Research Report

The Use of Assistive Technology by High School Students with Visual Impairments: A Second Look at the Current Problem

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Even though a wide variety of assistive technology tools and devices are available in the marketplace, many students with visual impairments (that is, those who are blind or have low vision) have not yet benefitted from using this specialized technology (Abner & Lahm, 2002). An Illinois survey of the use of assistive technology by elementary and secondary students with visual impairments reported that students are not receiving the experiences with assistive technology that support successful participation in the curriculum (Kapperman, Sticken, & Heinze, 2002). The findings of that study pertained specifically to students with visual impairments who were academically oriented readers (that is, those who read braille or large print) and, therefore, could have been especially inclined to have benefitted from training in assistive technology. The study also indicated that "60% of the students who, in the authors' judgment, could benefit from the use of assistive technology were not given the opportunity to use it" (Kapperman et al., 2002, p. 107).

The results of a recent analysis of a nationally representative federal survey on the use of assistive technology (Kelly, 2009) indicated that the situation in Illinois paralleled the current national status of these students. Less than half the academically oriented students with visual impairments in the United States were using assistive technology during each of the three periods measured by the Special Education Longitudinal Study (SEELS). Specifically, across all three waves of data, an average of only 36% of the elementary and middle school students who were visually impaired had the opportunity to use assistive technology.

Kelly (2009) also examined the significance of many contextual factors that may or may not have contributed to the use of assistive technology. For example, she found that children who had parents that attended any type of parent meeting, special program, or training session for families with children with disabilities were significantly more likely to use assistive technology, and that placement in a residential school was a significant predictor of the use of assistive technology.

Contextual factors that are important to understanding the use of assistive technology by high school students with visual impairments may also include the measurement of preparation for post–high school outcomes. As Crudden (2002) explained, the majority of people with visual impairments are unable to sustain competitive employment. The potential relationship between the use of assistive technology and post-high school outcomes (that is, employment or postsecondary training) is worthy of further investigation.

Now that the estimate of the use of assistive technology by U.S. elementary and middle school students with visual impairments has been established, the study presented here assessed the use of assistive technology by high school students with visual impairments through a secondary analysis of the National Longitudinal Transition Study-2 (NLTS2). An investigation of many contextual factors that may or may not have contributed to the use of assistive technology was also replicated with the NLTS2 database. The predictors included those that Kelly (2009) found to be significant, as well as a measure of the likelihood of these high school students, who are about to make the transition to adulthood and post–high school outcomes, eventually getting paid jobs.

To investigate these issues, the study addressed the following research questions using the NLTS2 database as the data source:

1. What percentage of high school students with visual impairments in the United States who were academically oriented readers using large print or braille media and thus who were most inclined to have benefited from the use of assistive technology with academic materials were using assistive technology during the three periods under study (2000–01, 2002–03, and 2004–05)?
2. How did the prevalence of the use of assistive technology by high school students with visual impairments change or not change during the three measured periods?
3. How did the trajectories of the use of assistive technology by the high school students with visual impairments vary according to parental involvement, school placement, and the likelihood of eventually obtaining paid jobs?

Method

Data source

The federal government sponsored the collection of data between 1999 and 2010 to assess the 1997 Individuals with Disabilities Education Act (IDEA). To complete this assessment, seven surveys were commissioned. Two longitudinal child outcome surveys were SEELS and NLTS2, much of the structure and content of which are identical. This secondary analysis did not involve any direct contact with participants and was therefore exempt from approval by an institutional review board.

The data collection time line was determined by the federal entities that conceptualized and implemented the survey. The NLTS2 survey began in 2000 and concluded in 2010. Specifically, data from Wave 1 (2000–01), Wave 2 (2002–03), and Wave 3 (2004–05) were included in the study. No data were collected during the 2003–04 year; one year was skipped for the validity and reliability of the data collection process. The students were stratified by disability category to ensure that the sample of students who were included in the NLTS2 database would be nationally representative.

Participants

The NLTS2 youths with visual impairments who were assessed in the study were aged 13–16 during Wave 1 of NLTS2. The participants aged five years during the overall period, and those who were older than 18 during the second and third waves aged out of the study.

The youths who were included in the first research question (Wave 1, $n = 80$; Wave 2, $n = 40$; and Wave 3, $n = 90$) were identified as academically oriented on the basis of the parent-reported measures that the youths read braille or large print (see Kelly, 2009). Those who were included in the other three research questions ($n = 940$) were visually impaired with and without other more severe disabilities (see Kelly, 2009). Sample sizes were rounded to the nearest 10 according to the Institute of Education Sciences publication policy for restricted-use data.

Measures

The binary outcome measure was the use of assistive technology, and the three covariates assessed by the other three research questions were parental involvement, school placement, and the likelihood of a youth eventually getting a paid job. All measures were derived from telephone interviews and mail surveys completed by parents of students with visual impairments except the measure of school placement, which was provided by the school staff.

The assistive technology outcome measure asked the following yes-or-no survey question during each wave, "Does the youth use assistive technology, such as voice synthesizers or software, to enlarge the size of the print on the computer screen?" This question was

Table 1
Percentage of students who used assistive technology by wave.

Wave	Percentage	*SE*
1	43	.04
2	54	.04
3	29	.11

asked only of those parents who confirmed that their children were visually impaired. Therefore, for the purpose of the study presented here, *assistive technology* referred exclusively to the particular type of high-tech assistive technology that is used by youths who are blind or have low vision to access print.

