CONSULTATION ON

LITERACY AND NUMERACY ACQUISITION,

INCLUDING THE ROLE OF BRAILLE,

FOR STUDENTS IN AUSTRALIA

WHO ARE BLIND OR VISION IMPAIRED

This Discussion Paper explores issues of literacy and numeracy acquisition for blind and vision impaired students, and seeks views as part of a national consultation.

The consultation will lead to a comprehensive report to the Commonwealth Department of Education, Training and Youth Affairs (DETYA).

This paper has been prepared by:

Jolley William & Associates Pty Ltd

in association with

Renwick College
and
Royal Institute for Deaf & Blind Children

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Discussion Paper on Literacy and Numeracy Acquisition, Including the Role of Braille, for Students in Australia who are Blind or Vision Impaired

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ABOUT THIS DOCUMENT

The Commonwealth Government's highest priority in education is the improvement of literacy and numeracy skills of all young Australians, with Commonwealth, State and Territory Ministers having agreed on new national literacy and numeracy goals. This strong commitment to literacy and numeracy extends to all students including those who are blind or vision impaired.

The Commonwealth Minister for Education through the Department of Education, Training and Youth Affairs (DETYA) has commissioned a research report on the acquisition of literacy and numeracy skills by students who are blind or vision impaired. The investigation seeks to identify issues, impediments and practical approaches to literacy and numeracy acquisition, focussing particularly on the current status and use of braille. As well as a critical analysis of current relevant professional literature, the project will seek and provide information on any available empirical data and current approaches to literacy and numeracy acquisition in students who are blind or vision impaired, including exemplary practice within Australia and internationally.

This paper is part of the consultation and discussion with Australian experts. It explores issues and questions relating to literacy and numeracy and their acquisition by blind and vision impaired students. We are seeking information and feedback to inform government policy development processes. Questions are raised throughout the document, and collated as a questionnaire to assist your response at the end of the Discussion Paper. If possible, please email your response to William Jolley at wjolley@bigpond.com . Your response is requested by **Monday 23 April 2001**. Responses may also be sent to 20 Wadham Parade, Mount Waverley VIC 3149.

PROJECT AIMS

Specifically, the Consultant Group seeks your assistance to provide DETYA, at the conclusion of the project, with the following:

- a critical analysis of the issues regarding literacy and numeracy acquisition by students who are blind or vision impaired;
- identification of impediments to literacy and numeracy acquisition for those students;
- evaluation of the claims made about the need for braille and about difficulties in accessing braille instruction;
- an analysis of the relative strengths and weaknesses of current approaches to literacy and numeracy acquisition; and
- identification and evaluation of practical approaches to overcome impediments that have been identified.

The Discussion Paper is presented in three sections:

- Section One discusses definitions in the acquisition of literacy and numeracy skills by students who are blind or vision impaired.
- Section Two addresses student-centred issues in the acquisition of literacy and numeracy skills by students who are blind or vision impaired.

- Section Three addresses critically important systemic policy areas, for example, service delivery approaches and personnel preparation are addressed.

Each section is subdivided into focal areas identified by issue number. You are requested to respond to the questions that are presented throughout the document. These are compiled into a questionnaire, for ease of response, in Section Four.

SECTION 1: THE CONCEPTUAL FRAMEWORK OF THE PAPER

The following discussion is offered as an aide to clarifying the meaning of important concepts and terms used in this Discussion Paper:

Blindness and Vision Impairment

Students with vision impairments can be broadly defined as children and youth who experience impairments of the eye and visual system that affect their ability to learn. The most commonly considered vision impairments are those involving acuity of vision (sharpness or clarity), visual fields and colour vision (Lamb, 1995). In the educational system, two distinct terms are used to classify these students. They are generally termed:

a) 'blind' if they have little or no useful sight, and

b) 'vision impaired' if they have visual difficulties which limit their ability to access the regular school curriculum.

Since it is generally accepted that as much as 80% of learning is acquired through vision, the difficulties experienced by students so impaired are compounded with regard to their literacy and numeracy acquisition (Corn, Hatlen, Huebner, Ryan & Siller, 1995). Based on the number of students receiving support services due to their disability, it is estimated that there are some 3,000 students of school age who are blind or vision impaired in Australia (Verick, 2000).

Australian Bureau of Statistics data indicate that in 1993, approximately 18% of the Australian population claimed to have one or more disabilities and that 9% of those who had responded had a sight disability of one sort or another (Australian Bureau of Statistics, 1993). For persons less than 15 years of age, 0.4% of the total Australian population was estimated to have a sight disability. This suggests a figure for the school-age population of 10,000. However, for the majority of these students, their sight disability is not educationally significant. In the population under 15 years of age, data indicate that males and females with vision impairment are of approximately even proportion.

For students with an educationally significant vision impairment as a group, vision ranges from total sight loss to an upper limit of 6/18 visual acuity or 20 degrees visual field. The term 'low vision' is commonly used interchangeably with 'vision impaired'. In an educational context, the term 'blind' generally refers to those students whose preferred reading medium is braille, whereas those whose preferred medium is print may be referred to as 'vision impaired'.

Increasing numbers of students are reported to have additional or multiple disabilities. In Queensland up to half of the population of students with vision impairments have one or more additional disabilities (Bevan & Lovie-Kitchen, 1990). Anecdotal information suggests that measurements of the cognitive abilities of children with vision impairments do not follow the normal statistical curve, but cluster at either end of the range (Chorniak, 1984). It has been estimated that between 40 – 60% of children with a vision impairment also have additional disabilities (Gates & Kappen, 1985; Kirchner, 1990; Rogow, 1998).

Target Group for this study

Because of the effects of intellectual disability on literacy and numeracy acquisition, the target group for this research project has been limited to students who are blind or vision impaired and who do not have an intellectual disability that precludes them from developing reading, writing and numeracy skills using braille or print.

QUESTIONS

1. i. How many students who are blind or vision impaired receive service from your system or agency?

1. ii How many of these students, in your opinion, fall into the target group for this study? That is do not have an intellectual disability that preclude(s) them from using print or Braille to attain literacy and numeracy

1. iii What proportion of the student population of your system (or school) falls into the target group? For example, if the total state student population is 900 000 and there are 500 students on your service and 300 of them fall into the target group for this study, the proportion would be 0.03%.

1. iv Please provide data on the numbers (by age and gender) of students taught in each of the following settings:

a) solely in mainstream classes;
b) specialist classes;
c) a mix of mainstream and withdrawal classes; or

d) other arrangements (please specify).

Literacy

The acquisition and use of literacy and numeracy skills can, for many Australians with disabilities, be the means by which they more actively participate in society, become personally empowered, and learn to advocate for themselves. People with disabilities who are literate and numerate, as van Kraayenoord, Elkins, Palmer and Rickards (2000) have pointed out, have greater opportunity to integrate within their communities; to have better access to educational, employment, housing, transport and leisure opportunities than those who are not.

Because of their critical importance to the lives of Australians with disabilities, literacy and numeracy are generally considered a fundamental or “basic” right. In understanding the issues related to literacy and numeracy for students who are blind or vision impaired, it is essential to determine what is meant by “literacy” and “numeracy”.

Conceptualisations of literacy

Literacy as skills to be mastered or literacy as a social practice

Conceptualisations of literacy in Australia range from understanding literacy as a skill or set of skills that a person develops over time to an understanding that literacy is a social practice. The former view of literacy suggests that these skills belong to the reader and are inherent. The idea that literacy comprises skills is predicated on the idea that there is a sequence of subskills that must be mastered. Research in reading and writing (Adams, 1990) has emphasised the important role of phonemic awareness so that students can understand the alphabetic principle that lies behind the orthography of English. From a skills viewpoint such early reading and writing components are seen as prerequisite to higher order skills such as comprehension and critical reading.

The view of literacy as a social practice suggests that literacy develops in a social context and changes as a consequence of the interactions with others, the material being used, the purposes, and the consequences of the activities. Literacy is learned as students strive to create meaning in authentic contexts which constitute a strong motivational force for persevering with a difficult learning task. This view holds that the texts (books, environmental print, film, TV, etc.) draw on the student's prior knowledge and experiences. Students use cognitive and metacognitive strategies to make sense of their prior knowledge in relationship to new information presented in texts.

While these two conceptualisations of literacy are not necessarily contradictory positions, each requires teachers to adopt different stances. The first is as "instructor", providing information and correcting errors, while the latter views the teacher as a supporter/facilitator of learning that is under the control of the student. Skilful teaching recognises that both approaches are valuable at particular stages in students' development.

Literacy as reading, writing, speaking, listening and viewing

Literacy is thought to comprise reading, writing, listening, speaking and viewing. This is similar to the definition used by DEETYA (1991) which states:

> *Literacy involves the integration of speaking, listening and critical thinking with reading and writing. Effective literacy is intrinsically purposeful, flexible and dynamic and continues to develop throughout an individual's life time. (p. 9)*

The term "literacies" (plural) is also becoming more common, indicating that many types of literacy can be employed, depending on the cultural context, specific social situations, the mode and medium of communication, and those participating in the interaction.

Literacy as processing and understanding symbols

Literacy is about processing and understanding symbols. Symbols include letters, words, pictures, graphs, maps, film, video and the use of alternate symbol systems. The recognition that literacy is about "symbol systems" (not just print orthography) is evident in a recent Queensland statement about literacy in *Literate Futures* (2000). This document states:

> *Literacy is the flexible and sustainable mastery of a repertoire of practices with the texts of traditional and new communications technologies via spoken language, print, and multimedia. (p. 9)*

Increasingly students are being required to interpret pictorial/spatial information in association with printed materials and other media. In our view, it is therefore important that a definition of literacy should include viewing and interpreting pictorial/spatial information. This issue has particular salience for students with vision impairments and blind students.

It is also important to note that one never just reads – one always reads something, and one never just views – there is always a purpose or audience involved. However, some students with vision impairments or blindness may be hampered by the lack of appropriate texts and access to media.

The most current conceptualisation of literacy that has widespread recognition in Australia is the Four Resources Model (Freebody & Luke, 1990; Luke & Freebody, 1999a, 1999b). This model applies to all aspects of literacy including reading, writing, speaking, listening, and viewing. Freebody and Luke (1990) suggest that successful readers must develop a series of literacy practices which relate to four roles:

- Codebreaker (How do I crack this text?);
- Text participant (What does this mean?);
- Text user (What do I do with this text?); and
- Text analyst (What is this text trying to do to me?).

It is important to note that Freebody and Luke (1990) did not view the roles as organised hierarchically by age or ability. They do not suggest that young, beginning readers are only able to decode text and that only more mature or sophisticated readers are able to undertake critical or analytical reading. Rather, they argue that the practices associated with all four roles are necessary and are typically employed in an overlapping and coordinated way. They are also used in flexible ways with a range of expertise according to the nature of the text and the task.

Competencies in literacy

There are a number of lists of competences or cotinua that document suggested sequences of development in literacy.

A continuum of children's development in early reading and writing (Years K to 3) appears as part of a joint position statement of the International Reading Association (IRA) and the National Association for the Education of Young Children (NAEYC), which was adopted in 1998. The position paper is entitled: "*Learning to read and write: Developmentally appropriate practices for young children*." The literacy goals and their meanings, as presented in this continuum, follow:

Continuum of children's development in early reading and writing

Phase 1: Awareness and exploration (goals for preschool)

Children explore their environment and build the foundations for learning to read and write.

Children can

- enjoy listening to and discussing storybooks
- understand that print carries a message
- engage in reading and writing attempts
- identify labels and signs in their environment
- participate in rhyming games
- identify some letters and make some letter-sound matches
- use known letters or approximations of letters to represent written language (especially meaningful words like their name and phrases such as "I love you")

Phase 2: Experimental reading and writing (goals for kindergarten)

Children develop basic concepts of print and begin to engage in and experiment with reading and writing.

Kindergartners can

- enjoy being read to and themselves retell simple narrative stories or informational texts
- use descriptive language to explain and explore
- recognise letters and letter-sound matches
- show familiarity with rhyming and beginning sounds
- understand left-to-right and top-to-bottom orientations and familiar concepts of print
- match spoken words with written ones
- begin to write letters of the alphabet and some high-frequency words

Phase 3: Early reading and writing (goals for first grade)

Children begin to read simple stories and can write about a topic that is meaningful to them.

First graders can

- read and retell familiar stories
- use strategies (rereading, predicting, questioning, contextualising) when comprehension breaks down
- use reading and writing for various purposes on their own initiative
- orally read with reasonable fluency
- use letter-sound associations, word parts, and context to identify new words
- identify an increasing number of words by sight
- sound out and represent all substantial sounds in spelling a word
- write about topics that are personally meaningful

- attempt to use some punctuation and capitalisation

Phase 4: Transitional reading and writing (goals for second grade)

Children begin to read more fluently and write various text forms using simple and more complex sentences.

Second graders can

- read with greater fluency
- use strategies more efficiently (rereading, questioning, and so on) when comprehension breaks down
- use word identification strategies with greater facility to unlock unknown words
- identify an increasing number of words by sight
- write about a range of topics to suit different audiences
- use common letter patterns and critical features to spell words
- punctuate simple sentences correctly and proofread their own work
- spend time reading daily and use reading to research topics

Phase 5: Independent and productive reading and writing (goals for third grade)

Children continue to extend and refine their reading and writing to suit varying purposes and audiences.

