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<td>Source</td>
<td><em>Journal of Reading and Literacy, 1(1), 107-115</em></td>
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<tr>
<td>Published by</td>
<td>The Society for Reading and Literacy, Singapore</td>
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</tbody>
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Improving Literacy of the Visually Impaired in Singapore: Pre-, Post- and In-Between Literacy Considerations

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Abstract
This paper underscores the importance of a multi-prong approach to literacy when considering literacy needs of the visually impaired in Singapore. While acquisition of literacy is often considered as a single prong approach, there is a need to satisfy the pre-literacy; post-literacy and in-between literacy needs if persons with visual impairments are to have equitable access to information. Each of these three prongs is considered in turn focusing particularly on braille, alternative formats and access to such mediums of communication for the visually impaired. These are critical given that it is through multiple modalities that the visually impaired are able to access a diversity of materials. The absence of information in one modality may be available in an alternative format. The needs also extend beyond the young as with the prospect of an aging society looming, the elderly who are predisposed to visual impairment will need to be equipped with literacy skills.

Introduction
At the inaugural International Education Roundtable (IER), education ministers representing top performing school systems met to discuss how education systems can continuously improve to equip and skill youth to meet the fast changing and unpredictable future. As the global economy shifts from industrial-based to knowledge-based, so will there be a shift from education for a small elite group to education for all. Future jobs will demand not just basic, but a post-secondary education (Ministry of Education, 2009a).

In Singapore, human capital is not only Singapore’s single resource, but also the basis for survival and success. The Ministry of Education is keenly aware of this need and has a mission to equip citizens so that through education, the potential of every citizen is realized to fulfil personal aspirations as well as to contribute to the community and nation (Ministry of Education, 2009b). If education is the cornerstone by which human capital is built, literacy must then form the building blocks of this framework. What then is understood by literacy?

The United Nations Educational, Scientific and Cultural Organization (UNESCO) defines ‘Literacy’ as the ability to identify, understand, interpret, create, communicate, compute and use printed and written materials associated with varying contexts. Literacy involves a continuum of learning to enable an individual to achieve his or her goals, to develop his or her knowledge and potential, and to participate fully in the wider society’ (UNESCO, 2004).
Visual Impairment and Literacy

The function to read and write or literacy is therefore the fundamental building block to education for all students, including those with disabilities. The issue of literacy concerning the visually impaired, however, requires additional consideration given that the nature of visual impairment impacts the medium of reading and writing resulting in necessary modifications in order to access information. Where literacy for the sighted person is taken to mean ability to read and write via print, what constitutes reading and writing for the visually impaired involves multiple modalities. It is therefore necessary to first establish from the onset what these modalities are before mainstream notion of improving literacy can be considered.

Acquiring a visual impairment can be both congenital and adventitious. The onset of the visual impairment has implications on one’s visual memory. Further, the severity of the impairment will determine the extent of intervention necessary to support the person with the visual impairment. Given the prospect that Singapore is an increasingly aging society, the notion of literacy of the visually impaired will need to be confronted progressively as the senior citizen population swells.

The modalities for the visually impaired include braille, modified print, reading and writing through the help of assistive technology via screen readers, optical character readers (OCR) and close-circuit televisions (CCTVs). In short, the modifications can take on tactile, auditory or modified visual channels (Wong & Lee, 2010). These will be divided into braille and alternative modalities.

Reading with Braille

2009 signifies the 200th anniversary of Louis Braille who was born on January 4, 1809, the inventor of braille. Today, braille continues to be seen as the primary means of communication for the visually impaired. Braille has opened many opportunities for persons with visual impairments to access literacy, independence and for self-expression. Today, braille is available in both traditional hard copies as well as electronic formats with refreshable braille displays (Ivers, 2003). It has been called the ‘key to opportunity’ (Schroeder, 1989) and an equivalent system to print that is flexible and adaptable Stephens, 1989). Two hundred years later, the tactile system has been adopted for almost every language in the world and its impact cannot be ignored. For example, governments such as the European Union (EU) have made it obligatory for braille labels to be incorporated in lifts. Further, since October 2005, the EU has made it mandatory for medicines to carry braille labels. If this is not evidence of its utility and relevance, countries including France, Germany, Spain, India, Mexico, Colombia and Costa Rica are considering introducing braille options to extend citizen rights of voters with visual impairments to participate independently in elections (Zurita, 2009).

