$.

4. DISCUSSION

4.1. Correlates of AT Proficiency

Our results confirmed that identification with a pro-technology community of practice is related to higher assistive technology proficiency among teachers of students with visual impairments (Spearman's correlation of $\rho = 0.49$). Exploratory analysis using a segmented regression revealed that the positive correlation between CoP identification and AT proficiency was higher among low-CoP TVIs (59% of participants, $r = 0.40$) than high-CoP TVIs (41% of participants, $r = 0.20$). This implies that higher levels of AT proficiency are less affected by identification with a community of practice. This could reflect that with increased AT proficiency, TVIs are more likely to take on roles of experts and rely less on a CoP for their own professional development. By doing so, these TVIs help build the network's expertise, which benefits TVIs at lower levels of AT proficiency. TVIs with higher levels of AT proficiency have a greater repertoire of technology implementation in a wider variety of use cases. If their repertoire is available within a CoP, then TVIs with lower AT proficiency can access models of implementation that would otherwise be absent from their own practice.

We did not find a significant positive relationship between TVIs' estimated AT proficiency and their self-reported pre-service AT training, nor with their number of years working as TVIs. Rather, we found that their social network (CoP identification) was a better predictor of effective AT adoption and implementation. This finding is surprising given the emphasis on pre-service AT training to build TVIs' AT competencies [Abner and Lahm 2002; Zhou et al. 2011], and the reasonable assumption that teaching experience can build a TVI's ability to use technology with a wider variety of students. It is likely that device-specific knowledge gained in TVIs' pre-service training expires as technology changes. Additionally, students with visual impairments are a diverse population with differentiated technology needs. It is highly unlikely that a TVI will be assigned a student with the same needs that were covered in pre-service training or that they have previously encountered, and it is impossible for pre-service training to cover every possible AT and student scenario. As a supplement to pre-service training and formal models of professional development, connection to informal social networks may provide more sustainable supports for the development of AT proficiency.

4.2. Overcoming Challenges of An Isolated Practice

Eighty percent of participants in the current study were itinerant, which we believe accurately reflects TVIs' demographics based on the fact that the majority of students with visual impairments are educated in mainstream public schools and not at schools for the blind, where they are served principally by itinerant TVIs [Ajuwon and Oyinlade 2008; Correa-Torres and Howell 2004]. 50% of the itinerant TVIs reported having 2 or fewer TVI colleagues, and 25% had no other TVIs in their districts. These findings are consistent with others' suggestions that while itinerant TVIs collaborate with a wide range of educational team members to implement services, they often work in isolation and never encounter another TVI within a school day, week, or month [Correa-Torres and Howell 2004; Yarger and Luckner 1999; Kapperman et al. 2002; Swenson 1995].

Teaching in isolation likely results in a dispersed practice for TVIs, whose skills are not supported through regular colleague interactions. Our results imply that the

best way to improve TVIs' AT proficiency may be to connect those who are not already connected to a pro-technology community of practice. Given that TVIs often report limited time and resources for learning technology and are physically separated from other TVIs, their access to professional social networks are most likely to be found online. Examples of online professional TVI social networks include email listservs (e.g., Braille-N-Teach, Association for Education and Rehabilitation of the Blind and Visually Impaired, National Federation of the Blind), Facebook groups, engagement in a Twitter community, and websites that host lesson-plan sharing and online discussions (e.g., Perkins' Paths to Technology). Further work is needed to examine the dynamics of these online communities, and if they adequately provide communities of practice that support assistive technology.

4.3. Implications

In response to reports that many TVIs feel inadequate in knowing what and how to teach AT, university teacher preparation programs have focused on incorporating AT training to various degrees across North America [Smith and Kelley 2007]. However, there are no current data on the breadth and extent of topics these programs cover. It is likely that these programs include survey courses that focus on devices a TVI might encounter in the field, which may or may not facilitate the instructional design knowledge necessary to apply technology skills in novel situations that were not specifically taught in training [Mishra and Koehler 2006].

As mentioned above, the speed of technology development and the varied use-cases of technology with students who have visual impairments make it unlikely that these types of courses alone would fully support TVIs' AT proficiency. Instead, courses should also include strategies to engage with communities of practice. The current results indicate that professional connections are critical to stay abreast of technology changes, to learn current features and key words to use as search terms, and to leverage expertise beyond what is available locally. Any form of training, whether in pre- or post-service, must also have a social component for participants to transfer their knowledge to real-world applications. Given that identification with a community of practice is predictive of AT proficiency, these interactions should be considered informal models of professional development. Ideally, school administrators and political stake-holders will recognize online communities as such, and allow time for and provide encouragement to teachers so that they may incorporate these social interactions into their schedules.