Third graders can

- read fluently and enjoy reading
- use a range of strategies when drawing meaning from the text
- use word identification strategies appropriately and automatically when encountering unknown words
- recognise and discuss elements of different text structures
- make critical connections between texts
- write expressively in many different forms (stories, poems, reports)
- use a rich variety of vocabulary and sentences appropriate to text forms
- revise and edit their own writing during and after composing
- spell words correctly in final writing drafts.

(Selected sections from The International Reading Association (IRA) and the National Association for the Education of Young Children (NAEYC), 1998, pp. 8 – 9)

Drawn from these documents and from Wixson and Dutro (1998) there appear to be a number of elements necessary for literacy that are particularly important:

- Oral language
- Phonemic awareness
- Concepts of print
- Experiences with media of communication
- Letter knowledge
- Meaning-based word recognition strategies

- Spelling-sound word recognition strategies
- Sight words
- Fluency
- Prior knowledge
- Comprehension strategies
- Vocabulary
- Experiences with literature
- Genre: understanding various forms, purposes and features
- Motivation, habits and attitudes

The Oral Language Developmental Continuum – First Step Series (Evans, 1994) may be useful in the area of oral language. However, guidance about competencies for viewing appears to be lacking.

Most Australian States and Territories have statements of learning outcomes (variously called syllabuses, curriculum frameworks, etc.) that are similar to these competencies and that extend to Year 10. The statements of outcomes refer not only to literacy in the Key Learning Area of English, but also to literacy in the other Key Learning Areas, such as the reading, writing, speaking, listening and viewing outcomes expected in Studies of Society and the Environment or in Science.

Other considerations

There are several other elements that influence the development of literacy including:

- Motivation
- Reading, writing, speaking, listening and viewing are more than only functional. Positive attitudes, interests, and habits lead to a desire to engage with various media of communication, as well as derive enjoyment or pleasure from them.

In discussing young learners, Dombey (1993) has highlighted a number of elements that she refers to as attitudes that students need to learn on entering primary school. They have been applied to all the strands and media forms. They are:

- pleasure and satisfaction (to see media as powerful sources of enjoyment, information and understanding;
- confidence (a firm belief that they will learn to read, write, view etc.);
- concentration and persistence;
- tolerance of uncertainty (preparedness to accept that what a symbol means or why a particular situation in a piece of text or film has arisen and be prepared to find the answer); and
- tentativeness (a willingness to correct errors and revise ideas and understandings about the text (adapted from p. 3).

For many older students, these attitudes also to need to be promoted so that they are willing to take up and continue engaging with a variety of media. In addition, students need to see that reading and the like have personal value, that is that they are affirmed as people by the experiences they have with various media, and with reading, writing, speaking, listening, etc.

Metacognition

Metacognition is defined as “cognition about one's own thinking”. It involves the ability to think about and regulate one's own thinking and learning processes. Most current researchers in the field of metacognition also refer to the role of motivation in thinking and behaving metacognitively. Learning to think metacognitively is important in learning in many areas of the curriculum.

Metacognition appears to be developmental, with younger children being less metacognitively aware, and frequently failing to spontaneously apply metacognitive strategies when compared to older children (for example in memory: Flavell & Wellman, 1977; Schneider & Pressley, 1997; and reading: Garner, 1987; Myers & Paris, 1978).

Metacognitive knowledge may also be unstable until Years Three or Four (Bouffard, 1996). It appears that the procedural aspects of metacognition (planning, monitoring, checking, evaluating and revising) are particularly important elements of metacognition when applied in contexts involving reading, speaking, listening, writing and viewing. It is well known that teaching students to think metacognitively does result in improved learning and performance (Paris & Oka, 1986; Pressley & McCormick, 1995).

Shared Experiences

It is generally recognised that students from other cultural backgrounds, or for whom English is not their native language, may need additional support in the development of English language literacy. Some students from Aboriginal and Torres Strait Islander communities may also need additional support in fostering their English language literacy.

Similarly, it is important to recognise that students with visual impairments/blindness may have restricted experiences as a foundation for literacy learning. For example, they may have limited understanding of environmental print and of the social practices that demonstrate to the students why literacy is a valued competency. Thus these students may need to develop shared experiences as part of their development of literacy.

What might literacy be for students with vision impairments or who are blind?

The goal of literacy instruction for students with vision impairment/blindness should be the same as for other children. We believe that the goal for all students should be the ability to communicate effectively with others about ideas, situations, and experiences that are important in their lives, using all media of communication. For braille users, everyday informal communication is likely to be through the medium of oral language. Access to braille and taped materials are crucial for the wider academic success of students who use braille. Computer technology may enable braille users to produce printed or spoken output, thereby increasing their ease of communication with sighted individuals. For other students with visual impairments, low vision aids will be necessary for them to access handwriting, print and other media.

Conclusion

Literacy education is one of the main responsibilities of teachers. Whether students are educated in inclusive, integrated or separate settings, competence in literacy is a key outcome. Teachers who have a broad conceptualisation of literacy, such as has been suggested in this section – who have a repertoire of teaching strategies which includes knowledge and use of adaptive technology, and who are provided with a wide range of

media – will be able to assist their students to become effective and motivated literacy learners.

Numeracy

Many issues of literacy development relate also to the acquisition of numeracy. However, there are also numeracy-specific issues.

There has been much recent debate about the relationship between mathematics and numeracy. Johnston (1994) has proposed that to be numerate is more than being able to manipulate numbers, or even being able to 'succeed' in school or university mathematics. Numeracy is a critical awareness which builds bridges between mathematics and the real world, with all its diversity (p. 11). Numeracy tends to be developmental and sequential (Crawley & Miller, 1989) which implies that problems with early level skill acquisition may create difficulties in mastering other or later developing skills. Just as problems with reading can influence a child's self-image, failure at mathematics can lead to negative attitudes at school and a general feeling of low self-esteem (Foreman, 1996).

The Use of Braille

The acquisition of literacy and numeracy by students who are blind is complicated by the need to substitute, in many instances, printed text with braille. There a number of important issues that emerge in relation to the use of braille by the current generation of blind and vision impaired students:

- Until the 1970s, blind or vision impaired children received braille instruction as part of literacy development programmes in specialist primary/secondary schools. More recently, inclusion/integration policies and a focus on new technologies have seen a shift away from the use of braille.
- Reliance on technologies using aural skills, which do not develop students' understanding of written structures and conventions, is considered to have the unintended consequence of leading to functional illiteracy. This is thought to have affected many children with severe vision impairment over the last 25 or so years.
- Braille is viewed by many specialist educators as the key to literacy for students with vision impairments. Literacy and numeracy development are highly visual for most of the population; tactile skills replace, or augment, sight in those who are blind or severely vision impaired. New technologies make the preparation of braille materials simpler than ever before, yet fewer braille publications are available. Australia is further hampered by the use of a system of braille that differs from those in the United States and the United Kingdom, although a universal braille code is expected to be introduced in 2003.
- As is the case with all students in schools, students who are blind or severely vision impaired need to develop functional literacy and numeracy for independence in life and work.

By analysing information obtained through the present research project, the study aims to evaluate the above claims and examine impediments to literacy and numeracy acquisition that will support the enhancement of functional literacy and numeracy for Australian students with vision disabilities.

Systemic issues

There currently appear to be few comprehensive national data on the prevalence of blindness and vision impairment among Australian school students. Furthermore, it appears that definitions of blindness and vision impairment used in Australian educational agencies vary. This diversity is possibly because States and Territories have responsibility for the administration and delivery of school education.

There are a number of factors which influence the provision of educational service to students with disabilities, including those who are blind and vision impaired.

Integration, inclusion and mainstreaming

The terms “integration” and “inclusion” are used interchangeably in much of the current literature (McCrae, 1996). “Integration” is generally used as a broad term to refer to a child’s attendance at a regular school. The term also refers to the process of transferring a student to a less segregated setting (Foreman, 1996). “Mainstreaming”, however, occurs when a student is enrolled in, or participating in, a regular class (Foreman, 1996). By way of further clarifying the terms, it is possible, for example, that a student might attend an integrated special class in the morning, and be mainstreamed in the afternoon. Terms such as “full inclusion”, “inclusive education” and “progressive inclusion” have evolved from the American “mainstream movement” of two decades ago (Stainback & Stainback, 1992). The concept of inclusion is based on the notion that schools should, without question, provide for the educational needs of all children in their community, whatever the level of their ability or disability (Kochhar & West, 1996; McCoy, 1995; Putnam,1993; Reynolds, Wang & Walberg,1992). Inclusive schools celebrate diversity in ability as well as in cultural, racial, ethnic and social background (Giorcelli,1995).

The curriculum

In Australia, most students who are blind or vision impaired receive their schooling in community school settings with the assistance of some specialist intervention and support services. The extent and quality of support services appears to vary widely between the States and Territories. In some States (e.g. Victoria and New South Wales) there are multiple service systems, while students in many rural and remote areas appear to receive comparatively low levels of support.

While all students (disabled or otherwise) seek to complete most elements of the core curriculum in the nation’s schools, students who are blind or vision impaired must additionally undertake an “expanded core curriculum” which equips them with knowledge and skills specific to the requirements of their disability, but which must articulate with the core curriculum. Thus, for the students who are the focus of this project there is an additional workload and a level of complexity in learning and in completing work assignments than is the case for non-disabled students. The main elements of the expanded core curriculum for acquiring literacy and numeracy skills are compensatory academic skills, including communication modes; technology; and visual efficiency skills. Communication modes may refer to a combination of braille, large print, tactile and audio skills, as well as to the mastery of electronic and low vision devices.

Students with significant vision impairments are further disadvantaged because they are generally slower than their sighted peers in carrying out routine learning tasks, and because they often require individualised support and the provision of assistive technology to facilitate information access.

While the additional workload inherent in learning to read and write in braille is readily apparent to all who teach these students, others with low vision who use large print or low vision aids can also experience significant disadvantage in acquiring literacy and numeracy skills. For example, they may read more slowly and may be susceptible to eye strain and tiredness. For some students with significant vision impairments, the availability of choice in using print or braille (or a combination of the two) is a particular issue.

The development of literacy and numeracy skills by students who are blind or vision impaired is improved by the use of a combination of access media, for example, braille and audio, large print and audio, and braille and large print. For such students, access to electronically-produced documents through braille, synthetic speech or large print has become regarded as a necessity.

Braille code developments

Australia has inherited the British tradition in braille from its colonial past. History and relative isolation has created a divergence from the British and other braille codes. These differences are particularly evident with the mathematics code. To remedy these differences, Australia has been exploring the adoption of the impending Unified English Braille Code (UEBC), a project of the International Council on English Braille (ICEB).

Professional development

Teachers of students who are blind or vision impaired need specific knowledge and skills. Just as sighted students enjoy the right to learn from trained teachers who have appropriate skills, students who are blind or vision impaired may be deemed to be entitled to learn the curriculum from teachers who are appropriately trained in vision education. To support these students in increasingly integrated settings, these teachers require specialised training that cannot be easily obtained through generic professional preparation avenues.

SECTION 2: ISSUES OF LITERACY AND NUMERACY ACQUISITION FOR STUDENTS

This section of the Discussion Paper addresses nine student-centred issues that directly affect the acquisition of literacy and numeracy skills by students who are blind or vision impaired. These issues are:

1. Reading and Writing;
2. Numeracy;
3. Braille code and teaching standards;
4. Appropriate media for students with low vision;
5. Curriculum access;
6. Tactile graphics;
7. Technology;
8. Assessment and benchmarking; and
9. Parents as partners.

This Discussion Paper does not deal exhaustively with each issue. Our purpose is to provide readers with an overview of each issue, identifying impediments and practical approaches, then ask questions to elicit your considered response.

STUDENT ISSUE 1: Reading and Writing

The issues

Students who are blind or vision impaired form two significantly different groups with differing needs: those who can access print, large print and/or low vision devices, and those who cannot. This second group of students have traditionally used braille. A further, smaller group of students may use a combination of print and braille. Whatever the medium used by these students, they can be disadvantaged in the acquisition of literacy by their lack of exposure to the print environment (Wormsley, 2000), and by the paucity of materials available in alternative formats (Australian Braille Authority, 2000). Students who use braille do not always have access to teachers who are fully conversant with the braille code or in the use of low vision devices and computer hardware and software. Also, as Palmer has stated, with the increase of technology, the use of braille has decreased and the issue of whether listening is literacy has emerged (Palmer, 2000, p. 130).

Impediments

As stated earlier in this paper, for students who are blind or vision impaired there are deficits in several phases of the identified developmental competencies for the acquisition of literacy (IRA NAEYC, 1998).

Children who are blind or vision impaired are restricted in their ability to learn by visual imitation. Lamb (1996) states that they have fewer opportunities than do sighted children for incidental learning; may acquire different concepts; have limited experiences, including those with books; and have less access to role models for reading and writing (Lamb, 1996, pp. 185-186). In the early phases of acquiring competence children who are blind or who have very low vision do not have access to the wealth, enjoyment and reading cues of the picture storybooks which so greatly assist their sighted peers in learning to read. Young braille-using students are disadvantaged by the complex task of decoding braille symbols. The braille code may mask, confuse or contradict the cues that normally allow the beginning reader to encode the language patterns that facilitate efficient reading (Rex, Koenig, Wormsley, & Baker, 1994, p. 31). Children must also learn the special requirements for touch reading (Lamb, 1995).