The use of braille is not merely functional, but braille literacy also points to an advantage in accessing employment. The American Foundation for the Blind (AFB) reports that of the 32 percent of persons with visual impairments who have held jobs, 90 percent of this population are braille literate (Kirchner, Johnson, & Harkins, 1997).
While this statistic emphasizes the importance of braille literacy, access to timely and diverse braille material and the advancement of assistive technology raises questions of reliance on a single modality. Reading only with one modality has been challenged by (Corn & Koenig, 2002; Lusk & Corn, 2006) and researchers have proposed dual literacy programmes of braille and print where appropriate. Moreover, depending on the environment of the employment, it is unlikely that colleagues function in braille. Compounding this is an estimate that only five percent of the world's publishing output is made accessible in alternate formats for people who cannot use print (Epp, 2006). Persons with visual impairments do not have the luxury of walking into a shop and picking up a braille book of their choice. Books to be transcribed to braille need time for transcription. With a paucity of braille books available to the visually impaired, it is therefore restrictive to limit braille alone as a single measure of modality of literacy.

These counter points are raised not to disparage the relevance of braille, rather, to draw attention to the increasingly available alternative formats to information. It is an affront to relegate braille as an outmoded medium because of the disparity in access to equitable information. Societal failure to provide accessible formats cannot justify the denial of the building blocks to acquisition to literacy for the blind. Braille remains a cardinal mode of communication for the visually impaired. While braille is used by a minority of persons with visual loss, it is undeniable that there is universal impact. The question is how to combine braille with emerging technologies.

There are no concrete figures of braille users in Singapore. However, it is possible to approximate numbers of braille users from the figures captured at the Singapore Association of the Visually Handicapped (SAVH), the national register of persons with visual impairments. Clients served at SAVH in 2007-2008 numbered 2919 (SAVH, 2008). Of this number, it is recorded that 1130 are blind. Granted that it is not possible to assume that all blind clients are braille readers, it is also not a foregone conclusion that all clients with partial sight are not braille readers. While braille remains a primary medium of reading and writing for persons with visual impairments, it is also evident that not all persons with visual impairments use braille as their single medium of communication given various available alternatives in communication emerging in recent years. How then are these alternative modalities conveying the information to persons with visual impairments?

**Alternative Access to Information and Assistive Technology**

Where braille meets the needs of persons with severe visual impairments, large print can serve those with low vision. This will involve modification of colours, contrast, size and fonts to achieve optimum reading conditions. In addition, appropriate lighting can also be adjusted to improve conducive reading conditions to avoid glare, shadows and to control adequate lighting (Griffin, Williams, Davis & Engleman, 2002; Kalloniatis & Johnston, 1994). Font sizes of 14 to 16 points were reported to be helpful for elderly persons with mild to moderate visual impairments (Rubin, Feely, Perera, Ekstrom, & Williamson, 2006) while (Russell-Minda, et al., 2007) suggested up to 18 points for general readers with visual impairments who are able to read large print. In determining font size, optimum reading conditions is determined by the ‘critical print size’ (CPS), where beyond a point of increased enlargement, the modification yields no benefit (Rubin, et al., 2006).
A further and significant alternative access to information is through aural means whether pre-recorded, with the help of assistive technology or via a live reader. This is more common today with greater numbers of audio book titles made available commercially. The advancement of technology has also made it possible for screen readers and optical character reading software to enable electronic texts to be converted to accessible formats for the visually impaired. When all fails, the help of a family member, friend, caregiver, volunteer, fellow human being offers a human touch to otherwise synthetic modes. Reading for the visually impaired, as we begin to understand, may therefore be more befittingly defined ‘as the recognition, interpretation, and assimilation of the ideas that are represented by symbolic material, whether it is displayed visually, tactiley, or aurally’ (Tuttle, cited in Hatlen & Spungin, 2008).

Yet explanations have been put forward to argue how listening, while an important access to information is merely ‘access to information’. Listening alone is not a complete measure of literacy given that someone listening to information is not necessarily reading the information. By contrast, advocates such as Tuttle, ‘Is Listening Literacy?’ and Foulke's series entitled ‘Reading by Listening’ counter argue for the case for reading through listening (Hatlen & Spungin, 2008).

Reading, however, is but one half of the literacy discussion, the other half is writing. If there is to be a demonstration of understanding, there also needs to be evidence of assimilation, commonly expressed through writing. Where visual, tactile and aural channels are critical for reading, it is also equally necessary to have multiple modalities to express writing?