Developers of AT need to consider not only how students with visual impairments will use their technologies, but also how they can support their adoption by TVIs. This can be done by providing forums for users to engage with one another about using the AT. Additionally, it would be beneficial for developers to supply information for different types of use cases, e.g., by creating example lesson plans and video tutorials. The current research suggests that social support is a primary means by which AT is adopted by teachers and taught to students.

4.4. Survey Functioning

Survey items had acceptable internal consistency for research purposes, and all items had infit MSQ values within acceptable levels. Significant positive correlations between participants' estimated identification with a community of practice that values assistive technology and assistive technology proficiency, produced from model results, and open-ended responses coded for these characteristics provided additional evidence of the survey's validity to that established in previous work [Siu and Morash 2014]. Therefore, the survey is suitable for use by other researchers in future studies.

In the current study, we did not observe differences in item difficulty across the survey scenarios, which was consistent with previous findings [Siu and Morash 2014]. We did find that funding questions were more difficult than ability and integrate questions (on AT proficiency), and community questions were more difficult than practice and domain of interest questions (on CoP identification). This implies that funding assistive technology and engagement with other TVIs were particularly challenging for our participants. Barriers to AT adoption related to funding have been noted previously [Strobel et al. 2006], and our results extend this finding to teachers who act as AT gatekeepers for K-12 students with visual impairments. TVIs may not have the luxury of dedicating time to engage with other TVIs, because they work in isolated practice with large caseloads, and feel that they already spend less time working directly with students than they would like [Correa-Torres and Howell 2004]. TVIs, might also feel that they do not have time for formal professional development. This may be particularly true for high AT-proficiency TVIs, who are less reliant with a community of practice to troubleshoot AT challenges.

4.5. Limitations

The current research documents a positive correlation between assistive technology proficiency and identification with a community of practice that values assistive technology for teachers of students with visual impairments. As with any non-experimental work, it cannot prove a causal relationship. However, the current findings provide a base on which future experimental work may be conducted. Specifically, research should examine the effectiveness of a community of practice intervention for increasing TVIs' AT proficiency. The current work supports such future endeavors by defining AT proficiency and CoP identification constructs, and a validated survey for measuring these constructs.

It is possible that an unobserved confounding variable produced the correlation observed between AT proficiency and CoP identification. Additionally, participants may have answered questions according to what they believed were "correct" answers. While the survey was designed to present options with neutrality, it remains possible that participants felt that certain responses were expected of them. However, given that the relationship between CoP identification and AT proficiency was stronger for low-CoP and low-AT participants, it seems unlikely that the observed relationship was driven by response bias for high-CoP and high-AT responses.

Another limitation of this research is that TVIs were recruited through professional networks, and by their willingness to take the survey were likely to have relatively high identification with a community of practice already. Efforts were made to include low CoP-identification and low AT-proficiency TVIs by recruiting through mandatory TVI professional contacts (Ex-Officios) and by providing paper and phone survey options. Despite this, it is likely that TVIs with the lowest levels of CoP identification and AT proficiency were underrepresented in this research.

4.6. Conclusion

Results confirm that TVIs' assistive technology proficiency is related to their identification with a community of practice that values assistive technology, and not their number of years working as a TVI nor amount of pre-service assistive technology training. Developers of assistive technology should consider the social context in which technology is used, as teachers act as the gate-keepers of assistive technology for their students with disabilities. AT implementation may be promoted by promoting engagement between teachers, which allows them to trouble-shoot problems and seek advice about new assistive technologies.