In the acquisition of Phase 2 competencies (IRA NAEYC, 1998), students with vision impairments may be disadvantaged in their ability to use descriptive language (Gale, 1999). Due to their lack of experience and their inability to make sense of the world around them, these students may use the language of sighted people that is not real to them (Lowenfeld, 1973, Warren, 1994). Students may also be restricted in the range of topics available for them to write about due to their lack of experiences.

The acquisition of spelling skills is often impeded by the complexity of braille, the lack of instant reinforcement from a teacher who knows the braille code, the restricted access to the wide variety of reading materials available to sighted students and the over-dependence on audio material. The insistence on the use of correct braille contractions can impede writing development and the student may come to believe that writing is a tedious undertaking whose purpose is to get ‘all the dots right’ (Rex et. al, 1994, p. 108). Students with low vision seldom have clear images of word patterns. Word recognition can be enhanced by enlarged print, font selection and the use of low vision devices.

Learning to research through reading identified in Phase 4 (IRA NAEYC, 1998) is a further impediment to students with vision impairments. Students with sight can scan library

shelves to select appropriate texts. Not only is the student with a vision impairment disadvantaged by being physically unable to do this but there is not the choice of texts available to students working in alternative formats (Gale & Cronin, 1998). While information on the Internet is an option for research, some sites are inaccessible to people who are vision impaired. The student may only listen to the information and fail to access the spelling of new words.

The skills of drafting, revising and editing identified in Phase 5 (IRA NAEYC, 1998), present difficulties to a student using braille. Rex et. al have stated that writing with a braillewriter is less flexible and less 'recursive' than is writing in print. Both the revision and editing of a paper are more cumbersome with a brailler, and feedback from the regular classroom teacher is less readily accessible to the student (1994, p. 56). For a student with low vision the task is often laborious.

Unless students use computer word processing or braille computers, such as the Mountbatten Brailler, to produce their work, it is difficult for them to share their work with their peers. It is even more difficult for their peers to reciprocate and share their work with the student who is blind, other than aurally.

Controversy has existed for over a quarter of a century over the most effective instructional approaches for teaching reading (Palmer, 2000, p. 111). Lamb (1995) and Swenson (1999) have identified the whole language approach to literacy as one that works well for braille-using students while Rex et. al (1994) have stated that a more and middle of the road approach has emerged. Regular schools vary in their teaching approaches to literacy and the teaching/learning methods used may not always be those best suited to students who use braille. As for other students, blind or vision impaired students will vary in their preferred learning styles.

Effective and practical approaches

We are continually reminded that children are our future. Early childhood programmes can have an important in physical and mental development. They can also enhance the performance and progress of children in schooling, which is, in turn, associated with important changes in the skills and outlooks that affect adult behaviour. As Rogoff pointed out 20 years ago, schooling helps build skills such as the ability to organise knowledge into meaningful categories, to transfer knowledge from one situation to another, and to be more selective in the use of information (Rogoff, 1980).

Young braille-using students require a high degree of specialised assistance in the early stages of learning:

> *Learning to read braille is a time-consuming and complex process that requires daily instruction by a teacher of visually impaired students. This frequent intensive level of intervention is necessary to provide young students with consistent access to adapted classroom materials and to give them sufficient practise to master the braille code and correct braille reading techniques* (Swenson1999, p. 8).

Assisting a child at this early stage of learning must be based on the unique needs of the individual student and delivered by a professional who fully understands the impact of vision loss on learning, is an expert in braille, and trained to teach braille. Such a professional must also have the 'knowledge of the perceptual and cognitive processes of braille reading and writing and be familiar with techniques for teaching reading' (Palmer, 2000, p. 136).

The advent of computers and word processing packages has greatly assisted students in the writing process. It enables them edit their work with comparative ease and to produce a hard print copy of their work that can be read by their teachers and peers. It is an important benefit for students to have access to this technology.

QUESTIONS

2. 1.i What competencies do students in the target group require for the acquisition of literacy, which are additional to, or different from the competencies required by their sighted peers?

2. 1.ii What impediments are faced by teachers in enabling students in the target group to achieve satisfactory literacy outcomes?

2. 1.iii What teaching/learning approaches, being used by your agency, are proving efficacious?

STUDENT ISSUE 2: Numeracy

The issues

Difficulties in teaching mathematics to blind and vision impaired students include time constraints, lack of knowledge of the braille mathematics code, and the increasingly visual nature of mathematics texts (Gale & Cronin, 1998).

Mathematics is considered one of the most important key learning areas in today's curriculum (Booty, 1998). To perform at the same mathematical level as sighted peers, students with vision impairments need the support of teachers who have both an understanding of the mathematics syllabus and a sound knowledge of the braille mathematics code.

Impediments

In Australia, specialist teachers of students who are blind or vision impaired continually voice their concerns about the difficulties of teaching maths to students with vision problems, and the level of attainment of these students (personal communication, visiting teachers' meeting, RVIB October 2000). However, little has been reported in the Australian professional literature on this issue.

Time Constraints

One impediment for students who are blind or vision impaired is that work often takes longer to complete compared to their sighted peers (Round Table, 1999). In the area of mathematics and science, the focus of work is often very visual and students who are blind or vision impaired may require extra time to complete work or a modified workload (Gale & Cronin, 1998). Telec, Boyd and King (1997) have acknowledged that there are difficulties in the area of mathematics with 'time constraints for the student with additional equipment', indicating that problems with the use of 'esoteric materials can be eased by setting additional maths questions' (section 2, p. 38). Further, it is suggested that additional time and exposure to learning materials will be necessary to allow the student to develop mathematical concepts (Education Queensland & Griffith University, 1997).

Increasing visual nature of maths

Teaching material is becoming more visual and this places demands upon the supply of appropriately adapted resources that are accessible to children who are blind or vision impaired (RNIB, 1998). Mathematical symbols can present major problems (Telec, Boyd & King, 1997, section 2, p. 38).

Limitations of voice output software

All electronic screen readers – for example, JAWS for Windows or Window Eyes – read information in a linear fashion. As a consequence, they are unable to interpret mathematical notation or the vertical layout of mathematical equations (personal communication, L. Kumutat, December 2000). This has serious implications for students who are not proficient braille readers but who wish to study mathematics through voice output software. The use of voice output software is impractical for arithmetic and mathematics, not simply because all information is presented linearly, but also because it cannot cope with the graphical symbols used by word processors for mathematics. Specialist software has been developed for accessing mathematics through a screen

reader, but it is oriented to advanced mathematics and its initial application has been beyond the scope of numeracy acquisition. This is not to say that the work may have a wider application for use by both primary and secondary school students. Raman (1994) describes the development of an Audio System for Technical Reading. The system takes a mathematics document written in LaTeX and reads it aloud using synthetic speech and audio cues such as pitch variation to show deviations above and below the baseline. The approach and its application is summarised by Hayes (1996).

Competency levels - students

Overseas literature has voiced concerns about the competency levels of numeracy in students who are blind or vision impaired. A review of literature by Kapperman, Heinze & Strickens (1997) found a low level of literacy in mathematics for students who are blind or vision impaired.

Competency levels – teachers

Students with vision impairment may perform poorly in mathematics due inadequate levels of competency of their teachers. DeMario & Lian (2000) reported on teachers' lack of abilities in the maths code when quoting a study by DeMario, Lang & Lian (1998). Teachers in the United States indicated that they felt much better prepared using the literary braille code than using the American Nemeth mathematics code, and their attitude toward the Nemeth code was 'not as positive as was their attitude toward literary braille' (p. 7). Gentle (2000) found that 53% of vision support teachers (VST) across Australia were knowledgeable of the braille mathematics code, although actual proficiency levels in terms of teaching or transcription were not investigated. The study found varying levels of knowledge of the braille mathematics code across States and Territories and across educational sectors (government, independent and Catholic).

Changing maths curriculum

Today's perpetually changing maths curriculum presents increasing difficulties for students with vision impairments. Clamp (1997) has stated that as the curriculum has become more practical, investigative, constructive and more individually creative, it has in fact become more labour intensive for the student who is visually impaired. This is also the case for the teacher who has to provide suitable mathematical experiences to facilitate understanding in these active learning situations (p. 234).

Difficulties with concept acquisition

There are other impediments in the vital initial acquisition of concepts. The Texas School for the Blind stated that numeracy requires a sound concept base in order to perform at the same mathematical level as peers; students with vision impairments must develop concepts to a comparable standard (Texas School for the Blind: http://www.tsbvi.edumath/teaching, 2000). Clamp (1997) reported that lack of visual experiences impedes concept development and for pupils who have a visual impairment all aspects of mathematical concept formation rely on the consolidation of experiences mediated by the use of real objects and appropriate relevant language in everyday situations. Limited spatial awareness and poor manual dexterity may delay the development of geometrical, graphical, and time-distance concepts (p. 234).

The Texas School for the Blind (2000) has reported that one of the most difficult challenges it has faced has been teaching concepts involving three-dimensional objects. Three-dimensional problems are found in all levels of mathematics. They are often difficult

for students with vision impairments to understand, especially when trying to depict 3-D objects in a 2-D drawing. Such a drawing, even when tactually raised, makes no sense without sighted `perspective`. Chapman (1978) commented that most mathematics is presented in a visual, two dimensional, and non-linear form, which clearly presents an access problem to people who are visually impaired (p. 105).

Compounding problems:

Cahill, Linehan, McCarthy, Gbormans and Engelen (1996) noted that as a result of a limited visual pattern and problems with object relationship and shape experiences, students with vision impairments often experience difficulties with maths presentations. Further, Sims (1967) has provided a list of difficulties in comprehending and replicating diagrammatic work and general speed of calculation (except in the case of mental arithmetic). The results of the Cahill et al. survey suggest that the low number taking higher-level mathematics examinations is associated with mathematical access difficulties rather than any conceptual or cognitive problem. The speed of manipulation and memory overload cause students the most difficulty.

Mathematics equipment

Rapp and Rapp (1992) reported that teachers encounter continuing difficulties in providing materials and equipment, or rely upon ineffectual maths equipment. Tactile measuring devices in some cases have weaknesses and inaccuracies built into the apparatus. These weaknesses not only create problems for the pupil, but place restrictions on the tasks which the teacher can prescribe (Texas School for the Blind: http://www.tsbvi.edumath/teaching, 2000). As well as the challenge of keeping up with mathematics technology tools for sighted students, the scientific graphic calculator is increasingly becoming a required tool in mathematics and science classrooms. They are also becoming necessary to complete coursework and standardised tests. Students who are blind can solve the majority of set problems without a scientific graphic calculator, but are at a disadvantage if they must do everything ‘manually’ (Texas School for the Blind).

Effective and practical approaches

Ahlberg and Csocsan (1999) have written persuasively on the ways in which children who are blind or vision impaired experience numbers. They propose that teaching arithmetic skills to such children should not focus on counting on the fingers or creating finger patterns. Instead, a way of resisting developmental delay is to provide opportunities to group elements and numbers through hearing and touch (p. 559). They further assert that children who are blind require training to perceive their fingers as objects to be connected with number words.

Rapp and Rapp (1992) have suggested that teachers attempt to bring school administrators up-to-date on any new technology or equipment that is available for students taking mathematics courses, in order to bring about improvement in the area of mathematics for braille users. Administrators also need to become aware of the extra time requirements necessary for students with vision impairments, and to encourage and permit teachers to participate in professional skills updating. They also suggested that efforts to develop software to transcribe maths into braille should be a priority.

DeMario and Lian (2000) suggest that to provide successful mathematics instruction, a standard needs to be set for training teachers in the braille maths code at the university level. They propose that this should be taught separately from the literacy unit. They also suggest that more research is required to develop effective instructional strategies to teach

students with severe vision impairments and increase their achievement levels, particularly at the higher levels of maths.

Other recent research has addressed maths instruction for students with vision impairments, in particular Dick and Kubiak (1997); Kapperman, Heinze and Stricken (1997) and Kapperman and Stricken (1998). These authors have suggested that many of the currently available mathematics resources and materials for teachers and students are inadequate.

QUESTIONS

2. 2.i What competencies do the students in the target group require for the acquisition of numeracy, which are additional to, or different from the competencies required by their sighted peers?

2. 2.ii What impediments are faced by teachers in enabling students in the target group to achieve satisfactory numeracy outcomes?

2. 2.iii What teaching/learning approaches being used by your agency are proving efficacious?

STUDENT ISSUE 3: The Braille Code and Teaching Standards

The issues

Literacy and numeracy acquisition for students with vision impairments is affected by:

a) the complexity of the braille code;

b) the difficulty of teaching braille in a regular school classroom setting;

c) an absence in Australia of widely accepted standards for the teaching of braille literacy and numeracy (Gentle, 2000).

The Australian Braille Authority (ABA,1999), has asserted that braille services in Australia are, arguably, among the poorest in the western world, and lag behind those available in some developing countries (p.1). Examples cited by the ABA include the virtual absence in Australia of braille magazines and the difficulties faced in obtaining specific titles if the request is not linked to the subject requirements of specific students.

The perceptions of classroom teachers about the difficulties associated with learning braille and the complexity of the braille code, impact upon their willingness to reinforce braille skills during the specialist teacher's absence (Mosen & Small, 1996; Swenson, 1999). In turn, these perceptions impact upon the student's motivation and enthusiasm to master the braille code. As Swenson (1999) has stated, "I want my students to be motivated less by a desire to please me than by a love of books and an eagerness to communicate their ideas in writing. These are the attitudes that will be with them for a lifetime" (p. 161).

