

## BRIEF REPORTS

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# Access and Challenges of Assistive Technology Application: Experience of Teachers of Students with Visual Impairments in Singapore

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### ABSTRACT

**Purpose:** *Assistive Technology (AT) enables persons with visual impairments to lead independent and productive lives. Teachers play an important role in facilitating education for students with visual impairments. This study describes the experiences of AT use by teachers of students with visual impairments in Singapore.*

**Method:** *6 teachers were recruited from the only school for the blind in Singapore. In-depth interviews were conducted in order to understand beliefs, practices and needs regarding the use of AT. The teachers were asked: how they learnt AT, where they acquired the knowledge, how they used AT in their teaching, what were the challenges or successes experienced. Qualitative thematic content analysis was used to evaluate the transcriptions.*

**Results:** *There was unequivocal recognition that AT is a facilitator for accessing information and improving the quality of life for students with visual impairments. At the same time, there were indications of significant gaps and disconnection in AT knowledge and skill among teachers. A noteworthy feature was the use and teaching of AT being driven by a teacher champion. Other focal areas include teaching of Braille and AT, whether AT is to be taught as a curriculum or enrichment subject, and whether the integration of AT is overlooked. The findings also point to limitations in resources, and inadequacies in pre-service training and professional development.*

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**Conclusion:** *Knowledge of AT is inadequate and its use by teachers of students with visual impairments is inconsistent. AT needs to be viewed as a complementary tool to aid teaching; not as something separate and a competitor to Braille. These gaps can be addressed by improving pre-service, in-service and professional development courses for teachers.*

**Key words:** *Assistive technology use, accessibility, student with visual impairment, special education, Singapore, integration of assistive technology*

## INTRODUCTION

Despite the positive reports about assistive technology (AT) enhancing the lives of persons with disabilities, access to these technologies remains limited. The World Health Organisation estimates that only 5% -15% of people who require and receive AT are in low-income and middle-income countries (WHO, 2015). Yet, receiving the devices is not the end of the provision. Use of AT involves assessment, selection, fitting, training, and follow-up support (Borg et al, 2009). When integrated with teaching, technology increases the efficiency of the educational process for educators and promotes learning for students with disabilities. Technology in the classroom alone is not significant; rather, how educators use the technology is critical (King-Sears & Evmenova, 2007).

### Literature Review

In this study, AT refers to the high-tech devices and software, such as text-to-speech devices, CCTVs, screen readers, and computer screen enlargement software. The power of AT to be an enabler in the lives of students with disabilities is unequivocally reported in the literature (Abner & Lahm, 2002; Mull & Sitlington, 2003; Weikle & Hadadian, 2003; Alper & Raharinirina, 2006; Okolo & Bouck, 2007). Yet, it is reported that individuals with disabilities are not benefiting fully from AT devices at home and at school. Lack of awareness, education of professionals and integration of assistive technology in schools were cited as barriers (Alper & Raharinirina, 2006). According to the literature, the majority of teachers of students with disabilities consider their knowledge of AT to be inadequate (Lee & Vega, 2005; Smith et al, 2009).

With regard to teachers of students with visual impairments, Parker et al (1990) reported that two-thirds of the respondents assessed themselves as having "poor" or "non-existent" knowledge of AT devices for the visually impaired.

Similar findings were corroborated by the study of Edwards and Lewis (1998), wherein lack of knowledge was given as the reason for not using assistive devices. Abner and Lahm (2002) reported that 51% of the surveyed teachers of students with visual impairments were not competent to teach their students how to use AT, while 62% of the teachers saw themselves as novice or apprentice users of the devices. In another study, Kapperman et al (2002) reported that 72% of the teacher respondents could not participate in the research due to lack of knowledge. While the trend has improved somewhat in recent years, the evidence remains discouraging. The study of Zhou et al (2011) on teachers of students with visual impairments reported deficits in 74.3% of AT competencies, while 57.4 % were not confident about using AT to teach their students. The apparent limitations in knowledge and skill in using AT that emerges from literature raises the question: how does AT feature with teachers of students with visual impairments in Singapore? This is important given that in 2011 the author of the current study reported that students possessed only little or basic AT knowledge, and experienced inconsistency with regard to AT-related instruction in school. The primary research questions are:

1. What are the barriers and challenges in using AT by teachers of students with visual impairments?
2. What are the AT-related classroom pedagogies, beliefs and practices of these teachers?

