# Research Report

## Practices of Assistive Technology Implementation and Facilitation: Experiences of Teachers of Students with Visual Impairments in Singapore

*Meng Ee Wong and Janet S. P. Law*

Assistive technology is defined by the Individuals With Disabilities Education Improvement Act (IDEIA) of 2004 as "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of a child with a disability" (IDEIA, 2004). This broad definition includes devices and software that are beneficial in supporting the instruction of students with disabilities in special education (Duhaney & Duhaney, 2000). General benefits of assistive technology are evident in the literature (Alper & Raharinirina, 2006). Benefits of assistive technology are also reported for students with visual impairments (Abner & Lahm, 2002; Kelly, 2009).

IDEIA also describes the need for assistive technology services, which it describes as "any service that directly assists a child with a disability in the selection, acquisition, or use of an assistive technology device" (IDEIA, 2004). Services include evaluation; purchasing; selecting, designing, or adapting; coordination of device use or services; device training; or expanding the availability of assistive technology.

The number of assistive technology devices that have the potential to empower individuals with disabilities has increased in recent years. Kintsch and DePaula (2002) found that even when the devices are purchased, success with these technologies is questionable because individuals with disabilities and their caregivers are unable to integrate the devices into their daily routines. Evaluating the technological needs of individuals with disabilities and identifying the appropriate assistive technology items that will increase their functional capabilities in daily life require guidelines and models (Lee & Templeton, 2008). Broadly, consideration of devices includes a process of evaluation, acquisition, personalization, service coordination, and training (Bausch, Quinn, Chung, Ault, & Behrmann, 2009).

Three major points are evident. First, the definition of *assistive technology* is diverse and multifaceted. Second, there is a process by which to navigate through assistive technology consideration. Third, providing assistive technology services is best facilitated by collaboration among professionals (Watts, O'Brian, & Wojcik, 2004). Increasingly, parents are also reported to influence assistive technology adoption and usage (Bausch & Ault, 2008; Hourcade, Parette, & Huer, 1997). Yet given the general definitions of *assistive technology* and *assistive technology services,* broad interpretation is reported to pose challenges for assessment, selection, training, and service provision (Marino, Marino, & Shaw, 2006; Watts et al., 2004). Assessing and navigating among assistive technology considerations are therefore indispensable. Ultimately, deciding on the most beneficial device is not straightforward but involves a process of assessment. Beigel (2000) posits that assessment involves three strands: learners, environments, and technology.

### Assessment

The purpose of assessment is primarily to provide data for team decision making (Stiggins, 2001), with the goal of achieving student attainment of specific skills and knowledge (Individuals with Disabilities Education Act [IDEA], 1999; Presley & D'Andrea,

 

2009). Formative assessment helps teams determine learning styles of students over a period of time (Hobson, 1997). These assessments also need to reflect a post-recommendation assessment of a device to determine its effectiveness. Ultimately, assessment models must demonstrate a direct link to learning objectives and student outcomes (Silverman, Stratman, & Smith, 2000). Assessment models need to have technical adequacy sufficient to achieve valid and reliable decisions. Technical adequacy may also be achieved by using multiple assessment tools to meet specific needs. The avoidance of bias across respondents and contexts is necessary (Watts et al., 2004).

The student should be central in the process of assessment (Alper, Ryndak, & Schloss, 2001) and be part of the decision-making team involved in: the inquiry, the tools, and activities to be used to gather data, the decision-making process, and the development of the resulting intervention (Stiggins, 2001).

The practices listed above are necessary for providing good practice with regard to the provision of assistive technology for end users. Yet it is not a foregone conclusion that such practices are used. This paper reports on a study that examined special school teachers and their experiences with the assistive technology–assessment process in Singapore. In an earlier study, by Wong and Cohen (2011), although teachers unequivocally recognized the benefits of assistive technology, preliminary findings indicated gaps and disconnection in assistive technology knowledge and skills among teachers. Assessment was not mentioned in the study (Wong & Cohen, 2011). This paper reports how teachers are assessing and making decisions related to assistive technology led by the following research questions:

> What decision-making practices relative to assistive technology do teachers employ in their work with students? Who is involved in making these decisions? How are needs, devices, and services considered in such decision making?