The ABA has also stated that since the first [recent series] international English Braille conference in 1982, there has been growing recognition that the general decline in levels of braille literacy and the erosion of the status of braille as the primary communication medium for blind people is problematic. This decline has been partly attributable to the inconsistencies and complexities of the braille system itself (1999, p. 9). The Unified Braille Code (UBC) Research Project initiated in the United States in 1991, aims at developing 'a single, unified braille code that will encompass all subject areas with the exception of music, while preserving the basic symbology and structure of standard English Braille' (p. 10).

Impediments

Learning based on the tactile complexity of braille may result in the student being out of phase with his/her sighted peers in literacy development in the early years of school (H. Grainger, personal communication November 2000). Swenson (1999) has stated that learning the braille code adds another layer to the already complex process of learning to read. This is not simply due to use of the tactual rather than the visual medium, but also because the learning of Grade II braille requires mastery of short-forms, abbreviations and their rules, in addition to the basic rules of English spelling and grammar.

Lamb (1995) stated that children who are blind have limited experiences, including those with books, and have less access to published materials and role models for reading and writing (pp. 185-6). They are not exposed to icons and signs, for example, 'McDonalds' 'Coca Cola', street signs or the constantly changing array of classroom display material. Because there is less material available for braille readers than for print readers, many students with vision impairments come to school less well prepared in their experiences in the written medium than do print readers. Many will require a certain amount of direct

instruction with skills-oriented activities, controlled vocabulary, and repetition (Wormsley & D'Andrea, 1997, pp. 9 & 82).

Students benefit from access to a variety of braille reading material for use at home and at school, both in the classroom and school library, with provision matching the supply of print books to sighted readers. Itinerant/visiting teachers and teachers/integration aides experience challenges in the production of tactile-braille books and tactile graphics to match the pace of provision of books to sighted readers (Telec, 2000).

Two recent American small-group studies of the reading rates of adolescent and adult print and braille readers (Trent & Truan, 1997; Wetzel & Knowlton, 2000) have shown significant differences in print and braille reading rates. Those authors found that proficient braille adult readers were 30% to 60% slower than proficient sighted readers across oral, silent and study reading tasks. This result is widely supported in the literature (Mason & McCall, 1997; Scholl, 1986). Slower reading rates are associated with limitations in the size of the perceptual unit to group (chunk) symbols in Braille (Lamb, 1995).

Braille has been developed to allow the literature of almost every conceivable subject to be rendered in braille (Australian Braille Authority, 1999, p. 7). However, there currently exists a lack of consistency between the various braille codes used in different countries, as well as a lack of consistency with the codes used in individual countries. Adoption by Australia of the Unified English Braille Code (UEBC) will solve some of these problems. However, the introduction of UEBC will be disruptive in the short-term for both students and teachers, particularly with regard to mathematics, where the code will be different from the present Australian Mathematics code (Australian Braille Authority, 1999).

Effective and practical approaches

Rex, Koenig, Wormsley and Baker (1994) provided a short list of the basic components necessary for teaching students who are blind:

a) individualism;

b) concreteness;

c) unified instruction;

d) additional stimulation; and

e) self activity.

Learning to read braille is, as Spungin (1996) has indicated, a time-consuming and complex process that requires daily instruction by a teacher of vision impaired students. Frequent, intensive intervention is needed, as Swenson (1999) has asserted, in order to provide young students with consistent access to adapted classroom materials and give them sufficient practice to master the braille code and correct their reading techniques (p. 8). It is important, therefore, that a braille reader receives daily intervention from a qualified teacher of students with vision impairments to build the literacy foundation necessary to compete with sighted peers. The challenge is to ensure that the mainstreamed child masters all competencies without missing part of the general education curriculum.

The Australian Braille Authority (1999) listed the following as fundamental changes that must take place in the near future if Australia is to reverse its isolation from the rest of the braille-using world:

1. *Need for more effective production:* Producers of braille material are experiencing a growth in the demand for material with complex formats, due partly to the

increasingly graphical nature of printed material. All production-quality software currently used in Australia is optimised for American braille codes and practices.

2. *Need for consolidated documentation:* Braille is currently being taught predominantly in mainstream environments. With a growing proportion of braille being produced by smaller organisations and individual teachers in schools, the task of obtaining, maintaining and updating resource materials and documentation is becoming unmanageable for such voluntary organisations as the Australian Braille Authority.
3. *Need for teaching resources:* Because Australian braille usage is based on a mixture of British and American braille codes, it is only possible to use teaching materials produced in these countries with substantial modifications.
4. *Developments in the delivery of braille material:* With the advances in information technology such as the Internet, it is now possible to provide on-line repositories of braille material that can be accessed by braille users world-wide. As much of this material is being produced in the USA, Australian braille users are likely to be increasingly disadvantaged by reliance on braille codes and practices that are significantly different from those used in other countries.
5. *Access to braille translation software:* There is an urgent need for the availability of computerised braille production software, which has the potential to bring about substantial time- and cost-savings in the production of Mathematics and Science codes. The version of the Duxbury Braille Translator released early in 2001 includes modules for translation into the United States (Nemeth) and British braille mathematics codes, but not the Australian braille mathematics code.

QUESTION

2. 3.i Has your system or agency observed any trend over the past two decades in the use of braille relative to other methods for encoding/decoding text? For example, increased use of audio taped material and computer speech output.

Please provide details.

STUDENT ISSUE 4: Appropriate Literacy Media for Students with Low Vision

The literature recommends a flexible approach to the selection of literacy media, in which braille and print are valued equally (Mosen & Small, 1996; Jennings, 1999; Swenson, 1999).

The perceptions of parents, teachers and students with low vision impact upon the choice of literary medium, print or braille. Societal attitudes towards blindness, whether conscious or unconscious, are associated with dependency and inferiority (Mullen, 1990). Braille is often equated with blindness, and children with significant vision impairments or unstable, deteriorating eye conditions, may be influenced by this negative view of blindness when making decisions about learning to read in large print or braille (Spungin, 1996). This may result in limited or delayed access to the most appropriate medium for educational needs (Committee to Develop Guidelines for Literacy, 1991; Mosen & Small, 1996).

The choice of literacy media for students with low vision involves consideration of a variety of factors, including child-related factors as

- age,
- cognitive and educational level, and
- eye condition.

Other areas of concern include:

- mechanical factors (quantity and quality of assignments, ability to take notes in chosen medium, reading age and accuracy); and
- social factors (portability, availability and cost of reading medium, child's motivation to use the medium, family or teacher perceptions of child's needs) (Craig, Priest, Harnack 1997).

Impediments

Koenig & Holbrook (1995) discussed the issue of an emphasis on print by educators (whether general or specialist) as the major educational medium in many or most school settings. This practice may be to the detriment of students with low vision who are not, in consequence, being encouraged by their teachers to use braille.

Effective and practical approaches

Corn and Koenig (1996) have stated that the attainment of literacy by students with low vision requires high quality services and trained professionals, guided by recognised standards in the field of vision impairment. These professionals should maintain an ongoing direct involvement in student literacy programmes. These authors specify a number of guiding principles for professionals, including:

- ensuring that young children have a wealth of basic life experiences and direct access to early literacy events;
- ensuring that students develop academic literacy skills that allow for reading with efficiency, stamina, comfort, and enjoyment during the school years; and
- teaching persons with low vision multiple strategies for gaining independent and ready access to information.

QUESTIONS

2. 4.i What reading/writing (encoding/decoding) systems do students in the target group use and what is their proportion or percentage of the total number of blind and vision impaired students your system or agency serves:

a) braille;

b) braille and print;

c) regular print;

d) large print; or

e) other methods? Please specify.

2. 4.ii What methods are preferred and/or used by your students for accessing and creating text? For example, Perkins Brailler, Eureka, laptop computer, CTTV, etc.

2. 4.iii What do you consider are the relative advantages and disadvantages of the various encoding/decoding methods available to people who are blind or vision impaired?

STUDENT ISSUE 5: Curriculum Access

The issues

Students with vision impairments are entitled to receive access to the same curriculum as their sighted peers. This curriculum, in some views, should include access to books and resource material of equal quality and clarity, in the appropriate format (for example, braille, large print, electronic text and audio), at the same time and at the same level, including the same book edition (Kelley & Gale. 1998; Mason & McCall, 1997; Mosen & Small, 1996; RNIB, 1998).

Corn et al (1995) consider that access to educational services should include the provision of instructional materials to students in the appropriate media and at the same time as their sighted peers. There is a need for special legislation or regulation to ensure that this takes place.

Kelley & Gale (1998) and Ryles (2000) have stated that literacy and numeracy skills should provide access to knowledge skills and understandings through the medium of braille across all learning areas to the same level of proficiency expected of the student's sighted peers. Students should be exposed to braille in a range of contexts, such as environmental print, factual and fictional texts and the full range of text types/genres (F. Telec, personal communication, October 2000).

Impediments

Problems associated with the delivery of texts in alternate formats have been widely seen as a major impediment by vision support teachers (personal communication, visiting teachers' meeting, RVIB October 2000). Spungin (1996) reported difficulties in finding braille that is produced on a timely basis (p. 271). The problem is apparently not a new one. The current President of the New South Wales Royal Blind Society, Graeme Innes (now also Deputy Disability Commissioner for the Human Rights and Equal Opportunity Commission), commenting on his education some 30 years ago, asserted that "one of my enduring memories of school is sitting in class waiting, waiting, waiting for the braille version of my textbook to arrive. While I sat there, wasting my time, my classmates got on with the work" (personal communication, report of article in *The Australian*, Round Table on Information Access for People with Disabilities Listserv, 2000).

Mosen and Small (1996) reported that the provision of work material in the appropriate format in New Zealand was affected by the student's geographical location, the organisation of the student's teacher or tutor and whether the material was already available in alternative format. Making do with a different textbook or an earlier (often inferior) edition of a textbook can seriously disadvantage learners in today's competitive environment (Mosen & Small, 1996, www.abcnz.org.nz/braille.htm).

Current teaching practice in Australia involves flexible use of a wide range of texts. This, however, has consequences for students who require texts in accessible formats, because of the time it takes to produce textbooks in formats such as braille or large print.

Effective and practical approaches

The State Legislature of Connecticut (1996) has had before it a Model Braille Literacy Bill, which was jointly proposed by the National Federation of the Blind of Connecticut and the Connecticut Council of the Blind and recommended by the Braille Literacy Task Force.

The intent of the legislation was to ensure that students with vision impairments are able to access books and resources at the same time as sighted peers. Such an act may have an unintended detrimental impact on strategies available to teachers of blind and vision impaired students in mainstream classes.

The State of Massachusetts has a similar Braille Literacy Act (Massachusetts Board of Education, 2000). The law in that State requires initial certification of teachers of students who are blind or vision impaired and the development of a teacher competence certification test. Under the Act, the State is required to periodically review and monitor its vision resource library programme and to develop guidelines to assist school districts in the timely ordering of braille materials, to ensure availability of material in the appropriate format at beginning of the school year. There is, further, a requirement under law to assess the need for braille instruction and to identify a braille assessment protocol.

The adoption of the Unified English Braille Code (UEBC), if ratified by the International Council on English Braille General Assembly in 2003, will improve the usage of Braille in Australia by making significant changes to Australian braille codes and practices. The UEBC will allow more cost-effective production of braille by Australian producers, as well as allowing access to a greater quantity of braille produced in other countries (Australian Braille Authority, 1999).

QUESTION

2. 5.i Are there any concerns you wish to raise or advice you wish to proffer on the issue of curriculum access?

STUDENT ISSUE 6: Tactile Graphics

Issues

Recent years have seen a dramatic increase in graphical information in school texts, resulting in the need to produce and teach tactile graphics. The ability to make and read graphics will lead to better communication skills, better educational and employment opportunities, better orientation and mobility, and thereby a better quality of life (Parkes, 1998). This notion is also supported by Mason and McCall (1997), who stated that tactual skills may transfer to other areas of academic study and to daily living skills. However, there are difficulties with the production and interpretation of tactile graphics.

Wild, Hinton & Hinton (1997) state that as today's world of information transfer becomes increasingly visual there is the danger that the blind student with no concept of or access to the visual media will find it more and more difficult to come to grips with modern courses (Wild, Hinton & Hinton, 1997). Gale (1998) suggests that if printed graphical information is not presented to students with vision impairments, they have been denied essential academic data (p. 153).

Impediments

An impediment allied with numeracy, but one that continues to increasingly permeate the spectrum of all educational enterprise, is the explosion of graphical information and communication. Students are increasingly faced and must grapple with this relatively new and difficult medium. d'Apice (1998) has stated that gathering information presented in graphical form is one of the most challenging skills for students with vision impairments. It is also imperative for students to learn to produce their own graphics.

Lack of knowledge by vision support teachers in the production and interpretation of tactile graphics was seen as an impediment (F. Telec, personal communication, November 2000). Although teachers have been assisting students to interpret and produce tactile graphics, systematic teaching programmes are not yet available (Gale, 2000).