**Improving Literacy: A Multi-Prong Approach**

As the issue of literacy for the visually impaired is examined, developing competent skills in a single, or a combination of the modalities is therefore critical if persons with visual impairments are to achieve literacy. When we then consider the larger question of improvement, there are wider implications such as the methodology to be adopted. The emerging literacy framework advocated here is similar to the literacy campaigns observed throughout the world as reported by the UN Chronicle (1990). The three common phases are: pre-literacy; literacy; post-literacy.

**Pre-literacy phase**

In this phase, the focus is to establish the needs of the population and to analyse motivating factors of potential learners and what incentives might be relevant. Two major areas to be considered for the visually impaired are learning media assessment and family-centered intervention.

*Learning media assessment.* Having established the multi-modalities the visually impaired employ to read and write, it is crucial that persons with visual impairments are assessed to determine the most appropriate and effective medium through which they can maximize their potential for learning. A learning media assessment will determine a student’s potential and current literacy media (McKenzie, 2007). For persons who do not have useful residual sight, braille is the natural choice. For persons with partial sight, a low vision assessment is necessary to determine to what degree the residual vision is suited to use modified print. Large print as a medium is recommended so far as it allows the reader to read comfortably, achieving a reasonable reading speed. When visual reading becomes too cumbersome that it impedes
reading speed, evaluation for one, or a combination of alternative modalities, is necessary to ensure that ease of access to information is achieved. The key is to have qualified and competent assessors who can make an evaluation.

**Family-centered intervention.** Families have a critical role in supporting their children with disabilities. Literature clearly supports that families have a pivotal influence in the long-term success of the family member with disability (Kosciulek, 1994; McCubbin, Balling, Possin, Friedich & Bryne, 2002). For children who have a congenital visual impairment, improved access to literacy for the child with visual impairment means early intervention to nurture the child in ways that will compensate for learning that would otherwise be acquired through observation. Some of these emergent literacies may include concepts of print, alphabetic knowledge, phonological awareness, environments, and motor development related to reading and writing (Erickson et al., 2007).

A support structure to prepare parents to nurture their children with visual impairment is then necessary for parents who are new to parenting a child with visual impairment, let alone parenthood (Dunst, 2002). The role of the family throughout the developing years of the child, into their adolescence also has implications in furthering literacy and language skills. Where communication is a key function of literacy, opportunities to build upon and foster communication through the various modalities strengthens mastery and familiarity of modalities.

**Literacy phase**
In this learning phase, the implementation of instruction needs to be built on a sound curriculum and pedagogy. Two areas of literacy are critical for persons with visual impairments, Braille literacy and AT literacy.

*Braille literacy: establishing a strong foundation for braille instruction and services.* Building a strong foundation of braille services effectively has three parts. (1) Learning of braille; (2) Teaching of braille; (3) Production and promulgation of braille. This third part will be considered in the Post-Literacy phase.

*Learning of braille.* Where braille has been determined as the appropriate medium of communication, the acquisition of braille skills is essential if persons with visual impairments are to participate in education. As in acquiring a new language, the ease of learning a new language is often optimized through an early start. By contrast, acquiring a new language later presents other challenges. In a similar vein, children who have a congenital visual impairment needing to use braille from their early years will develop and acquire skills more naturally than those who acquire their visual impairments adventitiously. With age, senior learners will have additional challenges to overcome.

*Teaching of braille.* The instruction of braille requires effective pedagogical methods for students who may not be initially receptive in learning a foreign skill, particularly to persons who have acquired their visual impairment suddenly or when the deterioration of the visual condition is precipitated. Identifying relevant strategies to effectively offer instruction to the students is important if the skill is to be nurtured. At the same time, teachers of braille need to be familiar with the various braille codes and impart up-to-date knowledge to meet the needs of the students.
Fostering assistive technology literacy. Parallel to the teaching of braille is the fostering of information technology, especially assistive technology (AT) for the visually impaired. With the pervasive use of IT in schools, daily lives and throughout society, it is critical that students and adults with visual impairments are able to access and work adeptly with electronic information. Likewise, advancements in assistive technology have been made and persons with visual impairments need to be able to use these devices in order to access IT as well as to enjoy the benefits with increased accessibility. Exposure to and training in using assistive technologies will be critical in building literacy.