APPENDIX - CONSTRUCT MAPS

Assistive Technology Proficiency

	Assistive Technology Proficiency Dimensions			
	Choose	Fund	Ability	Integrate
Proficiency Level	(Willingness and resources for choosing AT)	(Willingness and resources for funding AT)	(Willingness and ability to use AT)	(Willingness and ability to integrate AT into lessons)
Highest	Chooses AT with help from AT experts as needed.	Contacts specific funding sources at district, state, and federal levels.	Can use AT and troubleshoots with manual and help from AT experts if needed.	Uses AT for designated and other tasks.
High	Chooses AT with help from colleagues who are not AT experts.	Seeks district, state, and federal funding sources.	Can use AT and troubleshoots with manual and help from non-expert colleagues.	Uses AT for designated tasks; is open to using AT for other tasks, but does not know which ones.
Medium	Chooses AT based on familiar experiences.	Ask district, local community, or parents for funding.	Can only use AT with directions or after specific training.	Uses AT only for designated tasks.
Low	Chooses AT based on anecdotal information.	Ask and depend on district for funding.	Can use AT only with ongoing support from colleagues.	Uses AT only for designated tasks when non-AT solution is unavailable.
Ambivalent	Does not know how to choose AT.	Believes funding is unavailable.	Does not know how to use AT.	Is unsure how to integrate AT.
Aversive	Choosing AT takes too much time and effort.	Finding funding would take too much time and effort.	Learning to use AT takes too much time and effort.	Believes AT distracts from learning goals.

Identification with a Community of Practice

	Identification with a Community of Practice Dimensions		
	Practice	Domain of interest	Community
Community Identification	(Willingness to share, develop, and maintain a body of AT knowledge)	(Commitment to using AT when an accessibility issue arises)	(Interaction with other CoP members)
Contributing	Leverages familiar resources to learn new AT, such as manuals, the internet, and "techie" colleagues.	Committed to AT use, and confident it can improve access to education.	Shares and disseminates information about AT with other CoP members.
Seeking	Asks for help to learn new AT, but lacks known resources.	Committed to AT use, but unsure of how it can improve access to education.	Looks for, and uses information shared by CoP members.
Ambivalent	Will only learn AT according to a superior's directive.	Unsure of AT use, and unsure if it improves access to education.	Only exchanges information with members of a CoP as an obligation.
Non-Identifying	Will not learn AT, will work around it.	Considers AT use non-essential to learning, does not improve access to education.	Observes CoP members' exchanges of information only if convenient.
Opposed	Avoids learning new AT, employs non-AT solutions, or removes reason to learn AT.	Believes that AT use will reduce access to education.	Avoids members of CoP.

APPENDIX - SURVEY

Note that scenarios were not named (e.g., "Scenario 1: Printed Classroom Handouts") nor survey questions identified as construct dimensions (e.g., "Choose Scenario 1"), but are labeled as such below for clarification.

Introduction

In this survey, assistive technology (AT) is defined as high-tech devices or programs that are dependent on a power source, and specially utilized for students with visual impairments. There are different opinions regarding the use of assistive technology with students. Some people think it's a tool that should always be used, and others think other options can be as effective as assistive technology. We are interested in your honest opinion regarding assistive technology, and supports you utilize in your teaching. All responses will be anonymous and confidential.

If you already completed this survey before 2014, please consider participating again.

Demographic Questions

(1) Currently, which of these best describes your job:
   (a) Itinerant, I mostly travel to different schools to provide services to students
   (b) Resource, I mostly provide services in a room for students with special needs including visual impairment within a larger school setting
   (c) School for the Blind or for Special Education
   (d) Other (please describe)
(2) Approximately how many students with visual impairments are currently on your caseload?
(3) How many years have you been working with students with visual impairments?
(4) Approximately how many other TVIs (not including yourself) do you know of in your district or school for the blind?
(5) In the school district(s) where you teach, what kind of tech support is available? (Please check all that apply.)
   (a) None
   (b) General tech person/people who help all school staff and equipment for all students
   (c) Special Education tech person/people who help all special education staff and equipment for students with disabilities
   (d) Tech person(s) who only help staff who work with students with visual impairments, e.g., TVIs, O&Ms, transcribers
   (e) Other (please describe)
(6) What type of training, if any, in assistive technology did you receive in your teacher preparation program?
   (a) None
   (b) I don't remember
   (c) An intensive AT course lasting less than one semester
   (d) 1 semester AT course
   (e) 2 semester AT courses
   (f) Other (please describe)
(7) In which country do you teach? The United States of America or Canada?

Scenario Instructions

In the majority of this survey, a scenario will be presented followed by several questions about the scenario. Please read each scenario, and choose the answers that best

describe what you would do in each situation in your current teaching setting. If you can relate to any of the scenarios, try to remember what you did in that situation. Please select only one response per question.