Findings from this study seek to inform gaps in current AT practices by teachers, and offer suggestions for improvement. This is particularly pertinent as research reports that special education teachers who consider themselves comfortable with AT, value its use in instruction over those who consider themselves novice users (Seevers et al, 2001). Furthermore, the success that students with disabilities have with AT is related directly to the AT knowledge and skills of special education teachers (Judge, 2008).

## **Context**

In Singapore, 20 special education schools take care of the education of children with disabilities. The Lighthouse School is a special school for primary-age students with visual impairments. The school adopts the general curriculum which is taught in primary schools in Singapore. The primary medium of instruction is Braille, while the use of large print, close-circuit-televisions (CCTVs)

and magnifiers are encouraged for students with low vision. Most classrooms have only 1 computer and there is a central computer lab with 8 computers. For students with visual impairments who choose to be educated in mainstream schools, support is dependent on voluntary registration with social services that are offered by the Singapore government. After completion of the Primary Six Leaving Examination (PSLE), students have the option to enter one of four mainstream secondary schools that cater to students with visual impairments, where they are supported by resource teachers (Wong & Chia, 2010).

Currently, for pre-service special education training, educators of students with special needs enrol in the Diploma in Special Education (DISE) course offered at the National Institute of Education (NIE), the sole teacher training institution in Singapore. This 1-year full-time Diploma offers introductory courses in understanding various disabilities, principles in educational psychology, curriculum content, assessment and intervention methods, and a 10-week practicum component. 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).

## **METHOD**

### **Participants**

Six teachers from the Lighthouse School were recruited as participants on the basis of convenience sampling. They were the only teachers working with children with visual impairment who were available and who consented to participate in the project. The newest member of the teaching staff had joined the school only 1 year earlier, while senior teachers had up to 30 years of experience. Five teachers possessed either a Certificate or Diploma in Special Education from the NIE, while two teachers had undergraduate qualifications either in special education or visual impairment. The primary medium of instruction is Braille, while the use of large print, CCTVs and magnifiers are encouraged for students with low vision.

### **Procedures**

Semi-structured qualitative interviews were conducted with the participants. The protocol consisted of open-ended questions that were designed to investigate the issues at hand and expose new areas for future investigation. The interview

questions sought to understand when the teachers used AT in school, under what circumstances, who taught them the skills and whether they were able to use the devices. All the names used are fictitious and relationships are modified where necessary, to protect respondents without altering content.

The research procedures were reviewed and approved by the Human Ethics Review Committee at the NIE. A cover letter, explaining the aims of the study, was sent to the principal of the Lighthouse School who is a project collaborator and endorsed the research.

Analysis of the data was carried out concurrently during fieldwork, to ensure that questions were relevant and appropriate, owing to new insights and emerging results. Transcriptions of the semi-structured individual interviews were analysed using the approach of Miles and Huberman (1994) to qualitative research. The themes from the interviews centred on the content of the questions, and sub-themes were discovered, constructed and confirmed to the themes presented in the section that follows.

## RESULTS

The findings are presented as 4 themes: Teacher Competencies; Teacher Champion; Braille versus AT - Curriculum or Enrichment; and, Resource Limitations.

### a) Teacher Competencies

The range of skills, knowledge and competencies that the teachers demonstrated were diverse. Firstly, teachers' perspectives of AT were broad. General educational software such as grammar and maths teaching software were understood to mean AT. Some teachers also believed that the use of internet websites with in-built enlargement features, such as the BBC website, constituted AT use. For those who understood the broad definition of 'assistive technology', low and medium technologies were familiar devices. High-tech devices were technologies that were heard of, but many did not have a working knowledge of the equipment. At the same time there were also teachers who had no clue what the devices were, let alone how to incorporate them in their teaching. The following comments illustrate this:

*"I have this thing in the room, but I don't know what is the gadget or equipment...I'm not familiar with that assistive device... I don't know....Actually I haven't used it"*  
(Gene).

It turned out that the “thing” was a CCTV.