The parental involvement covariate also asked a yes-or-no survey question during each wave: "In the past two years, have you or has anyone in your family participated in any parent meetings, programs, or training sessions for families of students with disabilities?" The school placement covariate asked a yes-or-no survey question only during Wave 1. The measure described whether the students with visual impairments attended a residential school or not.

To assess the likelihood of the participants eventually getting a paid job (hereafter, likelihood of paid work), the parents were asked to respond to a Likert-type question, "How likely do you think it is that [youth's name] eventually will get a paid job? Do you think he or she definitely won't = 1, probably won't = 2, probably will = 3, or definitely will = 4?" This question was asked during each wave.

Data analysis

The data were weighted using normalized weights to provide the nationally representative results that this database is capable of generating. The data analysis involved a descriptive analysis to address the first research question and to provide an estimate of the percentage of youths who were using assistive technology during each wave.

To address the second and third research questions, I used multilevel modeling and generated descriptive statistics for each of the measures involved in multilevel modeling. Specifically, these statistics included the use of and rate of change in the use of assistive technology as a function of certain contextual factors, including parental involvement, school placement, and the likelihood of paid work. Data analysis strategies accounted for the attributes of a binary outcome with the binary logistic application of multilevel modeling (Raudenbush & Bryk, 2002).

Results

Of the U.S. high school students with visual impairments in the study who were at or near grade level, used large print or braille media, and hence were inclined to have benefited from the use of assistive technology with academic material, an average of 42% were using assistive technology during the three waves (see Table 1). The descriptive statistics generated for each measure involved in the multilevel modeling analysis are displayed in Table 2. The multivariate analysis showed that the change in the use of assistive technology during the three waves was not statistically significant

Table 2
Descriptive statistics from the multilevel modeling analysis.

Variable	*M*	*SD*	Minimum	Maximum
Use of assistive technology	.51	.50	0.00	1.00
Parental involvement	.38	.48	0.00	1.00
School placement	.24	.43	0.00	1.00
Likelihood of paid work	3.28	1.01	1.00	4.00

Table 3
Multilevel modeling log-odds and odds ratios by variable.

Variable	Research question	Log-odds	Odds ratios
Wave (change in the use of assistive technology)	2	0.004	1.004
Parental involvement	3	0.321*	1.378
School placement	3	0.604*	1.829
Likelihood of paid work	3	0.398*	1.489

* $p < .05$.

($p = .944$). Students were nearly equally as likely to use assistive technology regardless of the particular wave (see Table 3).

Parental involvement ($p = .004$), school placement ($p = .027$), and the likelihood of paid work ($p = .002$) were all statistically significant predictors of the use of assistive technology. High school students who were visually impaired whose parents participated in any parent meetings, programs, or training sessions for families of students with disabilities were approximately 1.4 times more likely to use assistive technology than were those whose parents were not involved. High school students with visual impairments who attended residential schools were approximately 1.8 times more likely to use assistive technology than were those who did not attend such institutions. High school students who were visually impaired and had parents who reported a higher likelihood of their children eventually getting a paid job were approximately 1.5 times more likely to use assistive technology (see Table 3).

Limitations

The study was limited to a secondary analysis of an existing federal database. Those who analyze existing databases are unable to adjust the questions asked or other features, such as the fact that parents were asked a lot of the questions that contributed to the present study. Although the validity of parent-reported survey data has been well documented, other reliable data sources (such as teachers of students with visual impairments) could be just as fitting.

Conclusion

The study found that across the three waves of data, an average of only 42% of academically oriented high school students with visual impairments were using the high-tech assistive technology analyzed in the study. This finding concurs almost precisely with that of Kapperman and colleagues (2002) and Kelly (2009). Again, it has been established with a nationally representative sample that less than half the students with visual impairments were using the assistive technology that they needed to be using. It can now be added that this finding applies to U.S. students with visual impairments regardless of their primary or secondary grade levels.

It must also be noted that there are many similarities between the findings of this longitudinal analysis of the use of assistive technology by high school students with visual impairments and Kelly's (2009) findings of the longitudinal analysis of the use of assistive technology by elementary and middle school students with visual impairments. Both studies found that there were no significant changes in the use of assistive technology during the three waves of data collection, and that having involved parents as well as school placement in a nonitinerant setting significantly predicted the use of assistive technology.

Yet again, these findings bring attention to the concept that "children with visual impairments fall further behind their sighted peers every year that they continue not to use assistive technology to experience the benefits of electronic information sharing" (Kelly,

2009, p. 478) and further validate the merits of parental involvement (Hancock, Wilgosh, & McDonald, 1990). In addition, Kelly (2009) and the present study found that school placement is a salient factor in determining the likelihood of both primary and secondary students with visual impairments using assistive technology. The inherent characteristics of particular service delivery models likely contributed to this finding. Residential school students with visual impairments were significantly more likely to use assistive technology than were those students with visual impairments placed in nonresidential schools. School placement in nonresidential schools presents itself as another underlying challenge in the widespread use of assistive technology among students with visual impairments.

More favorably, the study found that the use of assistive technology significantly predicted the likelihood of youths eventually getting paid jobs. This finding is even more pertinent for high school students with visual impairments who are about to make the transition to adulthood. Persons who are visually impaired who maintain competitive employment have presumably overcome a multitude of significant barriers. Wolffe and Candela (2002) addressed these barriers in an analysis of employers' comments about workers with visual impairments. More than 30% of the comments were related to the importance of these workers using assistive technology in the workplace to be able to perform their jobs competitively. The evident connection between the use of assistive technology and post–high school outcomes (employment or postsecondary training) is worthy of more attention. In this era of digital information sharing, too much is lost by not completely addressing what has become an increasingly better-defined problem—the gap between those with access to information technology and those without it.

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