Scenario 1: Printed Classroom Handouts

Imagine you have a high school student in a resource room with teachers who use several handouts a day. Some of the handouts are printed from a website, and others are created by the teacher on the computer. This student has low vision and cannot see regular print size. How would you work with the teacher to provide the handouts in a way the student could access?

Choose Scenario 1. If the student was not already using technology during the school day, how would you proceed?

I would get the handouts in advance from the teacher to enlarge on a copier, or assign a reader or paraprofessional because

(1) It takes too much time and effort to find a technology solution in this situation.
(2) I don't know how technology could help the student read the printed handouts.

I would use a CCTV or computer program to help the student read the handouts because

(3) I was told or have heard this is a good way to access print handouts.
(4) It is how I have accessed print handouts before.

I would use a CCTV or computer program, and independently search for alternative technology if this solution didn't meet the student's needs. If I required additional input to make a decision, I would consult

(5) Various colleagues or other resources, but I'm not confident they would have good suggestions.
(6) Specific colleagues or resources I know will have good suggestions.

Fund Scenario 1. If you decided a CCTV was necessary and appropriate for the student, but this device was not available how would you proceed?

I would get the handouts in advance from the teacher to enlarge on a copier, or assign a reader or paraprofessional, because asking the district to pay for the CCTV

(1) Would take too much time and effort.
(2) Is something I am not sure the district would agree to, and I don't want to use my own money.

I would ask the district to pay for the CCTV, and if they weren't willing, I would

(3) Fall back to enlarging the handouts on a copier, or assigning a reader or paraprofessional.
(4) Lobby the district, local community, or parents to buy the CCTV for my student.

I would lobby the district to buy the CCTV, and if it didn't work I would

(5) Look for federal or state funding sources.
(6) Contact federal or state funding sources, and/or specific people inside or outside my district.

Ability Scenario 1. If a portable CCTV was available, how would you proceed?

I would continue enlarging the handouts on a copier, or assigning a reader or paraprofessional because

(1) It would take too much time and effort for me to learn to use the portable CCTV.
(2) I don't currently know how to use a portable CCTV to view and enlarge the handouts.

I would use the portable CCTV with help, but only if

(3) Someone else (e.g., a colleague) set it up and helped me whenever I used it.
(4) I had directions to follow, and/or was given one-on-one training.

I would use the portable CCTV after training or reading a manual, and to troubleshoot problems I would

(5) Consult the manual or ask a colleague.
(6) Consult the manual or ask a colleague, and then ask someone I have in mind who is an expert.

Integrate Scenario 1. If a laptop with screen magnification software was available with support, how would you proceed?

I would continue enlarging all handouts on a copier, or assigning a reader or paraprofessional because

(1) Using the laptop would distract from other learning goals.
(2) I do not currently integrate use of a laptop into lesson plans with this student.

I might use the laptop for appropriate handouts,

(3) But only for handouts I wasn't able to enlarge on a copier (i.e., I did not get them ahead of time).
(4) Whether or not I'm able to enlarge them on a copier.

I would use the laptop for accessing digital versions of all appropriate handouts. I would also use the laptop for

(5) Other print materials, but I dont have any lessons in mind.
(6) A number of other specific lessons and activities.

Practice Scenario 1. Imagine this high schooler is new on your caseload, and he typically uses an iPad to view most classroom handouts. If you were unfamiliar with how to use the iPad to access handouts, how would you proceed?

I would work with the device, and I would tap into these supports

(1) A regular network of resources, such as manuals, cheat sheets, web sources, and/or "techie" colleagues who have helped me in the past.
(2) Help from a colleague who doesn't necessarily know how to use the iPad in this capacity, but could provide suggestions.
(3) Contacting my supervisor, and following his/her recommendations.

I might not work directly with the device, instead I would

(4) Rely on a colleague or the student to address iPad issues, so I could focus on the non-technology portion of lessons.
(5) Ask to swap the student off my caseload, and in the meantime rely on hard copy braille or large print books, a paraprofessional, or assign a peer buddy.

Domain of Interest Scenario 1. How would you feel about using electronic versions of the handouts?

I would consider using electronic versions of appropriate handouts,

(1) And I feel confident in how to do this.
(2) But I feel unsure about how to do this.

I would rather enlarge handouts using a copier, or assign a reader or a paraprofessional, because

(3) I need more information to decide if using technology to access handouts is appropriate for this situation.
(4) Based on my experiences, I know that electronic versions of the handouts will help the student learn more effectively.
(5) Teaching a technology would take time better spent working with a reader or previewing the large-print paper copy.