Effective and practical approaches

Gale (1999) has made the following recommendations at a tactile graphics workshop presented to educators of students with vision impairments in New South Wales:

- Tactile graphics should be introduced to children who are blind at a very early age, with the provision of continuing intensive exposure to and ongoing training in the interpretation of tactile graphics.
- People who are blind need to develop an awareness of shape, direction and distance before they can correlate pictures, maps or other raised representations with any kind of external reality.
- Students who are blind will only be able to read graphical material if they are constantly provided with the material and taught the interpretation skills to make use of tactual graphics.
- To develop a comprehensive understanding, students must be encouraged to both read and interpret graphical material as well as to create and produce their own graphics.
- People who are blind must be continuously introduced to graphics prepared from a wide range of tactual media.

QUESTION

2. 6.i Are there any concerns you wish to raise or advice you wish to proffer on the issue of Tactile Graphics?

STUDENT ISSUE 7: Technology

Issues

Rapidly escalating technological change has brought with it issues related to the availability, range, choice and cost of technological support for literacy and numeracy. There is also a perception that electronic technology can replace braille (Kelly, 1998). The efficiency of any approach which avoids the learning of an encoding method should be measured in the light of understanding of fundamental literacy skills it enables in the student.

Current professional literature features a debate over the efficacy of audio options for literacy development as this affects children with vision impairments. A perspective emerging in the literature is that technology should enhance literacy development in braille or print, with text-to-speech systems and audiotapes augmenting reading and enabling access to material not available in braille (Halliday, 1999; Indiana Department of Education, 1997; Mason & McCall, 1997; Wittenstein, 1994;). Audio options may be preferred over braille or large print in particular situations. In this regard, Halliday (1999) stated that speech is a more efficient form of reading basic text and of reviewing what one writes. However, the more complex the formatting becomes, the greater the need for spatial access, which is best accomplished either visually or tactually (p. 4).

The strengths of the electronic media relate to the volatile or changeable nature of data access. Braille and audiocassette tapes are examples of fixed media, whereas electronic text is accessible via synthesised speech or electro-mechanical braille display (Halliday, 1999). For this reason, computers and computerised note-takers are ideal for storing, retrieving and organising information. Halliday (1999) recommended the combination of a computer, speech synthesiser, scanner and special software to access books and articles that are not available in Braille or large print. Equality of access to the curriculum, research facilities and future employment opportunities are becoming increasingly dependent upon skills in the use of multi-media. Teachers of students with vision impairments play an important role in the teaching of skills and knowledge necessary for efficient and effective access to multimedia options (Kelley & Gale, 1998).

Impediments

The computer revolution has raised general expectations and benchmarks. There is a significant additional load for students who are blind or vision impaired in learning to use computers and the assistive technology required for their access. Furthermore, an efficient student who is blind is likely to be significantly slower in carrying out word-processing or at accessing the Internet than a sighted peer. This is because access is generally more complex via voice output software and the use of keyboard commands rather than the mouse (W. Jolley, personal communication, December 2000).

The need for professional training of vision support teachers in the use of new technologies, and their ability to teach and support students in the use of computers and electronic braille note-takers, is a significant issue. One major challenge for educators, according to Downie (Kelly, 1998), is that no individual can hope to keep fully abreast of innovations. Itinerant/visiting teachers must be trained to the point of proficiency in new technologies in order to promote their use by students with vision impairments.

The Australian Braille Authority (1999) stated that for subjects such as mathematics, statistics, computing and phonetics, braille was – and still is – the only way of gaining access to study material (p. 5).

Effective and practical approaches

Kelley (1998) stated that to facilitate effective use of new technologies by students, vision support teachers (VST) must be able to evaluate and select appropriate technology, have the skills to introduce it to the student, and have the knowledge which allows the VST to remain current with changes in technology' (p.218). It is essential that VST receive professional development in the range and variety of technology available and the information technology skills required for effective instruction of students in the use of such technologies (Kelley, 1998).

QUESTION

2. 7.i What assistive technology (including software) is used to develop literacy and numeracy skills in your system or agency by students in in the target group? For example, Perkins Brailler, laptop computer with JFW software, Mountbatten Brailler with speech output, audio tapes and tape recorder, CTTV, etc.

a) How many of your students in the target group use each of these aids or adaptive software?

b) What impediments, in your opinion, prevent students from using the technology or adaptive software to its maximum efficiency?

STUDENT ISSUE 8: Assessment and Benchmarking

Teachers of students with vision impairments must ensure that appropriate qualitative assessment underpins instructional planning and programming in literacy and numeracy. A range of appropriate assessments will enhance communication and reporting of student achievement by teachers and specialist teachers (Rex, Koenig, Wormsley, & Baker, 1994). The Missouri Department of Elementary and Secondary Education (1999) recommended the use of assessment tools such as the learning media assessment, functional literacy assessment, and information technology and adaptive technology assessments. The importance of clear, useful records, passed on in a timely manner to the next setting, was emphasised (RNIB, 1998).

Corn, Hatlen, Huebner, Ryan and Siller (1995) consider that educational and developmental goals, including instruction, should reflect the assessed needs of each student in all areas of academic and disability-specific core curricula.

H Grainger points out that limitations and impediments in the assessment of students with vision impairments in all Australian States and Territories have prevented the establishment of benchmarks comparable to those established for literacy and numeracy acquisition of sighted students (Personal communication, October 2000).

Impediments

In a preliminary braille literacy survey of teaching methods currently being used in New South Wales Department of Education and Training schools, itinerant teachers reported a range of difficulties associated with standardised tests. These tests include, for example, the Basic Skills Test (Year 3 and Year 5) and the ELLA test (Year 7) undertaken by braille-using students. Comments reported included (Telec, 2000):

- Academically able students are overwhelmed by time constraints, even though they were capable of completing the work. One student reportedly cried through frustration with the ‘tyranny of time’.
- Time allocated for test completion was often not sufficient, as it is time-consuming accessing information that sighted children see ‘at a glance’.
- It was reported that some students took up to two days to complete the assessment. It was noted that one student guessed the answers towards the end of the day, resulting in a below average performance.
- Tactile graphics were frequently complex and required additional time to interpret.
- Written descriptions made tasks less exciting and more arduous.
- The Year 3 level Basic Skills Test is presented in Grade 2 braille. Students would be disadvantaged if they have not yet learned the entire Grade 2 code and associated rules.
- Some students were presented with the Basic Skills Test as an oral test. This impacted upon the interpretation of student results in relation to the performance of sighted peers.
- No alterations or modifications can be made to the Basic Skills tests, ELLA test or SNAP test when converting to alternate formats, as compared with the School Certificate (T. d’Apice, personal communication, December 2000).

Effective and practical approaches

Since the adoption of the National Goals for Schooling by the Australian Ministers of Education in 1989, there has been a move towards competency-based assessment and the development of national profiles for the assessment of attainment for all students in the major areas of learning (Blatch, Nagel & Cruickshank, 1998).

The educational policy statement of Blind Citizens Australia (1999) included the principle that assessment procedures should include provision for reasonable accommodation, taking into account a person's specific needs and the preservation of academic standards (p. 10).

'Hands-on' pre-test training workshops are an option to assist students with vision impairments in completing standardised tests in braille. These should include training in effective braille scanning techniques to locate information, braille transcription procedures for test layout in braille, and opportunities to explore the format in which information will be presented in braille (Blatch, Nagel & Cruickshank, 1998). St. Lucy's School, New South Wales, offers holiday workshops for braille-using students on the Basic Skills Test, literacy, numeracy and the disability-specific skills. Relatively small numbers of students currently attend these four-day residential workshops offered twice-yearly to students in Years 3 –4 and Years 5 – 6 (T. d'Apice, personal communication, December 2000).

QUESTIONS

2. 8.i How do your students perform on State/Territory or National tests of literacy and numeracy compared to their fully sighted peers? If possible, please also provide a breakdown of students according to their age group and the reading/writing format and methods they use.

2. 8.ii What impediments do students who are blind or vision impaired face in achieving literacy and numeracy outcomes consistent with the Agreed National Goals of Schooling?

STUDENT ISSUE 9: Parents as Partners

Issues

In the view of Corn, Hatlen, Huebner, Ryan & Siller (1995), there is a need for policies and procedures to ensure the access of all parents to full participation and equal partnership in the education process.

Kelley & Gale (1998), Koenig & Farrenkopf (1997) and Swenson (1999) all report the value placed on parent participation in the education of their children. Swenson stated that the involvement of parents also enhances students' opportunities for success. Parents who take the time to learn braille, supervise homework, and become involved in the school programme communicate the importance of braille literacy to their child (p. 8). Parents have an important role in exposing young children with vision impairment to early experiences that promote literacy development through the daily experiences of routine activities with family and friends around the home and within the community (Rex et al., 1994; Wormsley, 1997).

Impediments

Parental concerns raised in the Royal Blind Society and the Royal Institute for Deaf and Blind Children research project (1999) included the added difficulties experienced at high school level, where the number of teachers involved in the education of children increases, together with the difficulty level and complexity of school work. Homework tasks, such as projects and mathematics, take longer for a student with vision impairment than for a sighted student, and this requires negotiation for extra time or other arrangements.

Effective and practical approaches

Hartshorne (2000) recommends training to help professionals learn to establish rapport and generate confidence in family members, to learn to work with all family members, to provide clear and accurate information, and to provide appropriate feedback to parents, and to enlist the help of other parents (p. 47).

QUESTION

2. 9.1 Are there any concerns you wish to raise or advice you wish to proffer on the issue of Parents as Partners?

SECTION THREE: ISSUES OF LITERACY AND NUMERACY ACQUISITION FOR POLICY DEVELOPMENT

This section of the Discussion Paper addresses four issues that directly relate to support systems which affect the acquisition of literacy and numeracy skills by students who are blind or vision impaired. These issues are:

1. Professional preparation;
2. Specialist teachers and resource provision;
3. Australian national level data; and
4. National Agenda.

This Discussion Paper does not provide exhaustive coverage of each issue. Our purpose is to provide respondents with an overview of each issue, to identify impediments and present practical approaches and provide prompts or cues for your response to our questions.

Australia's States and Territories have responsibility for the administration and delivery of school education within their area of jurisdiction. The result for students who are blind or vision impaired is significant variation between systems.

Your response will aid in the construction of a useful report to DETYA on each issue. As an aid to the task, each of the numbered issues is presented on a new page.

SYSTEMIC ISSUE 1: Professional Preparation

Students who are blind or vision impaired may learn differently from other students in accessing the core curriculum. For example, students who are blind may need to be assisted to explore objects tactually, or have concepts or objects explicitly explained or described to them. Thus teachers need appropriate knowledge and skills to effectively support students who are blind or vision impaired.

What level and kind of support is needed by each student who is blind or vision impaired? This particular systemic issue will be explored in more detail during later stages of the research project.

A specialist teacher of students who are blind or vision impaired needs to have the following skills and knowledge:

- a foundation in regular education (including methodology);
- techniques for curriculum adaptation; and
- skills to deliver the expanded core curriculum (Hazekamp et al., 1993).

Lamb (1997) has developed a list of competencies for Australian vision education teachers. These include knowledge in the areas of:

- vision;
- educational management;
- braille media;
- resources and technology;
- orientation and mobility;
- assistive technology; and
- professional issues/administration.

This means that specialist teachers of students who are blind or vision impaired require specific training. It is not feasible for them to receive this specific training as part of a pre-service under-graduate teacher training course, where there is only enough time for elementary knowledge and skills to be acquired. The necessary knowledge and skills are best obtained through training in graduate courses. If they are lacking in knowledge, resources or confidence, this impacts on the quality of their service delivery.

There are currently no national level data on specialist teacher education, including initial training, in terms of course content, teacher development, subsequent in-service, and award bearing professional development (Gentle, 2000).

Professional training is not uniform across the States and Territories, and some Government-funded university programmes have been cut in recent budgets. Most often, staff training is of the in-service variety provided by one or other of the major specialist community sector organisations. Australia is not alone in this predicament. Reports from colleagues attending overseas conferences indicate a similar response to training needs (Steer, 1998).

The optimal development of literacy and numeracy skills for students with vision impairments in alternate formats (for example, braille, moon and large print) requires student access to experienced specialist teachers, professionals who are skilled in the

provision of intensive, consistent, quality instruction and teaching strategies during all stages of literacy development (Koenig, 1995; Koenig & Farrenkopf, 1997; Mullen, 1990; Swenson, 1999; Verick 1999). Deciding in which area a student needs adaptations, either in skill training or modifications, and which intervention would be most effective is an essential task for the teacher, parent or carer, IST(V), other professionals and the student (Telec, Boyd & King, 1997).

In addition, access to specialist teachers who are competent Braille users and strong advocates for the use of Braille by students who are acquiring literacy and numeracy in braille is an important issue (Lamb, 1995; Mosen & Small, 1996). Mason and McCall (1997) have stated that the success of children learning to communicate through braille is determined to a large extent by the teaching expertise made available to them. It can also be attributed to the teachers' 'enthusiasm for braille, their knowledge of the code and of the perceptual and cognitive processes of braille reading and writing, and their familiarity with techniques for the teaching of reading' (p. 152).

Teachers also need to be acquainted with the resources available, and possess the skills to adapt and interpret these resources to best facilitate literacy and numeracy acquisition (Lamb, 1998b).

Much of the support to students who are blind or vision impaired is apparently provided by untrained personnel (teacher/integration aides) who lack expertise in braille teaching and an understanding of the ways in which children who are blind or vision impaired learn. Mosen & Small (1996) and Gentle (2000) report that teacher aides are not well qualified in braille.