These questions are fundamental but important, since many professionals working with persons with disabilities are unfamiliar with assistive technologies, lack knowledge in obtaining and funding them, and are missing an effective process for matching a person with a device (Scherer & Cushman, 2002).

## Methods

With ethical clearance from the Nanyang Technological University Institutional Review Board, semi-structured in-depth interviews were carried out at the Lighthouse School, the only school for visually impaired students in Singapore. Following approval from the school's principal, four teachers of students with visual impairments volunteered and consented to participate. Follow-up interviews were scheduled to seek clarification. All participants taught students from a variety of elementary grade levels in different subjects. Three teachers in the age range of 30 to 39 years had taught for 2 to 4 years. The other teacher, in the age range of 50 to 59 years, had taught for 34 years. The senior teacher had secondary education and a certificate in education, while the 3 younger teachers had a diploma, a degree, or a post-graduate degree. Two also had training and experience in other fields—occupational therapy and information technology. All participants reported familiarity with computers and screen readers, screen magnification devices, portable notetakers, and video magnifiers.

An open-ended interview guide was developed to inquire as to how teachers considered assistive technology in their practice: How do you assess the assistive technology needs of your students? What processes does the school adopt in assistive technology consideration? Can you describe the decision-making process in

 

acquiring assistive technology for your students? To what extent do you collaborate with partners to support assistive technology needs? Additional questions were posed to elicit more in-depth responses. Interviews lasted between 90 and 120 minutes. Follow-up interviews were scheduled to seek clarification. Interviews were recorded and transcribed for coding using Nvivo. Through an inductive process of collapsing and narrowing the codes, themes were generated.

## Findings

The findings are summarized in four themes: making a decision, accessing assistive technology, working together, and increasing capacity.

### *Making a decision*

Findings showed there was an absence of any formal tool or instrument to guide assistive technology decisions. Instead, teachers reported that assessment decisions were made largely by observation, trial and error, staff suggestions, and student self-reports of difficulties experienced. They did whatever they knew best to assess the students.

These practices were also used in device selection, since decisions were made without sufficient joint consultation, consequences of which included device abandonment. On occasions in which discussions resulted, lack of adequate documentation from established processes led to difficulties in constructive deliberation, resulting in divided consensus and inconsistency of devices used. When considering screen reader options, making a choice between JAWS (Job Access With Speech), NVDA (Nonvisual Desktop Access), and the VoiceOver from Apple Mac resulted in difficulties in arriving at a collective decision.

### *Accessing assistive technology*

Participants reported that the school time table only allowed two hours of dedicated assistive technology content per week, which was insufficient to provide the preliminary familiarization necessary to introduce the technology to the children. Fundamental keyboarding skills were prerequisites and had to be imparted before the students could advance. Further, assistive technology lessons were taught separately and were not folded into subject lessons. This practice was traceable to the absence of a training and instruction curriculum. Further, a student's exposure to assistive technology depended on the competency of an individual teacher: one teacher might support one device; another might express doubt as to its utility. This disuniformity in practice resulted in a discontinuity in the potential of device usage. Without a well-planned and structured curriculum, students' learning outcome was limited to what the teachers knew.

### *Working together*

Generally, teachers reported that there were occasions of intercollegial collaboration on using devices. Although the relationship was informal, this collaboration still fostered the formation of a community of support in which colleagues could share practices and troubleshoot problems with each other. However, the informal nature of this collaborative relationship did not extend formally to other community agencies offering related services. Teachers admitted that working with other designated partners offering assistive technology services was organized on an individual arrangement rather than on a formal, institutional relationship. For example, teachers reported that there were at least two other community agencies offering assistive technology services, but that joint consultations were limited. In addition, parents were not an actively engaged resource. Although there were some parents who had little assistive technology knowledge and deferred to teachers for guidance, others were resourceful and kept abreast with assistive technology developments.