Community Scenario 1. Imagine your school district is implementing a new mandate to introduce iPads to all students in this high school. How would you meet the demands of the mandate for this student with low vision?

I would attend all mandatory district staff meetings, and

(1) Volunteer to lead workshops and discussions, or distribute "cheat sheets" about using the iPad with students who are visually impaired.
(2) Search for and attend workshops and discussions about using iPads with students who are visually impaired.
(3) Attend no other, non-mandatory workshops.

I don't think use of an iPad is relevant to my student with low vision, and I would

(4) Only attend mandatory district staff meetings, if they were conveniently located and scheduled.
(5) Not attend any meetings, because it would take time away from other teaching priorities.

Scenario 2: Computer Lab

Imagine you have a third grade student in a general education class. This class completes projects in a weekly computer lab, and optional computer time in the classroom. The student has low vision, and has extreme difficulty seeing what's on the computer screen using a standard monitor with conventional settings. What would you do to help this student access the computer?

Choose Scenario 2. If the student was not already using assistive or specialized technology to view the computer screen, how would you proceed?

I would have the student work with a peer or paraprofessional who could read the screen because

(1) It takes too much time and effort to find another technology solution in this situation.
(2) I don't know how additional technology could help the student access the computer independently.

I might use a screen magnification program (e.g., Windows Magnifier, Zoom, MAGic, or ZoomText). I would choose these tools because

(3) I was told or have heard this software is good for magnifying computer screens.
(4) I have used this software for magnifying a computer screen before.

I would use a screen magnification program, and independently search for alternative technology if the current technology wasn't meeting the student's needs. If I required additional input to make a decision, I would consult

(5) Various colleagues or other resources, but I'm not confident they would have good suggestions.
(6) Specific colleagues or resources I know will have good suggestions.

Fund Scenario 2. If you decided an advanced screen magnification program such as MAGic or ZoomText was necessary and appropriate for the student, but this software was not available how would you proceed?

I would have the student work with a peer or paraprofessional who could read the screen, because asking the district to pay for the software

(1) Would take too much time and effort.
(2) Is something I am not sure the district would agree to, and I don't want to use my own money.

I would ask the district to pay for the software, and if they weren't willing, I would

(3) Fall back to having the student work with a peer or paraprofessional who could read the screen.
(4) Lobby the district, local community, or parents to buy the software for my student.

I would lobby the district to buy the software, and if it didn't work I would

(5) Look for federal or state funding sources.
(6) Contact federal or state funding sources, and/or specific people inside or outside my district.

Ability Scenario 2. If an advanced screen magnification program such as MAGic or ZoomText was available, how would you proceed?

I would have the student work with a peer or paraprofessional who could read the screen, because

(1) It would take too much time and effort for me to learn how to use MAGic or Zoomtext.
(2) I don't currently know how to use these programs.

I might use MAGic or Zoomtext, but only if

(3) Someone else (e.g., a colleague) set it up and helped me whenever I used it.
(4) I had directions to follow and/or was given one-on-one training.

I would use MAGic or Zoomtext after training or reading a manual, and to troubleshoot problems I would

(5) Consult the manual or a colleague.
(6) Consult the manual or a colleague, and then ask someone I have in mind who is an expert.

Integrate Scenario 2. If MAGic or Zoomtext was appropriate and available with support, how would you proceed?

I would have the student work with a peer or paraprofessional who could read the screen, because

(1) Using software to magnify the screen would distract from other learning goals.
(2) I do not currently integrate MAGic or ZoomText into lesson plans with this student.

I might use MAGic or ZoomText, but only for

(3) Reading the computer screen during the weekly computer lab to complete projects.
(4) Viewing the computer during lab and, if needed, to complete projects in the classroom.

I would use MAGic or ZoomText to access computers in both lab and the classroom, and

(5) I'd like to use the screen magnification software with materials other than projects, but I don't have any materials in mind.
(6) I have specific ideas about other activities that could be accessed using MAGic or ZoomText.

Practice Scenario 2. Imagine this middle school student is new on your caseload, and she currently uses ZoomText. If you were unfamiliar with this particular program, how would you proceed?