*“I go to the BBC website which has a lot of activities. The students find it interesting, they are willing to try. For low vision they just go very close to the screen. When I first introduced the internet, I helped with navigation. They all say ‘can I try’, so I say ‘ok’. They say ‘teacher, put the cursor here’. So they will know the cursor is in the middle. They will try to navigate on their own. BBC has their own magnification built into the website” (Victoria).*

But not all websites have in-built magnification. Without AT to access commercial products, there are apparent limitations as Mary, an English teacher with about 30 years of teaching experience shared:

*“We actually bought some very good grammar software but the children can’t read because there are no features for the blind, unless we sit next to the child, and then we just go through using our mouse, and then they give us the answer, then we say ok, correct or wrong” (Mary).*

The varied understanding of AT encompasses a wide range of technologies. There was greater familiarity with more commonly used equipment in the classroom such as table lamps and photocopiers for enlarged materials, a similar trend reported by Wahl (2004) and Lee and Vega (2005). Interestingly, where mainstream educational software was also understood to be using AT, teachers did not make specific mention of using screen readers or magnifying software to bridge the otherwise inaccessible nature of the software designed for sighted users. There was greater lack of knowledge and its application regarding technologies most specific and relevant to the needs of students with visual impairments. This is consistent with the findings of Zhou et al (2011). Likewise, the disconnect between ICT and AT was more apparent when teachers were asked specifically about using AT in their teaching. Teachers were generally diffident about their skills and competencies regarding AT. Candid comments include:

*“I am not very computer savvy, I’m IT illiterate” (Carol).*

The designated teacher of technology in school, James, remarked:

*“I only have limited knowledge. I try my best... I’m running the whole computer system here. I still need help. Sometimes, I needed help but no one to go to, very frustrating”.*

With skills and knowledge so disconnected, how then are students receiving instruction and the use of AT?

Carol explained:

*“Most students have very basic keyboard skills. Sometimes they will come for writing, word processing, and sometimes they will just go to the website but very minimum, its not part and parcel within the classroom, the teaching of AT is very ad hoc”.*

Victoria, who teaches the upper primary students, shared:

*“Well, because I usually get the higher level children in (primary) P4, 5 or 6, so some of them already have computer skills - either they are exposed by previous teachers or sometimes I introduce it to them. Because I am doing science with them, I go to the computer to surf the internet for information or to do some activity”.*

As previously discussed, given the individual teacher’s understanding and skills related to AT and ICT, what was actually taught was subjective. Victoria explained further how students received instruction:

*“Some of them are self-taught. They get help from friends, go to websites all alone and then they experiment through trial and error. Then there are those who are introduced by their teachers, because their teachers are also visually impaired. For one intelligent and inquisitive boy, the teacher gave him the website and then he explored and learnt himself. For those who are very interested in computers and when they hear about the software from friends, they will on their own download and try for themselves. But not all students are technology or computer savvy”.*

Victoria then explained the resources she turned to for help on assistive technology:

*“For JAWS (Job Access With Speech) and Zoom Text, I will go to James. Anything with visual impairment then I will normally ask James, because he knows more of IT. Other than that, normally I solve computer problems on my own, go to internet and find out more. That’s how I come across all those lesson plans on JAWS, how to teach; we Google and then we get it, so oh....this is great. I download the materials, read it, decide what is suitable, if I understand it, impart it to the students and together we learn. Basically that’s how I get all my knowledge”.*

It is expected that a teacher with a visual impairment would be naturally more predisposed towards AT. Interestingly James, who is visually impaired and was cited as a resource for JAWS, admitted:

*“I don’t know much about JAWS, I depend on another boy to help me, but I know about Zoom Text and CCTVs”.*

## b) Teacher Champion

While knowledge and skills in AT are generally lacking among teachers in the school, there are also individuals who emerge as champions for AT. Teacher champions support their students to acquire basic skills, and stand out because they are themselves not formally trained. They are self-taught and rise from the ranks with a mission: to see that their students will benefit from AT and will themselves initiate subsequent learning and growth. These champions also go beyond the hardware and software, advocating for ideas to be shared with colleagues, parents, and school leaders for greater adoption. The teacher champions of AT epitomise the qualities of a champion for innovation as described by Howell and Boiesd (2004), "Champions, individuals who informally emerge to actively and enthusiastically promote innovations through the crucial organisational stages, are pivotal to the successful implementation of an innovation".

Mary is an example of a teacher champion of AT. An English teacher with a visual impairment, she is a Braille user. Mary describes herself as untrained and only possessed of limited knowledge in IT and AT, having acquired her skills through self-discovery and friends.