A joint research project of Royal Blind Society and Royal Institute for Deaf and Blind Children (1999) emphasised the importance families place on knowledge, expertise and professionalism in the area of sensory impairment at the school administration level, classroom level (teachers and teachers' aides), and itinerant/visiting teacher level. The research project reported high variability in the quality of education received by children with vision impairments in New South Wales and Australian Capital Territory schools.

Impediments

There are some major obstacles to teachers accessing specialist training in Australia. For example, teacher training (vision impairment) is only available in Queensland, New South Wales and South Australia. People in other States only have access to teacher training via the emerging distance education programmes. The training is costly and funded cadetships are not generally available.

The net result appears to be fewer trained teachers specialising in blindness or vision impairment. This means, for example, that increasing numbers of students who are blind are taught braille by teachers who have a limited knowledge of the code and little knowledge of appropriate teaching methods.

The range and quality of continuing professional development varies widely for teachers in vision education throughout Australia. This continuing professional development is critical for visiting/itinerant teachers supporting students who are blind or vision impaired in integrated environments, because:

- they necessarily work in isolation;
- they benefit from information exchange and networking;

- computer technology is changing rapidly, and assistive technology is increasing in complexity (especially software); and
- teachers need opportunities to update and reinforce their specialist knowledge and skills.

No standardised braille teaching methods or national level teacher certification in braille exist in Australia (Gentle, 2000). There has been a decrease in specialist teacher training courses and. Consequently, a loss of expertise and trained personnel (Gale, 1998, Verick, 1999). Similar concerns are also reported from the United States (Mason, McNerny, Davidson & McNear, 2000). Gentle (2000) emphasised the need for on-going professional development in the literary and mathematics codes. She also raised concerns about the low levels of knowledge of the music, chemistry and computer braille codes across all States and Territories and all educational sectors.

Gentle (2000) and Rapp & Rapp (1992) commented that teachers trained in braille may not have a braille-using student for several years and lose skills and expertise. The infrequent number of braille users may mean that years can go by before the teacher has another braille student, during which time the teacher may lose proficiency in braille.

Effective and practical approaches

In 1991, the New Zealand Qualifications Authority released a discussion paper entitled *Designing the Framework.* This discussion document recommended a unified, logically planned and systematic approach to the restructuring of national educational and vocational awards, qualifications and credentials (Blatch, Nagel & Cruickshank, 1998).

The Blindness Literacy Study of the Missouri Department of Elementary and Secondary Education (1999) recommended that teachers of students with vision impairments receive support at the state and regional level. This would be to enable them to acquire pre-service and professional development training in:

- the use of learning media assessments;
- the needs of students with multiple disabilities;
- competencies in the use of assistive technology; and
- methods of evaluating the assistive needs of students with vision impairments.

Spungin (1996) has pointed to the need in the USA for more standardised braille teaching methods and better quality assurance methods to ensure higher braille teaching standards. British researchers Mason and McCall (1997) assert that in Britain, as in Australia at the present time, there is no provision in law requiring teachers of braille to hold recognised braille qualifications. In New Zealand, there are currently recommendations before Government that promote and advocate legislation to ensure that braille (and access to braille literature of all kinds) is a “right” of all people who are blind. The professional literature on braille teaching generally affirms the need for standards in training programmes, including a greater emphasis on methodology of teaching braille, as well as the need for follow-up examinations (Mosen & Small, 1996; Wittenstein & Pardee, 1996). Allman and Holbrook (1999) also emphasised the need for more teacher aide training. However, they point out that training teachers only in the braille code is analogous to training teachers of print reading by teaching them the alphabet and expecting that this minimal competence will prepare them for the complex task of teaching reading (p. 524).

Recent New Zealand policy conferences on braille literacy proposed the development of an *incentive-based programme* designed to improve the braille skills of people of all ages, similar to programmes operated by the National Federation of the Blind in the United

States (Mosen & Small, 1996). The American programme includes remuneration for teacher aides who attain braille qualifications.

QUESTIONS

3) 1.i What qualifications are required in your service of teachers teaching literacy and numeracy skills to students in the target group?

3) 1.ii How many teachers on your service are proficient in the several braille codes?

For example:

a) literary code;

b) maths code;

c) computer code; or

d) music code

3.1. iii. What teacher professional development and support services are available?

SYSTEMIC ISSUE 2: Specialist Teachers and Resource Provision

There are currently widely varying levels of specialist teacher and resource support nationally (Gale, 1998). States and Territories operate independently with regard to educational service provision. The quality of service provision may be reduced or limited for students with vision impairment who:

a) are geographically isolated or live in rural communities;

b) come from socio-economically disadvantaged areas;

c) belong to indigenous or non-English speaking ethnic groups; or

d) experience poverty and abuse.

(Gale, 1998; P. Pagliano & H. Grainger, personal communication, October 2000).

Impediments

Itinerant/visiting teacher caseloads vary remarkably across Australian States and Territories. For example, Riley (2000) reported that 450 students are supported by 6.2 itinerant/visiting teachers in South Australia, and three itinerant/visiting teachers support 70 students in the Northern Territory (D. Schwartzkoff, personal communication, November 2000). These student-teacher ratios are inadequate for delivery of quality programmes. Given differences in service delivery due to the rural and remote demands of the Northern Territory, there appears to be some inequity of service to students who are blind or vision impaired across the country. Verick (1999) has reported that 'services to students who are blind or vision impaired in the Northern Territory are to be the victims of massive funding cuts' (p. 2).

In a recent national survey of specialist teachers of students who are vision impaired (Gentle, 2000), the Head of the Tasmanian vision impairment services commented that the State had difficulty recruiting and retaining trained braille teachers, because many were attracted to mainland teaching positions.

Effective and practical approaches

The Tasmanian vision impairment service has implemented a statewide professional development plan to address the skills of resource staff, the specialist curriculum needs of braille-using students and the need to develop skills and knowledge in the teaching of braille literacy. The networking of experienced and inexperienced teachers through video-conferencing was implemented as a temporary solution to the problem (Gentle, 2000).

QUESTIONS

3. 2.i What student-teacher ratios apply in your administration/agency for students in the target group?

3. 2.ii To what extent has your service been able to recruit sufficient and adequately trained teachers? How might any difficulties in this area be addressed?

SYSTEMIC ISSUE 3: Australian National Level Data

Issue

Little national level data currently exists on a wide variety of matters relating to literacy and numeracy acquisition by students who are blind or vision impaired. It may be statistically useful given the low incidence of blind and vision impaired students in Australia, to collect data pertaining to these students at national level.

Impediments

Koenig (1992) reported concern regarding the fundamental gaps in knowledge about reading levels of students with vision impairments in the United States. These same challenges appear to be relevant to Australia in 2000 (Australian Braille Authority, 1999). Koenig described the following impediments:

- The most recent study of reading achievements and reading rates for students who are functionally blind and use braille as a primary reading medium was by Lowenfeld, Abel and Hatlen (1969).
- There are currently in the professional literature, virtually no large-group data on reading achievement and reading rates for students with low vision who use print as their primary reading medium. This was similarly reported by Rapp and Rapp (1992).
- The efficacy of instructional practices for teaching reading to students with vision impairments, in either print or braille, has no extensive empirical basis (other than *Patterns*, which has undergone extensive field trials).
- The efficacy of teaching reading in braille to students who are legally blind has never been empirically established or empirically disputed.
- The efficacy of concurrently teaching reading in both braille and print for students with low vision has never been empirically established or disputed.

Effective and practical approaches

Mechanisms for rigorous and sustained research are required (Koenig,1992) to provide an empirical base for understanding the various facets of literacy and numeracy and for future planning.

QUESTIONS

3. 3.i What data would assist with planning and policy development in relation to students who are blind or vision impaired?

QUESTIONS

3. 4.i What issues at system level impede the acquisition of literacy and numeracy by students who are blind or vision impaired?

3. 4.ii What information on other significant issues than those presented above should be considered in the preparation of advice from the field to DETYA on the acquisition of literacy and numeracy skills by students in the target group for this research project.

3. 4.iii Please provide examples of effective policies or practices which could inform practices in other jurisidictions or agencies.

SECTION FOUR: QUESTIONNAIRE

These questions have been formulated in consultation with DETYA. Please email your response to William Jolley at wjolley@bigpond.com by **Monday 23 April 2001**.

Name: …Helen Lunn……

Organisation:. …Royal Blind Society……..

Contact Details: Tel : 0293343120 Fax 93343126 email: hlunn@rbs.org.au…….

(In case we wish to contact you to clarify or obtain further information).

SECTION ONE: The Conceptual Framework of the Paper

Target Group for this Study

1. i How many students who are blind or vision impaired receive service from your system or agency?

1. ii. How many of these students, in your opinion, fall into the target group for this study - that is do not have an intellectual disability that preclude(s) them from using print or braille to attain literacy and numeracy?

1. iii. What proportion of the total student population of your system (or school) falls into the target group? For example, if the total state student population is 900,000 and there are 500 students on your service and 300 of them fall into the target group for this study, the proportion would be 0.03%.

1. iv. Please provide data on the numbers (by age and gender) of students taught in each of the following settings: N/A- we do not provide teaching services but do provide support services to students across all these settings

a) solely in mainstream classes;

b) specialist classes;

c) a mix of mainstream and withdrawal classes; or

d) other arrangements (please specify).

SECTION TWO: Issues of Literacy and Numeracy Acquisition for Students

Reading and Writing

2.1. i. What competencies do students in the target group require for the acquisition of literacy, which are additional to, or different from the competencies required by their sighted peers?

2.1. ii. What impediments are faced by teachers in enabling students in the target group to achieve satisfactory literacy and numeracy outcomes?

Mainstream teachers

- Lack of knowledge of Braille – because of their own perceptions of Braille as difficult mainstream teachers often have lowered expectations for students and an inability to convey a sense of enjoyment /fun in the acquisition of Braille skills
- Lack of time to provide individualised teaching
- Perception that Braille instruction/teaching the specialised curriculum is the role of the itinerant teacher
- Lack of resources – for teachers adopting a “whole language” approach to literacy using a range of stimulus materials there is not a comparable range available in Braille. There is also a lack of tactile games /playground games which build/reinforce readiness skills. Access to equipment/technology can be a barrier due to cost/availability etc
- Favouring of print alternatives because of their own skill base – failure to appreciate the limitations of reading very large print – the slowness and the inability to read in meaningful “chunks”
- Lack of parent support or parent opposition to the teaching of Braille

Itinerant teachers

- Caseload mix often means that teachers have few or no experiences of children with severe vision impairment – they may have never taught Braille or only taught it many years previously

- Different levels of skills in Grade 1 and 2 and specialist Braille codes/technology etc

Early childhood teachers

- Lack of knowledge of pre-requisite skills required for later specialised curriculum and general curriculum access

- Lack of resources – eg there is a very poor range of suitable early childhood books available in print/Braille, lack of materials for learning of tactile discrimination

- Lack of any curricular materials to support teaching of pre-Braille skills – there is no systematic documentation of prerequisite skills/suggested teaching strategies/assessment tools

- Some early childhood teachers in mainstream settings espouse a philosophy of allowing the child to pursue their own interests with little direct teaching –children with severe vision impairment have fewer opportunities for incidental learning and additionally need direct and systematic instruction in readiness skills for the specialist curriculum areas

2.1.iii. What teaching/learning approaches, being used by your agency, are proving efficacious?

Royal Blind Society does not play a major role in the teaching of Braille but we do use the following strategies:

- Intensive programs in holidays (generally individual)

- After school supplement to in-school programs (at times we have also been called on to teach Braille where there is no available Braille teacher in the school system)

- Correspondence courses including the teaching of parents

- Information to parents re role and value of Braille (individually and via newsletters/seminars etc)

Numeracy

2.2. i. What competencies do the students in the target group require for the acquisition of numeracy, which are additional to, or different from the competencies required by their sighted peers?

- For students who require greater than N20 magnification Braille skills are required for numeracy due to inadequacy of other methods for "setting out"
- General sense that students required higher meta-cognitive abilities

2.2. ii. What impediments are faced by teachers in enabling students in the target group to achieve satisfactory numeracy outcomes?

As above for literacy

2.2. iii. What teaching/learning approaches, being used by your agency, are proving efficacious?

This is not a frequent area of service for this agency. The following comments were however made:

- students need assistance with strategies for translating the teacher's classroom directions to the Braille page.
- greater and longer use of concrete materials eg for fractions is frequently helpful

The Braille Code and Teaching Standards

2.3. i. Has your system or agency observed any trend over the past two decades in the use of braille relative to other methods for encoding/decoding text? For example, increased use of audio taped material and computer speech output.

Please provide details. The Transcriptions section has noted marked increases in requests for audio and disk formats. Because of pressures of turnaround time and cost they report a tendency to encourage audio rather than Braille.

Appropriate Literacy Media for Students with Low Vision

2.4. i. What reading/writing (encoding/decoding) systems do students in the target group use and what is their proportion or percentage of the total number of blind and vision impaired students your system or agency serves: Data not available.

a) braille;

b) braille and print;

c) regular print;

d) large print; or

e) other methods? Please specify.

2.4. ii. What methods are preferred and/or used by your students for accessing and creating text? For example, Perkins brailler, Eureka, laptop computer, CTTV, etc.