I would work with the program. I would utilize these supports

(1) A regular network of network of resources, such as manuals, cheat sheets, web sources, and/or "techie" colleagues, who have helped me in the past.
(2) Help from a colleague, who doesn't necessarily know the program, but could provide suggestions.
(3) Contacting my supervisor, and following his/her recommendations.

I would not work with the program, instead I would

(4) Rely on a colleague or the student to manage use of the program, so I could focus on the non-technology portion of lessons.
(5) Ask to swap the student off my caseload, and in the meantime rely on a hand held magnifier, a paraprofessional, or assign a peer buddy.

Domain of Interest Scenario 2. How do you feel about using a computer screen magnification program such as MAGic or Zoomtext?

I would consider using a computer screen magnification program. I would feel

(1) Confident in how to do this.
(2) Unsure about how to do this.

I would rather have the student work with a peer or paraprofessional who could read the screen, or encourage the student to use a handheld magnifier. These strategies are preferred because

(3) I need more information to decide if using a screen magnification program to view the computer screen is appropriate.
(4) Based on my experiences, I know that technology screen magnification program is not necessarily essential to student learning.
(5) Teaching the screen magnification program will use up time better spent scaffolding interactions with a peer who can work with the student, or teaching the student how to use a handheld magnifier.

Community Scenario 2. Imagine your school district is implementing a new mandate to introduce a keyboarding program in computer labs for all students. How would you meet the demands of the mandate with this student who cannot see a standard computer monitor?

I would attend all mandatory district staff meetings, as well as

(1) Volunteer to lead workshops and discussions, or distribute "cheat sheets" about making keyboarding lessons accessible to students with visual impairments.
(2) Search for and attend workshops and discussions about keyboarding for students who are visually impaired.
(3) Attend no other, non-mandatory workshops.

I don't think use of a keyboarding program is relevant to my student who cannot see the computer screen. Since other standards are more relevant to my lesson planning, I would

(4) Only attend mandatory district staff meetings, if they were conveniently located and scheduled.
(5) Not attend any meetings, because it would take time away from other teaching priorities.

Scenario 3: Textbooks

The school year just began, and you have a middle school student taking several general education classes. This student needs textbooks for each class. The student has no vision, and is unable to access print. Unfortunately, it will take 6 to 8 weeks for the braille copy of the book to arrive the school.

Choose Scenario 3. If the student is not already using technology for reading books, how would you proceed?

I would have portions of the books brailled for the student until the braille textbooks arrive. I would use these methods because

(1) It takes too much time and effort to find a technology solution in this situation.
(2) I don't know how technology could be used by the student to read the textbooks.

I might use digital versions of the textbooks. I would select a device or software program because

(3) I was told or have heard it was good for reading books.
(4) I have used it for reading books before.

I would use digital versions of the textbooks, and independently search for alternative technology if the currently available technology wasn't meeting the student's needs. If I required additional input to make a decision, I would consult

(5) Various colleagues or other resources, but I'm not confident they would have good suggestions.
(6) Specific colleagues or resources I know will have good suggestions.

Fund Scenario 3. If you decided a BookPort Plus was necessary and appropriate for the student, but this device was not available how would you proceed?

I would have portions of the books brailled for the student until the braille textbooks arrive, because asking the district to pay for the BookPort Plus

(1) Would take too much time and effort.
(2) Is something I am not sure the district would agree to, and I don't want to use my own money.

I would ask the district to pay for the BookPort Plus, and if they weren't willing, I would

(3) Fall back to having portions of the books brailled.
(4) Lobby the district, local community, or parents to buy the BookPort Plus for my student.

I would lobby the district to buy the BookPort Plus, and if it didn't work I would

(5) Look for federal or state funding sources.
(6) Contact federal or state funding sources, and/or specific people inside or outside my district.

Ability Scenario 3. If a BrailleNote was available, how would you proceed?

I would braille for the student until the braille textbooks arrive. I would use this strategy because

(1) It would take too much time and effort for me to learn to use the BrailleNote.
(2) I don't currently know how to use the BrailleNote.

I might use the BrailleNote, but only if

(3) Someone else (e.g., a colleague) set it up and helped me whenever I used it.
(4) I had directions to follow and/or was given one-on-one training.

I would use the BrailleNote after training or reading the manual, and to troubleshoot problems I would

(5) Use the manual or ask a colleague.
(6) Use the manual or ask a colleague, and then ask someone I have in mind who is an expert.

Integrate Scenario 3. If the BrailleNote was an appropriate device for the student and available with support, how would you proceed?