Post-Literacy phase
This phase is concerned with the progression of literacy skills. Once basic literacy skills are acquired, availability, access and affordability of materials are imperative if literacy skills are to be developed and advanced to unlock opportunities. If braille is the primary medium of communication, access to braille materials is necessary. Likewise, acquisition and access to AT knowledge is critical if opportunities are to be expanded. Two major areas are:

Production and promulgation of braille. The use of braille is only effective if the users of braille have access to materials in Braille. The production, transcription, and promotion of braille usage as an equal medium to print need to be championed for the system to have a widespread influence. Timely delivery of transcribed braille textbooks to students remain a universal problem. Delays in meeting curricular material will impact access to education. With increasing technological intervention available to transcribe print to braille, negotiating with publishers to secure electronic versions of printed texts is one way to expedite the production process.

Access to materials. If multi modality is to meet the needs of the visually impaired, access to a diversity of materials, through a variety of modalities is critical to nurture literacy. Where one medium fails to offer the necessary accessibility, another medium will offer an alternative choice. This involves partnerships with libraries, databases, and information providers that can offer a conglomerate of information. The post-literacy phase needs also to go beyond the mere provision of accessible materials in terms of braille, large print books, audio books, digitized and electronic books. The provision of bridges to information via assistive technology such as screen readers, OCR and CCTVs in schools and public libraries is critical in creating a conducive literacy-friendly environment.

Discussion
With SAVH being the primary association serving the visually impaired and Lighthouse School the single school serving primary education to children with visual impairments in Singapore, together, these primary agencies have a critical role in meeting the literacy needs of the visually impaired. This means for pre-literacy needs, the learning media assessment as well as the family-centred interventions for children and adults with visual impairments need to be led by the primary service providers. Where specialist services are required, the Singapore National Eye Centre with their optometry services for example offers a further resource for low vision assessments to better inform learning media assessments.
The teaching of literacy, particularly braille literacy is a function that both SAVH and Lighthouse School has offered since the association and the school had been set up some 50 years ago. To ensure that knowledge is current, staff and teachers need to be updated with trends in effective teaching techniques and braille codes to both young and senior students. At the same time, balance in instruction in Braille and alternative formats must be offered to avoid an overemphasis on a single medium resulting in underemphasis on alternative formats. Where dual media programmes refer to braille and print, the literature suggests that teachers of the visually impaired favour alternative formats such as technology (Lusk & Corn, 2006).

Where SAVH and Lighthouse School remain the natural platform where braille and instruction in assistive technology can be introduced, the Infocomm Accessibility Centre and the Society for the Physically Disabled are alternative centres offering IT and AT courses and a Assistive Technology Loan Library including programmes designed for the visually impaired.

Beyond teaching and learning of braille, timely production, distribution and cataloguing of braille materials have been challenges confronting centres of Braille production in the literature (Emerson, Corn & Siller, 2006). As the Braille Production Unit at SAVH is responsible for braille production in the nation, up-to-date production techniques and equipment are critical to meet the demands as a national braille production centre.

Closely linked to the production of Braille for use is the post-literacy phase where advocacy will drive the availability of braille and alternative accessible formats in the public space. Leadership must come from SAVH being the primary association representing the visually impaired in Singapore to drive literacy needs beyond the immediate community of the visually impaired to include widespread availability throughout society. One obvious partner is the National Library Board and the networks of community library branches. Libraries of academic institutions are also critical partners if literacy is to open doors to education.

Finally, the task of bringing together the three phases of literacy while daunting can be supported with the involvement of related voluntary welfare organizations supporting the visually impaired such as the Macular Degeneration Society, Retinitis Pigmentosa Society (Singapore), Glaucoma Society, Glaucoma Patients Association of Singapore, Beyond Vision as well as other related voluntary welfare organizations supporting the visually impaired. Consultation, collaboration and networking will help to advance the cause through collective effort and shared vision.

**Conclusion**

Establishing pre, post and in-between literacy needs for the visually impaired is critical if persons with visual impairments are to have a chance to access mainstream literacy programmes. Reading and writing are fundamental building blocks to access the education system and in turn, creates opportunity to participate in community as a contributing member of society. As visual impairment can be acquired congenitally or adventitiously, literacy for the visually impaired is a need that extends to both young and old. Effort must go on to achieve seamless integration of these three pillars of literacy if Singapore is to prepare to include persons with visual impairments in society.

**References**