No hard data available but anecdotally the preferred methods are Perkins and Mountbatten Braillers and computers.

2.4. iii. What do you consider are the relative advantages and disadvantages of the various encoding/decoding methods available to people who are blind or vision impaired?

Perkins and Mountbatten Braillers – easy to read/write/check. Solid, reliable don't require continuous repairs . Less easy for students to lose. **BUT** noisy and heavy to carry around, the latter being particularly difficult at high school/ tertiary level.

Electronic Braille devices – Small, portable, versatile, can read what is being written (if Braille lite note), can correct and hold a lot of memory **BUT** expensive, easily damaged

Handframe – portable,cheap **BUT** slow and confusing

Computer - Good for writing rather than reading, is assisting with the development of work skills, can be portable if able to be put on laptop **BUT** requires additional set of skills (keyboarding) and not always portable

CCTV – Good for reading and writing, teacher can readily access **BUT** no privacy, huge (only one type is portable), can't see whole document

2.5. i. Are there any concerns you wish to raise or advice you wish to proffer on the issue of Curriculum Access?

- Students have more curriculum areas to cover and this places a strain on their abilities to keep pace with the standard curriculum
- There is poor access to general reference and research material – very little is available in alternate formats and there is no adaptive technology available at local libraries
- Students who are blind and vision impaired are often encouraged to take more language based areas because of difficulties of curriculum access in more technical areas
- Subject choices are often influenced by the itinerant teacher's own subject preferences – for example, where the teacher's original training is in primary teaching they may not have confidence in higher level, technical areas

Tactile Graphics

2.6. i. Are there any concerns you wish to raise or advice you wish to proffer on the issue of Tactile Graphics?

- There are inconsistencies between the educational systems in NSW with the government system producing 3-D models and only 2-D being produced for the Catholic system
- Tactile Graphics need to be introduced from preschool with recognition of the developmental stages of skill acquisition eg picture /object correspondence
- Tactile graphics are not seen as a high priority for most students and tactile maps are usually not introduced until adulthood – they are however needed earlier
- Tactile graphics need to be seen as only one strategy for representation/teaching
- There are resource difficulties with tactile graphics not always being easy to obtain

Technology

2.7. i. What assistive technology (including software) is used to develop literacy and numeracy skills in your system or agency by students in in the target group? For example, Perkins Brailler, laptop computer with JFW software, Mountbatten Brailler with speech output, audio tapes and tape recorder, CTTV, etc.

a) How many of your students in the target group use each of these aids or adaptive software?

b) What impediments, in your opinion, prevent students from using the technology or adaptive software to its maximum efficiency?

- Lack of teacher training /familiarity with adaptive technology options
- Difficulty for teachers to keep up to date in an ever changing scenario
- Equipment costs can be prohibitive for schools leading to purchase of less expensive but less appropriate options
- Equipment costs often mean that student cannot have the appropriate equipment at home and school
- In NSW frequently relies on cooperation between the school systems and the not for profit sector and this is variable
- Teachers often seem to choose a learning path/mode eg Braille vs. computer and one path tends to preclude the other

Assessment and Bench Marking

2.8. i. How do your students perform on State/Territory or National tests of literacy and numeracy compared to their fully sighted peers? If possible, please also provide a breakdown of students according to their age group and the reading/writing format and methods they use.

Data not available.

2.8. ii. What impediments do students who are blind or vision impaired face in achieving literacy and numeracy outcomes consistent with the Agreed National Goals of Schooling?

Parents as Partners

2.9. i. Are there any concerns you wish to raise or advice you wish to proffer on the issue of Parents as Partners?

Because of the difficulty in inclusive settings of covering the regular and specialised curricula parents are often being relied upon to take a teaching role to enable their children

to keep pace with their peers. This can be a daunting task for many parents in terms of constraints on their time by work and family demands and their skills and competencies as teachers. Parents being required to take on a teacher role can be disruptive of family life and cause more pressures on already stretched parents. Families also require assistance with locating private remedial Braille teachers so that they do not carry the full responsibility of extra tuition for their child.

Agencies involved in early childhood intervention for children with vision impairments need to take some responsibility for the promotion to families of Braille as an essential literacy tool.

SECTION THREE: Issues of Literacy and Numeracy Acquisition for Policy Development

Professional Preparation

3.1. i. What qualifications are required in your service of teachers teaching literacy and numeracy skills to students in the target group?

We have only one teacher who teaches Braille to children and young people.

In our early childhood intervention services we require early childhood qualifications, preferably with additional early intervention/special education qualifications. The agency takes responsibility for the training of staff in the specialist area of early childhood intervention for children with vision impairment.

3.1. ii. How many teachers on your service are proficient in the several braille codes?

For example:

a) literary code;

b) maths code;

c) computer code; or

d) music code

3.1. iii. What teacher professional development and support services are available for your teachers?

Inservice opportunities + funds and time available for attendance at external seminars/courses. Agency also has study leave arrangements for staff undertaking external courses.

Specialist Teachers and Resource Provision

3.2. i. What student-teacher ratios apply in your administration/agency for students in the target group?

Early childhood intervention teachers generally carry caseloads of approximately 25 with varying levels of service provision to these children and their families.

3.2. ii. To what extent has your service been able to recruit sufficient and adequately trained teachers? How might any difficulties in this area be addressed?

As stated above we are generally unable to recruit staff with a background in vision impairment and there are no vision specialist early intervention courses in Australia. A course is currently being developed as a collaborative venture between the University of Arizona and the University of North Carolina – it may be that there are opportunities for international distance education students. Perhaps a consortium of Aust/NZ agencies or an Australian university with a track record in early intervention/disability studies should approach universities such as these to develop links.

Australian National Level Data

3.3. i. What data would assist with planning and policy development in relation to students who are blind or vision impaired?

Other Questions

3.4. i. What issues at system level impede the acquisition of literacy and numeracy by students who are blind or vision impaired?

3.4. ii. What information on other significant issues than those presented above should be considered in the preparation of advice from the field to DETYA on the acquisition of literacy and numeracy skills by students in the target group for this research project.

3.4 iii Please provide examples of effective policies or practices which could inform practices in other jurisidictions or agencies.

REFERENCES

Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, MA: The MIT Press.

Ahlberg, A., & Csocsan, E. (1999). How children who are blind experience numbers. *Journal of Visual Impairment & Blindness,93*(9), 549–560.

Allman, C. B., &Holbrook, M.C. (1999). Providing a braille refresher course for teachers of students with visual impairments, *Journal of Visual Impairment & Blindness, 93*(12), 770–777.

Australian Braille Authority, (ABA). (1999). *Braille 2000: Meeting the challenges of the new millennium.* Melbourne: Royal Victorian Institute for the Blind.

Australian Bureau of Statistics. (1994). *Disability, ageing and carers: Visual impairment*. Canberra: Authors.

Bevan, J., & Lovie-Kitchen, J. E. (1990). *Ophthalmic characteristics of a paediatric low vision population.* Paper presented at the conference of the Australian and New Zealand Association of Educators of the Visually Handicapped, Perth.

Blatch, P., Nagel, G., & Cruickshank, L. (1998). Current practices and future directions. In P. Kelley & G. Gale (Eds.), *Towards excellence: Effective education for students with vision impairments* (pp. 17–32). Sydney: North Rocks. Press.

Blind Citizens Australia (1999). Policy statement: Education for people who are blind or vision impaired. Prahran, VIC.: Authors

Booty, J. (1998). Curriculum adaptations: Mathematics. In P. Kelley & G. Gale, (Eds.), *Towards excellence: Effective education for students with vision impairments.* Sydney: North Rocks Press.

Bouffard, T. (1996, August). *A developmental study of the relationship between reading development and the self-system.* A paper presented at the International Congress of Psychology, Montreal, Canada.

Cahill, H., Linehan, C., McCarthy, J., Gbormans, G., & Engelen, J. (1996). Blind and partially sighted students' access to mathematics and computer technology in Ireland and Belgium, *Journal of Visual Impairment & Blindness, 90*(2), 105–114.

Chapman, E. K. (1978). *Visually handicapped children and young people*. London: Routledge & Kegan Paul.

Chorniak, E. J. (1984). Conceptualizing the gifted blind child. In A. Skyanda (Ed.), *Insights in sight: Proceedings of the Canadian interdisciplinary conference on the visually impaired child* (pp.175–190). Vancouver, BC: Canadian National institute for the Blind. (ERIC Document Reproduction Service No: ED 260 566).

Clamp, S. (1997). Mathematics. In H. Mason & S. McCall (Eds.), *Visual impairment: Access to education for children and young people*. (pp. 218–235). London: David Fulton.

Committee to Develop Guidelines for Literacy. (1991). Selecting appropriate learning media for visually handicapped students. *RE:view*, 23(2), 64–66.

Commonwealth of Australia. (1992). Disability discrimination act. Canberra: Australian Government Publishing Service.

Corn, A. L., & Koenig, A. J. (Eds.). (1996). *Foundations of low vision.* New York: AFB Press,

Corn, A. L., Hatlen, P., Huebner, K. M., Ryan, F., & Siller, M. A. (1995). *The national agenda for the education of children and youth with visual impairments, including those with multiple disabilities*. New York: AFB Press.

Craig, C. J., DePriest, L., & Harnack, K. (1997). Teachers' perspectives on selecting literacy media for children with visual impairments. *Journal of Visual Impairment & Blindness, 90*(6), 539–545.

Crawley, J. F., & Miller, J. H. (1989). Cross sectional comparison of the mathematics performance of children with learning disabilities: Are we on the right track for comprehensive programming? *Journal of Learning Disabilities, 22*(4), 250–254.

d'Apice, P. (1998). Human society and its environment. In P. Kelley & G. Gale (Eds.), *Towards excellence: Effective education for students with vision impairments* (pp. 157–163). Sydney: North Rocks Press.

DeMario, N. C., & Lian, J. (2000). Teachers' perceptions of needs for and competency in transcribing braille materials in the Nemeth Code. *Journal of Visual Impairment & Blindness, 94*(1), 7–14.

DeMario, N. C., Lan, S., & Lian, M.G. (1998). Teachers' self assessed competence and attitudes toward literary braille and the Nemeth code. *Journal of Visual Impairment & Blindness, 92*(5), 354–357.

Department of Employment, Education and Training. (1991). *Australia's language. The Australian language and literacy policy.* Canberra, ACT. Author.

Dick, T., & Kubiak, E. (1997). Issues and aids for teaching mathematics to the blind. *Mathematics Teacher, 90*(5), 344–349.

Dombey, H. (1993). What children need to learn and how teachers can help them. *Reading, 27*(3), 2–9.

Education Queensland & Griffith University. (1997). *Teaching students with disabilities: Vision impairment.* Brisbane: The State of Queensland (Department of Education).

Evans, J. (1994). *Oral language developmental continuum*. Melbourne: Longman.

Ferrell, K. A. (1986). Infancy and early childhood, in G. Scholl (Ed.) *Foundations of education for blind and visually handicapped children and youth: Theory and practice* pp. 119–135. New York: American Foundation for the Blind

Flavell, J. H., & Wellman, H. M. (1977). Metamemory. In R.V. Kail & J.W. Hagen (Eds.), *Perspectives on the development of memory and cognition* (pp. 3–33). Hillsdale, NJ: Erlbaum.

Foreman, P. (1996). *Integration & inclusion in action*. Sydney: Harcourt Brace.

Freebody, P., & Luke, A. (1990). Literacies programs: Debates and demands in cultural context. *Prospect, 5*, 7–15.

Gale, G. (1995). Addressing the disability specific needs of students with vision impairment: or where do we think are and what can we do about it? *Newsletter of the Australian and New Zealand Association of Educators of the Visually Handicapped* 33 (1), 17–18.

Gale, G. (1998). The teacher and the teacher aide. In P. Kelley & G. Gale (Eds.), *Towards excellence: Effective education for students with vision impairments* (pp. 77–88). Sydney: North Rocks Press.

Gale, G. & Cronin, P. (1998). The school years. In P. Kelley & G. Gale (Eds.), *Towards excellence: Effective education for students with vision impairments* (pp. 118–136). Sydney: North Rocks Press

Gale, G. (1999). *Tactile graphics.* Workshop notes presented at the NEW SOUTH WALES Department of Education and Training IST(V) Conference: Education in Change.

Gale, G. (2000*). Educational guidelines for teaching the interpretation and production of tactile graphics*. Unpublished paper. Melbourne: Royal Victorian Institute for the Blind.

Garner, R. (1987). *Metacognition and reading comprehension.* Norwood, NJ: Ablex Publishing.

Gates, C., & Kappen, G. (1985). Teacher preparation in the education of visually impaired children: A multi-competency approach. *Journal of Visual Impairment & Blindness, 79,* 306–307.

Gentle, F. (2000). *Braille literacy: Report of an Australian national survey of braille teachers and support staff*. Unpublished paper. Sydney: Renwick College and St Edmund's School for the Blind and Vision Impaired.

Giorcelli, L. (1995). *An impulse to soar: Sanitization, silencing and special education*. Keynote Papers from the 19th Annual Conference, Australian Association of Special Education, Darwin.

Grieve, I. (1999). Regional report to the Australian and New Zealand Heads of Services meeting. Sydney: Royal Institute for Deaf and Blind Children.