I would braille for the student until the braille textbooks arrive. I would use this strategy because

(1) Technology distracts from other learning goals.
(2) I do not currently integrate the BrailleNote into my lesson plans.

I might use the BrailleNote, but only for

(3) Reading textbooks unavailable in braille.
(4) Reading all textbooks, whether or not they're available in braille.

I would use the BrailleNote for reading all textbooks, and I'd like to use the BrailleNote to access materials other than textbooks

(5) But I don't have any materials in mind.
(6) And I have specific ideas about materials that could be accessed on the BrailleNote.

Practice Scenario 3. Imagine this middle school student is new to your caseload, and he currently uses a BrailleNote. If you were unfamiliar with this particular device, how would you proceed?

I would work with the BrailleNote. I would utilize these supports

(1) A regular network of resources, including manuals, cheat sheets, web sources, and "techie" colleagues, who have helped me in the past.
(2) Help from a colleague who doesn't necessarily know the device, but could provide suggestions.
(3) Contacting my supervisor, and following his/her recommendations.

I would not work with the device, instead I would

(4) Rely on a colleague or the student to manage the BrailleNote, so I could focus on the non-technology portion of lessons.
(5) Ask to swap the student off my caseload, and in the meantime rely on hard copy braille or large print books, a paraprofessional, or assign a peer buddy.

Domain of Interest Scenario 3. How do you feel about using electronic versions of textbooks (such as textbooks on a BrailleNote, BookPort Plus, or iPad) with students accessing the academic curriculum?

I would consider using electronic versions of the textbooks, I would feel

(1) Confident in how to do this.

(2) Unsure about how to do this.

I would rather braille portions of the book as assigned or assign a reader. These strategies are preferred because,

(3) I need more information to decide if using technology to access textbooks is appropriate.
(4) Based on my experiences, I am confident digital textbooks are not essential to student learning
(5) Teaching the technology will use up time better spent working with a reader or previewing braille.

Community Scenario 3. Imagine your school district is implementing a new mandate to use eTextbooks with all visually impaired students. How would you meet the demands of the mandate with this student who is blind?

I would attend all mandatory district staff meetings, as well as

(1) Volunteer to lead workshops and discussions, or distribute "cheat sheets" about using eTextbooks with students who are visually impaired.
(2) Search for and attend workshops and discussions about using eTextbooks.
(3) Attend no other, non-mandatory workshops.

I don't think use of eTextbooks is relevant to my student who is blind. Since other standards are more relevant to my lesson planning, I would

(4) Only attend mandatory district staff meetings, if they were conveniently located and scheduled.
(5) Not attend any meetings, because it would take time away from other teaching priorities.

Scenario 4: Library Internet Research

Imagine a new student transferred to a general education middle school in your school district mid-year. The student is totally blind and on grade level. The student's homeroom class goes to the library once a week to learn how to research information on the internet. All of the computers are Windows computers, with standard size monitors set to conventional settings. What do you do to help the student participate in this library research activity?

Choose Scenario 4. If the student is not already using technology to conduct research, how would you proceed?

I would assign a peer buddy or paraprofessional to work with the student, encourage the student to utilize references available in braille, or contact resources by telephone. I would use these methods because

(1) It takes too much time and effort to find a technology solution in this situation.
(2) I don't know how technology could be used by the student to carry out online research.

I would install a screen-reading software (e.g., JAWS, System Access To Go) on one of the library computers, or have the student use a BrailleNote. I would choose these tools because

(3) I was told or have heard this is good for reading computer screens.
(4) I have used it for reading computer screens before.

I would use a screen reading software or BrailleNote, and independently search for alternative technology if the currently available technology wasn't meeting the student's needs. If I required additional input to make a decision, I would consult

(5) Various colleagues or other resources, but I'm not confident they would have good suggestions.
(6) Specific colleagues or resources I know will have good suggestions.

Fund Scenario 4. If you decided an advanced screen reading program such as JAWS was necessary and appropriate for the student, but this software was not available how would you proceed?

I would have the student work with a peer or paraprofessional who could read the screen, encourage the student to utilize references available in braille, or contact resources by telephone because asking the district to pay for the program

(1) Would take too much time and effort.
(2) Is something I am not sure the district would agree to, and I don't want to use my own money.