*"You know we have our mind set, we don't need computers...being the older generation, so I think that's not right as a teacher. So I think ok, its time for me to pick up computer skills. My friends helped me a lot and some of my colleagues too. So they showed me how to use a lot of things so I just pick it up informally. My friends will come to my house and they will teach me what I need to learn. For example email, Windows and screen readers. Now I can do quite well after some encouragement and I'm happy!"*

When she is stuck, Mary has a network of supporters who help her outside school.

*"Usually my friends, they are very good. So if I am stuck, I will call my blind friends who are very good using the screen reader. They will teach me over the phone and the problem usually will be solved. So that's how I learned, because I haven't gone through a formal training."*

Without formal classes in AT, Mary took the initiative to introduce computers and screen readers to her students. To start with, she designed a simple curriculum using screen reader to teach typing in order to familiarise her students with the keyboard. This was incorporated into her English class, with the students finding word meanings via the internet. A favourite website is: <http://www.wordweb.com>. For more advanced classes, Mary dictated sentences or passages from a

book and the students would type these on the computer. She also had her class transcribe Braille texts to soft copy as a typing exercise. Her plan was to have seniors in the school type short stories for the juniors. The creative way in which Mary combined English classes with the use of AT had raised the awareness of technology among her students. Mary had designed an informal curriculum where she differentiated the teaching of AT from basic keyboarding skills to an interactive lesson of writing, vocabulary and dictation using AT. Without this opportunity, many of the students could go through school with little exposure to the potential of AT.

*“I use the computer to look up word meanings, using the net, using online dictionaries. Then I think the children will learn faster. Because we only have an old set of Braille dictionary but that’s not sufficient, so going to the net to look for meanings will be better. But before going to the net, the children must learn how to key in words, so keyboarding skills is fundamental. I try to incorporate keyboarding skills with looking up word meanings...also as part of my English class in teaching vocabulary”* (Mary).

Depending on the level of ICT and AT skills of the students, Mary involved students in different grades to work collaboratively.

*“Actually what I did is that I made the senior students key in their own composition and they have their own file, so every time they go into the computer, they just open their file, then they can get to their work. But I also get younger students to come in to read their seniors’ compositions too. So that is the former group who know keyboarding skills already to do the typing and the younger ones to practice navigating around the document. For the primary ones, I brought them to the computer lab and introduced the screen reader to them. They were very excited they could key in some simple words. Because we managed to spend about a week, the children knew all the letters so they could key in the words by the end of the week. Then I taught them how to use the arrow keys and the control keys, so after keying in they can listen to the words that they have keyed in for themselves...and the children are very happy, excited, because they are learning something new”* (Mary).

Mary’s competency in AT developed from her personal needs. Building from this knowledge, she championed passionately to incorporate the use of AT for her students in the curriculum. However, this knowledge needs to be built upon and shared with the other staff, and not limited only to the students who are in Mary’s class. Moreover, a single champion will

not be able to effect systematic changes by working alone (Fixsen et al, 2005). Professional development is critical, not only for single champions but also for the collective staff. There is the potential for introducing a collaborative apprenticeship model to share the knowledge (Glazer et al, 2005) and to transform such teacher champions to link agents to yield greater organisational change (Havelock & Hamilton, 2004).

### **c) Braille versus AT – Curriculum or Enrichment?**

The school has a strong conviction that Braille is the foundation for literacy. This philosophy which guides how Braille education features in the school curriculum cannot be undermined. One common view expressed is the importance of securing Braille before assistive technology is introduced.

*“You see some of the Primary 1 children have some learning difficulties. They have difficulties coping with Braille alone. Some of them already find it hard to master Braille. They take longer time to learn - because of that we need to mediate, we need to give one-to-one personal attention to those who need Braille first, until they are proficient in Braille, then we can introduce other technology for them” (James).*

When asked about the feature of audio or electronic books to complement Braille in teaching literacy, the response was:

*“There are audio or electronic books, AT can help but still they listen, then what? They will still need to know the words through Braille, how words are formed. What you get is only audio input. Then your word formation needs to be good. When it comes to writing and spelling - if they only hear and not understand how words are expressed, how will they spell? Reading and writing goes together. Braille is an important part of literacy” (James).*

Beyond the debate of Braille and AT to deliver literacy is the need to ensure that academic fundamentals are first met, as exemplified in this response:

*“For the weaker students, we have to help them in class. We have to mediate their academic studies first before we can introduce computers. Because there is not enough curriculum time, they are very weak and very slow in following to keep up with the pace. We have to keep them after school to really do one-to-one teaching....now the syllabus is getting tougher, and more higher order thinking skills are required and so we are helping them to cope with their academic studies first. AT classes are conducted outside curriculum time, 2 p.m., 2.15p.m., then they will do Talking*

*Typer. For P6, the students will do lessons after they finish their PSLE. They have some time, then we will introduce JAWS to them, like the basic commands that they need to learn” (James).*

The issues raised here on Braille literacy and assistive technology reflect similar discussions among educators of students with visual impairments. While the literature strongly calls for the defence of and continued promulgation of Braille literacy (Rex et al, 1994; Spungin, 1996; National Federation of the Blind, 2009), there is the advancement of speech output and print magnification technology as competing modalities (Thurlow, 1988; Rex, 1989; Wong & Tan, 2012). With technology featuring prominently in 21st century living, the discussion continues as the boundaries are blurred with the overlap between approaches to the early literacy education of children with visual impairments and the new media literacies as they are enmeshed with the affordances of specific technologies (Alper, 2012).

How then can assistive technology be introduced in school, integrated as part of the curriculum or delivered as an enrichment class? These are issues teachers are confronted with in the expanded core curriculum (Hatlen, 1996; McDonough et al, 2006). Similar to the findings of Wolffe et al (2002), academic curriculum content takes priority over extra-curricular activities and it is evident where AT is positioned in the school curriculum. Comments included:

*“I see AT as an enrichment programme because they need more time spent on their studies during the curriculum time as it’s just not enough. Now and then we do one-to-one teaching because the weaker ones need the one-to-one, not like in mainstream school where they can have mass teaching... Most of the time, I find that we spend much time on the curriculum. We need IT, because the children need more time to study their academic skill and less time on ICT. Even we want very much to introduce AT but we couldn’t find the time. We go to CCA, and the kids cannot go back beyond 2.15 (p.m.), that is our school day. The transport comes at 2.15-2.30 (p.m.) ok, and then they fetch the kids and go home; we cannot make them stay slightly longer for all this kind of other enrichment programme like other schools, they can do till about 4 p.m. or 5 p.m.” (James).*

#### **d) Resource Limitations**

Where internal skills and competencies on AT were limited, efforts to deploy resources were faced with apparent challenges such as: (a) limited resources, (b)

knowing the funding options that are available, and (c) lack of expertise. The challenges in deploying resources, which included limited technology and lack of expertise, were revealed through these responses:

*“I told James who is in charge of computers in the school that we need a computer in the class itself. So it will help us, so that the children don’t have to wait to come to the computer room, so we can train the children in the class itself. I have a computer in my class but it cannot be used at all. We have requested for at least two more computers... they have already written to MOE so we are waiting for that... Usually, when new computers are bought, we are given the old ones... so we try to use the old ones with whatever software is there... there is only one computer and we have to take turns... now that’s also spoilt so we are waiting for the new ones” (Mary).*

*“We tried learning but we failed because we tried to get somebody to come but the person played us out... Actually we also wanted to get Agency X involved, they said they can train us and all that, but a lot of feedback from secondary schools was that they don’t know much. The students who went for the course told us those trainers are not blind themselves, so it’s very difficult. We still need someone to train us. Especially for us teachers you know” (James).*

## DISCUSSION

The state of AT use, skills and competence indicate that teachers of students with visual impairments have a highly variable and subjective understanding of assistive technology. The knowledge is generally basic and inconsistent across the school levels. Where low-, medium- and high-tech applications are available in the school, skills and competencies diminish as the technology and devices become more advanced. Where the high-tech ATs are able to effectively close the gaps for many, it is also technologies at this level that separate those who possess skill and competence from those who do not. As a result, teachers with visual impairments are viewed as the natural experts and proponents by virtue of intimate familiarity. Teacher champions quickly emerge from the ranks as sages, and shoulder the responsibility even though they are not formally trained but are motivated by passion. Where AT is generally embraced and recognised as an enabler, support for Braille remains a fundamental pillar for building literacy. The question then is, how to incorporate assistive technology in the school curriculum: as a core subject or as an enrichment activity. The outcome is a haphazard, ad hoc delivery of instruction that is uncoordinated. A conspicuous gap in the findings

is the lack of resources and training opportunities and professional development for teachers.