 

Teachers recognized greater partnership with parents, saying that informed parents had much to share. In the climate in which a team approach to assistive technology decision-making and support was advocated, the existing arrangement was not conducive to achieving optimum collaboration.

### *Increasing capacity*

Having considered how assessment featured in their work, teachers recognized the gaps of knowledge in how they evaluated assistive technology for their students. They acknowledged the need for greater professional development and for collaboration with knowledgeable others. One tangible solution was for an assessment guide or checklist to help teachers with the assistive technology consideration process.

## Discussion and recommendations

The lack of a process of assessment points to challenges experienced in assistive technology consideration, adoption, and training. Assistive technology considerations were not based on systematic assessment, but were derived from personal and professional influences. When deciding on similar and competing technologies such as which screen reader to adopt, challenges arose. The danger was when personal biases, rather than systematic processes of consideration, clouded judgment.

Contributing to the difficulty in decision making are the missing key partnerships with parents, colleagues, and specialists from community agencies. This weakens the potentially facilitating role of assistive technology services. The helplessness of teachers in making choices about assistive technology and how to introduce such materials into the curriculum points to the implications of teacher training and professional development. Obtaining assistive technology devices for trial use is one practice that could allay uncertainty and promote confidence among teachers about such technologies.

Findings also revealed a need for an in-school assistive technology team with collaborative partnerships consisting of parents and specialists from relevant agencies. Adopting an evidence-based assistive technology assessment framework is a critical priority. A complementing strategy is to foster stronger collaboration to build communities of assistive technology support and practice.

## Conclusion

Findings point to gaps in assessment, collaboration, and knowledge among teachers about assistive technology. One suggestion is for a general implementation form, such as that described by Bausch and Ault (2008), that would guide teams through a planning process of assistive technology implementation and would include elements unique to assistive technology consideration. This form would help to ensure activities related to assistive technology are completed. An assistive technology assessment and implementation guide would allow teachers to ensure the features associated with assistive technology consideration are addressed and would also introduce a process to be completed. The guide would also allow for the documentation of the consideration and provide a means for accountability. Further, when it is not always possible to secure direct service from an assistive technology specialist, a guide would allow teams to create an assistive technology plan, thereby reducing the constant dependence on specialists. Broad areas of consideration include student information, identifying a contact person, listing members of the implementation team, equipment information and tasks, details of training, device implementation, monitoring, and evaluation. Together, this could help teachers to consider the process systematically.

In addition, teacher training remains a core need. The National Institute of

 

Education, the sole teacher training institution in Singapore, trains all special educators. Content in visual impairment and assistive technology is not delivered as a dedicated course, but is introduced as part of a generic, 36-hour course on sensory and physical disabilities (Wong, 2014). Greater emphasis on assistive technology training at preservice, in-service, and professional development levels remains a platform on which assistive technology content needs to be included to improve teacher knowledge and practice in assistive technology support for students.

## References


Abner, G. H., & Lahm, E. A. (2002). Implementation of assistive technology with students who are visually impaired: Teachers' readiness. *Journal of Visual Impairment & Blindness, 96*, 98–105.

Alper, S., & Raharinirina, S. (2006). Assistive technology for individuals with disabilities: A review and synthesis of the literature. *Journal of Special Education Technology, 21*(2), 47–64.

Alper, S., Ryndak, D. L., & Schloss, C. N. (2001). *Alternate assessment of students with disabilities in inclusive settings.* Needham Heights, MA: Allyn and Bacon.

Bausch, M. E., & Ault, M. J. (2008). Assistive technology implementation plan: A tool for improving outcomes. *Teaching Exceptional Children, 41*(1), 6–14.