I would ask the district to pay for the program, and if they weren't willing, I would

(3) Fall back to having the student work with a peer or paraprofessional who could read the screen.
(4) Lobby the district, local community, or parents to buy the program for my student.

I would lobby the district to buy the software, and if it didn't work I would

(5) Look for federal or state funding sources.
(6) Contact federal or state funding sources, and/or specific people inside or outside my district.

Ability Scenario 4. If an advanced screen reading program such as JAWS was available, how would you proceed?

I would have the student work with a peer or paraprofessional who could read the screen, encourage the student to utilize references available in braille, or contact resources by telephone. I would utilize these tools because

(1) It would take too much time and effort for me to learn how to use JAWS.
(2) I don't currently know how to use this program.

I might use JAWS, but only if

(3) Someone else (e.g., a colleague) set it up and helped me whenever I used it.
(4) I had directions to follow and/or was given one-on-one training.

I would use JAWS after training or reading a manual, and to troubleshoot problems I would

(5) Consult the manual or a colleague.

(6) Consult the manual or a colleague, and then ask someone I have in mind who is an expert.

Integrate Scenario 4. If JAWS was appropriate and available with support, how would you proceed?

I would have the student work with a peer or paraprofessional who could read the screen, encourage the student to utilize references available in braille, or contact resources by telephone. These methods are appropriate because

(1) Using software to read the screen would distract from other learning goals.
(2) I do not currently integrate JAWS into lesson plans with this student.

I might use JAWS, but only for

(3) Accessing the computer in the library to learn how to research information.
(4) Computer-based research in the library and, if needed, for further computer-based research in the classroom.

I would use JAWS to access computers in both lab and the classroom. I would also use JAWS for

(5) Other computer activities, but I don't have any lessons in mind.
(6) A specific number of other lessons and activities.

Practice Scenario 4. Imagine this middle school student used JAWS at her previous school. If you were unfamiliar with this particular program, how would you proceed?

I would work with the program. I would utilize these supports

(1) A regular network of resources, such as manuals, cheat sheets, web sources, and/or "techie" colleagues, who have helped me in the past.
(2) Help from a colleague who doesn't necessarily know JAWS, but could provide suggestions.
(3) Contacting my supervisor, and following his/her recommendations.

I would not work with the program, instead I would

(4) Rely on a colleague or the student to manage use of the program, so I could focus on the non-technology portion of lessons.
(5) Ask to swap the student off my caseload, and in the meantime rely on a paraprofessional, peer buddy, brailled reference materials, or resources over the phone.

Domain of Interest Scenario 4. How do you feel about using a screen reading program such as JAWS or VoiceOver?

I would consider using a screen reading program. I would feel

(1) Confident in how to do this.
(2) Unsure about how to do this.

I would rather have the student work with a peer or paraprofessional who could read the screen, encourage the student to utilize references available in braille, or contact resources by telephone. These strategies are preferred because

(3) I need more information to decide if using a screen-reading program to access the computer and online information is appropriate.
(4) Based on my experiences, I know that a screen reading program is not essential to student learning.
(5) Teaching how to use a screen-reading program will use up time better spent scaffolding interactions with a peer who can work with the student, reinforcing braille reading skills, or teaching the student how to maximize phone resources.

Community Scenario 4. Imagine your school district is implementing a standards-based core curriculum for all students to learn how to carry out online research. How would you address the demands of this mandate to meet state standards with this student who cannot see a standard computer monitor?

I would attend all mandatory district staff meetings, as well as

(1) Volunteer to lead workshops and discussions, or distribute "cheat sheets" about using a screen reading program with students with visual impairments
(2) Search for and attend workshops and discussions on screen reading programs for students who are visually impaired.
(3) Attend no other, non-mandatory workshops.

I don't think use of a screen reading program is necessarily relevant to my student who cannot see the computer screen. Since other standards are more relevant to my lesson planning, I would

(4) Attend only mandatory district staff meetings, if they were conveniently located and scheduled.
(5) Not attend any meetings, because it would take time away from other teaching priorities.

Open-Ended Questions

For the last two questions below, please answer generally, not in response to one of the specific scenarios.

(1) Please describe a typical lesson with an academically oriented student. Please explain how you utilize high tech assistive technology, or low-tech solutions.
(2) If you are *not* currently using assistive technology with students, what resources or changes would be necessary to change your teaching practice to include use of assistive technology? If you *do* use assistive technology, what supports/resources enable you to use assistive technology with students?

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