### **Recommendation**

The barriers and challenges that teachers faced while using AT in school, echo the themes emerging from the literature. While this had resulted in minimal and ad hoc delivery of assistive technology in the school, it had also shaped the pedagogies, beliefs and practices of teachers in relation to their teaching. As a result, students' experiences with assistive technology varied according to teachers' expertise, leaving room for much improvement.

Below are some key considerations to assist leaders and teachers in facilitating understanding and use of AT in classrooms for students with visual impairment.

### **Integration of Assistive Technology**

**The use of Braille as a historical legacy** - The senior management is resolutely dedicated to Braille and is cautious not to dilute the Braille literacy skills of students, to the point of understating the potential and adoption of AT. With ICT so pervasive in schools and society today, leadership cannot afford to be intractable to evolving change. Without leadership support, teachers are limited in skills and knowhow.

**Dual approach to Braille and AT literacy** - School-wide curriculum needs to re-examine how a dual literacy approach can be adopted to ensure that AT can be introduced without compromising the fundamentals of Braille literacy. This begins with a strengthening of the practice of learning media assessment for students.

**Core curriculum or enrichment subject** - Study on the inclusion of assistive technology as a critical feature of the curriculum or enrichment programme needs to be reviewed. Structured, coordinated delivery of assistive technology is imperative if it is to reach the students with predictable outcomes through an extended core curriculum.

**Confusion between AT and ICT** - There is confusion among teachers between AT and ICT and web educational packages designed for instruction. Misunderstanding of these applications gives teachers a false sense of content delivery, resulting in a gap between perceived and actual instruction delivered.

**Subject constraints** - As English is text based, it is seemingly more accessible for assistive technology. Teachers in other subject areas are less exposed to AT and hence overlook the potential that assistive technology is able to offer.

### **Professional Development**

**Training** - Where teachers with visual impairments are predisposed towards AT through personal use, it is not a foregone conclusion that they are competent with the diverse equipment, let alone possessed of innate knowhow to teach with the technology.

**Support** - Where knowledge and adoption of assistive technology is not yet pervasive, teacher champions are crucial advocates, though their efforts have limited impact when they are in the minority. Without collegial support and opportunities to brainstorm, benefits cannot multiply.

**Availability of technology** - Singapore is positioning itself as a highly technological society. The vision of the third Masterplan is that ICT should “enrich and transform the learning environments of our students and equip them with the critical competencies and dispositions to succeed in a knowledge economy” (MOE, 2008). Yet students with visual impairments are taught in a special school with few technology resources. In the same spirit where the ICT Masterplan espouses ICT as an ubiquitous feature in education, it is imperative that special education and students with disabilities are not excluded from access to ICT through assistive technology.

## **CONCLUSION**

The investigation into the use of AT among teachers of students with visual impairments underscores the importance of the teacher’s role in facilitating access to learning through AT. How effectively this role is played out depends largely on how defined, comprehensive and effective is teacher pre-service, in-service and professional development in AT. Hence, AT cannot be neglected and seen as an individual or self-improvement task. Rather, it is critical to engage teachers, especially teachers of students with special needs, in continuous training in response to the evolving and rapidly transforming learning landscape. It should be a central vision, embraced by the system for training and development of special needs teachers. After all, it is the professional development of teachers that underpins their pedagogies, beliefs and practices, thereby affecting student learning outcome.

## Limitations

Since this study was limited to a small sample of 6 teachers of students with visual impairments, the findings cannot be generalised to other contexts. Recognising this limitation, the intention is to provide a rich and in-depth understanding of teacher experiences and perspectives of AT in Singapore. With time and ethical constraints, limited interviews of each participant limit the validity of the data (Lincoln & Guba, 1985). Although a more extensive research is needed to capture a broader range of teacher opinions, themes emerging from this study provide a starting point to understand the AT experiences and challenges of teachers of students with visual impairments in Singapore.

## ACKNOWLEDGEMENT

This paper refers to data from the research project 'From Beliefs to Practice: Students with Visual Impairments, Teachers and Their Perspectives on Assistive Technology' (OER 16/08 WME), funded by the Education Research Funding Programme, National Institute of Education (NIE), Nanyang Technological University, Singapore.

The views expressed in this paper are the author's own, and do not necessarily represent the views of NIE.

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