Bausch, M. E., Quinn, B. S., Chung, Y., Ault, M. J., & Behrmann, M. M. (2009). Assistive technology in the individualized education plan. *Journal of Special Education Leadership, 22*, 9–23.

Beigel, A. R. (2000). Assistive technology assessment: More than the device. *Intervention in School and Clinic*, *35*(4), 237–243.

Duhaney, L. M. G., & Duhaney, D. C. (2000). Assistive technology: Meeting the needs of learners with disabilities. *International Journal of Instructional Media. 27*(4), 393–401.

Hobson, E. H. (1997). Forms and functions of formative assessment. *Clearing House, 71,* 68–70.

Hourcade, J., Parette, H. P., & Huer, M. (1997). Family and cultural alert! Considerations in assistive technology assessment. *Teaching Exceptional Children, 30,* 14–51.

Individuals with Disabilities Education Act (IDEA). (1999). 34 C.F.R. 300.

Individuals with Disabilities Education Improvement Act (IDEIA). (2004). Amendments to Public Law No. 108-446, §602, USC 1401. Retrieved from http://idea.ed.gov/download/statute.html

Kelly, S. M. (2009). Use of assistive technology by students with visual impairments: Findings from a national survey. *Journal of Visual Impairment & Blindness, 103,* 470–480.

Kintsch, A., & DePaula, R. (2002). A framework for the adoption of assistive technology. In C. Bodine (Ed.), *Proceedings of the SWAAAC 2002: Supporting learning through assistive technology* (pp. E3, 1–10). Winter Park, FL: Assistive Technology Partners.

Lee, H., & Templeton, R. (2008). Ensuring equal access to technology: Providing assistive technology for students with disabilities. *Theory into Practice*, *47*(3), 212–219. doi:10.1080/00405840802153874

Marino, M. T., Marino, E. C., & Shaw, S. F. (2006). Making informed assistive technology decisions for students with high-incidence disabilities. *Teaching Exceptional Children*, *38*(6), 18–25.

Presley, I., & D'Andrea, F. M. (2009). *Assistive technology for students who are blind or visually impaired: A guide to assessment.* New York: AFB Press.

Scherer, M. J., & Cushman, L. A. (2002). Determining the content for an interactive training programme and interpretive guidelines for the Assistive Technology Device Predisposition Assessment. *Disability & Rehabilitation*, *24*(1–3), 126–130.

Silverman, M. K., Stratman, K. E., & Smith, R. O. (2000). Measuring assistive technology outcomes in schools using functional assessment. *Diagnostique, 25*(4), 302–326.


 

Stiggins, R. J. (2001). *Student-involved classroom assessment* (3rd ed.). Upper Saddle River, NJ: Prentice-Hall.

Watts, E. H., O'Brian, M., & Wojcik, B. (2004). Four models of assistive technology consideration. *Journal of Special Education Technology, 19*(1), 43–56.

Wong, M. E. (2014). Supporting pre-service educators in assistive technology integration: A curriculum model. In D. Combs (Ed.), *New research on assistive technologies: Uses and limitations* (pp. 97–115). New York: Nova Science Publishers.

Wong, M. E., & Cohen, L. (2011). School, family and other influences on assistive technology use: Access and challenges for special school students with visual impairments in Singapore. *British Journal of Visual Impairment. 29*(2), 130–144. doi: 10.1177/0264619611402759

***Meng Ee Wong, Ph.D.,*** *assistant professor, Early Childhood & Special Needs Education, National Institute of Education, Nanyang Technological University, 1 Nanyang Walk, Singapore 637616; e-mail: <mengee.wong@nie.edu.sg>.* ***Janet S. P. Law, M.Ed.,*** *research associate, Early Childhood & Special Needs Education, National Institute of Education, Nanyang Technological University, Singapore; e-mail: <lawjanet@yahoo.com>.*

 