Halliday, J. (1999). Braille versus speech: Making sense of the debate. http://www.closingthegap.com/cgi-bin/lib/libDsply.pl?a=1178b=2&c-2

Hartshorne, T. S. (2000). *The relationship between parents and teachers of young children with disabilities: Outcomes for children and families*. Sydney: North Rocks Press.

Hayes, B. (1996). *Speaking of Mathematics*. Computing Science, March-April 1996.

Indiana Department of Education. (1997). Functional literacy assessment: Guidelines for students who are blind or visually impaired, Field test edition, 1996/97 school year. Indiana Dept of Education, Division of Special Education http://web.indstate.edu/soe/iseas/blind.html:

International Reading Association (IRA) and the National Association for the Education of Young Children (NAEYC). (1998). *Learning to read and write: Developmentally appropriate practices for young children*. Newark, DE. Author.

Jennings, J. (1999). Print or braille: Decision-making in the choice of the primary literacy medium for pupils with a severe visual impairment. *The British Journal of Visual Impairment, 17*(1), 11-16.

Johnston, B. (1994). Critical numeracy. *Fine Print***,** *16*(4), Summer, 11–12.

Kapperman, G., & Stricken, J. (1998) The braillewriter as a calculation tool. *RE:view,* 30, 65–83.

Kapperman, G., Heinze, T., & Stricken J. (1997). Strategies for developing mathematic skills in students who use braille. Sycamore, IL: Research and Development Institute.

Kelley, P. (1998). Technology. In P.Kelley & G.Gale, (Eds.),*Towards excellence: Effective education for students with vision impairments* (pp. 218–226). Sydney: North Rocks Press.

Kelley, P., Gale, G., & Blatch, P. (1998). Theoretical framework. In P. Kelley and G. Gale (Eds.), *Towards excellence: Effective education for students with vision impairments* (pp. 33–40). Sydney: North Rocks Press.

Kelley P., & Gale, G. (Eds.). (1998) *Towards excellence: Effective education for students with vision impairments*. Sydney: North Rocks Press.

Kemp, D. (1999). *The Adelaide declaration on national goals for schooling in the twenty-first century.* Adelaide: Government Printer.

Kirchner, C. (1990). Trends in the prevalence rates and numbers of blind and visually impaired school children*. Journal of Visual Impairment & Blindness, 84*, 478–479.

Kochhar, C. A., & West, L. L. (1996). *Handbook for successful inclusion*. Gaithersburg, MA: Aspen Publications.

Koenig, A. J. (1992). A framework for understanding the literacy of individuals with visual impairments, *Journal of Visual Impairment & Blindness,86*(7), 277–284.

Koenig, A. J. (1995). Can reading and writing braille be taught effectively on an itinerant basis? *Journal of Visual Impairment & Blindness, 89*(2), 101–106.

Koenig, A. J., & Farrenkopf, C. (1997). Essential experiences to undergird the early development of literacy. *Journal of Visual Impairment & Blindness, 91*(1), 14–24.

Koenig, A. J. & Holbrook, M. C. (1995). *Learning media assessment.* Austin, TX: Texas School for the Blind and Visually Impaired.

Lamb, G. (1998a). Communication. In P. Kelley, & G. Gale (Eds.), *Towards excellence: Effective education for students with vision impairments.* Sydney: North Rocks Press.

Lamb, G. (1998b). Dots for tots: Emergent literacy and braille reading. *The British Journal of Visual Impairment, 16*(3), 111–115.

Lamb, G. (1997). Teacher competencies: An evaluative checklist for teachers of learners with vision impairments. Melbourne: Royal Victorian Institute for the Blind.

Lamb, G. (1995). Fingerprints: *A whole language approach to braille literacy.* Auckland: Homai Vision Centre.

Lowenfeld., B., Abel, G. L., & Hatlen, P. H. (1969). *Blind children learn to read.* Springfield, IL: Charles C. Thomas.

Luke, A., & Freebody, P. (1999a). A map of possible practices-further notes on the four resources model. *Practically Primary, 4*(2), 5–8.

Luke, A., & Freebody, P. (1999b). Further notes on the four resources model. *Reading Online,* www.readingonline.org

Luke, A., & Freebody, P. (2000). Literate futures: Report of the Literacy Review for Queensland Sate Schools. Brisbane: Queensland Government, Education Queensland. http://education.qld.gov.au

Mason, H., & McCall, S. (Eds.). (1997). *Visual Impairment: Access to children and young people.* London: David Fulton.

Mason, C., McNerny, C., Davidson, R., & McNear, D. (2000). *National plan for training personnel to serve children with blindness and low vision.* http://www.cec.sped.org/nw/nptp.html

Massachusetts Board of Education. (2000). Braille Literacy Advisory Council, http://dns.doe.mass.edu/boe/sac/councils/braille.html:

McCall, S., & McLinden, M. (1997). Towards an inclusive model of literacy for people who are blind and have additional learning disabilities. *The British Journal of Visual Impairment, 15*(3), 117–121.

McCoy, K. M. (1995). *Teaching special learners in the general education classroom: Methods and techniques* (2nd ed. pp13–20). Denver, CO: Love Publishing.

McCrae, D. (1996). *The integration/inclusion feasibility study*. Sydney: NSW Department of School Education.

Missouri Department of Elementary and Secondary Education (1999). Missouri blindness literacy study 1999 presented to the Missouri legislature www.dese.state.mo.us/divspeced/blindliteracy.html

Mosen, J., & Small, J. (1996). Braille literacy Report to conference briefing paper. Aukland, NZ: Homai Vision Centre, www.abcnz.org.nz/braille.htm:

Mullen, E.A. (1990). Decreased braille literacy: A symptom of a system in need of reassessment. *RE:view, 22*(3),164–169.

Myers, M., & Paris, S. G. (1978). Children's metacognitive knowledge about reading. *Journal of Educational Psychology, 70,* 680–690.

Palmer, C. (2000)

Paris, S. G., & Oka, E. R. (1986). Children's reading strategies, metacognition and motivation. *Developmental Review, 6,* 25–56.

Parkes, D. (1998). Tactile audio tools for graphicacy and mobility: A circle is either a circle or it is not a circle. *The British Journal of Visual Impairment* 16(3), 99–104.

Pressley, M., & McCormick, C. (1995). *Advanced educational psychology for educators, researchers and policy makers.* New York: Harper Collins.

Putnam, J. (1993). Coop*erative learning and strategies for inclusion: Celebrating diversity in the classroom.* Baltimore: Paul H. Brookes.

Raman, T. V. (1994). Audio System for Technical Readings. *Ph.D. Dissertation*. Cornell University. Audio edition distributed by Recordings for the Blind, order number FB190.

Rapp, D. W. & Rapp, A. J. (1992). A survey of the current status of visually impaired students in secondary mathematics. *Journal of Visual Impairment & Blindness, 86*(2), 115–117.

Rex, E. J., Koenig, A. J., Wormsley, D. P., & Baker, R. L. (1994). *Foundations of braille literacy.* New York: AFB Press.

Reynolds, M. C., Wang, M. C., & Walberg M. J. (1992). The knowledge base for special and general education. *Remedial & Special Education*, *13*(5), 6–10.

Riley, H. (2000). Visiting teacher service in South Australia in *Reports of Heads of Educational Services meeting*, Brisbane. Unpublished paper.

RNIB (1998). Numeracy matters: Preliminary report of the numeracy task force: Response from RNIB, Jan–March, www.rnib.org.uk/wedo/campaign/numer.htm

Rogoff, B. (1980). Schooling and the development of cognitive skills. In H. Triandis & A. Heron (Eds.), Handbook of cross-cultural society*. Boston: Allyn-Bacon.*

Rogow, S (1998*). Helping the visually impaired child with developmental problems: Effective practice in home, school and community.* New York: Teachers College Press.

Royal Blind Society of New South Wales & Royal Institute for Deaf and Blind Children. (1999). *The needs of children and young people (0–19 years) with vision impairment in New South Wales and ACT*. Sydney, NSW: North Rocks Press.

Ryles, R. R. (2000). The impact of braille reading skills on employment, income, education and reading habits. Website: http://www.nfb.org/bm980204.htm

Schneider, W., & Pressley, M. (1997). *Memory development between two and twenty* (2nd ed.). Mahwah, NJ: Erlbaum Associates.

Scholl, G. T. (Ed.). (1986). *Foundations of education for blind and visually handicapped children and youth: Theory and practice.* New York: American Foundation for the Blind.

Sims, A. M. (1967). Modern mathematics in a secondary school. In *The teaching of science to the blind.* Royal National Institute for the Blind. London: Royal National Institute for the Blind.

Spungin, S. J. (1996). Braille and beyond: Braille literacy in a larger context. *Journal of Visual Impairment & Blindness, 90*(3), 271–274.

Stainback, W., & Stainback, S. (1992). *Controversial issues confronting special education: Divergent perspectives*. Needham Heights, MA: Allyn & Bacon.

Steer, M. (1998). Australian teacher education in vision impairment. *The Visual Field, 17*(2), 6–7.

Swenson, A. M. (1999). *Beginning with braille*. New York: American Foundation for the Blind.

Telec, F. (2000). Untitled document. Sydney: New South Wales Department of School Education.

Telec, F., Boyd, A., & King, J. (1997). *Vision impairment: A reference for schools*. Sydney: New South Wales Department of School Education.

Texas School for the Blind (2000). Website: http://www.tsbvi.edu/math/index.htm

Trent, S. D., & Truan, M. B. (1997). Speed, accuracy, and comprehension of adolescent braille readers in a specialized school. *Journal of Visual Impairment & Blindness, 91*(5), 494–500.

van Kraayenoord, C., Elkins, J., Palmer, C., & Rickards, F. (2000). *Literacy, numeracy, and students with disabilities.* Canberra, ACT: Department of Education, Training and Youth Affairs. http://www.deet.gov.au/schools/publications/index.htm

Verick, M. (2000). Braille: The forgotten “language”. Paper presented at the National ACROD Convention. Canberra, 23 October.

Verick, M. (1999). *Getting back on the literacy agenda.* Background paper submitted to the Department of Education, Training and Youth Affairs, ACROD and the Australian Blindness Forum.

Warren, D. H. (1994). *Blindness and children: An individual differences approach*. Cambridge. NY: Cambridge University Press.

Wetzel, R. & Knowlton, M. (2000). A comparison of print and braille reading rates on three reading tasks. *Journal of Visual Impairment & Blindness, 94*(3), 146–154.

Wild, G., Hinton, D., & Hinton, R. (1997). The design of microcapsule diagrams for visually impaired students on distance learning courses. *The British Journal of Visual Impairment 15*(1), 23–27.

Wittenstein, S. H. (1994). Braille literacy: Preservice training and teachers' attitudes. *Journal of Visual Impairment & Blindness, 88*(6), 516–524.

Wittenstein, S. H. & Pardee, M. L. (1996). Teachers' voices: Comments on braille and literacy from the field. *Journal of Visual Impairment & Blindness, 90*(3), 201–209.

Wormsley, D. P. (2000). *Braille Literacy Curriculum.* Philadelphia: Towers Press.

Wormsley, D. P. (1997). Learning to read, reading to learn: Teaching braille reading and writing. In D. P. Wormsley & F. M. D'Andrea (Eds.), *Instructional strategies for Braille literacy* (pp. 57–109). New York: American Foundation for the Blind.

Wormsley, D. P., & D'Andrea, F. M. (Eds.). (1997). *Instructional strategies for Braille literacy.* New York: American Foundation for the Blind.

Wixson, K, K. & Dutro, E. (1998*). Standards for primary-grade reading: An analysis of state frameworks*. Ann Arbor, MI: Center for the Improvement of Early Reading Achievement, University of Michigan School of Education.

CONSULTATION ON

LITERACY AND NUMERACY ACQUISITION,

INCLUDING THE ROLE OF BRAILLE,

FOR STUDENTS IN AUSTRALIA

WHO ARE BLIND OR VISION IMPAIRED

This Discussion Paper explores issues of literacy and numeracy acquisition for blind and vision impaired students, and seeks views as part of a national consultation.

The consultation will lead to a comprehensive report to the Commonwealth Department of Education, Training and Youth Affairs (DETYA).

This paper has been prepared by:

Jolley William & Associates Pty Ltd

in association with

Renwick College
and
Royal Institute for Deaf & Blind Children

March 2001

Discussion Paper on Literacy and Numeracy Acquisition, Including the Role of Braille, for Students in Australia who are Blind or Vision Impaired

March 2001

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ABOUT THIS DOCUMENT

The Commonwealth Government's highest priority in education is the improvement of literacy and numeracy skills of all young Australians, with Commonwealth, State and Territory Ministers having agreed on new national literacy and numeracy goals. This strong commitment to literacy and numeracy extends to all students including those who are blind or vision impaired.

The Commonwealth Minister for Education through the Department of Education, Training and Youth Affairs (DETYA) has commissioned a research report on the acquisition of literacy and numeracy skills by students who are blind or vision impaired. The investigation seeks to identify issues, impediments and practical approaches to literacy and numeracy acquisition, focussing particularly on the current status and use of braille. As well as a critical analysis of current relevant professional literature, the project will seek and provide information on any available empirical data and current approaches to literacy and numeracy acquisition in students who are blind or vision impaired, including exemplary practice within Australia and internationally.

This paper is part of the consultation and discussion with Australian experts. It explores issues and questions relating to literacy and numeracy and their acquisition by blind and vision impaired students. We are seeking information and feedback to inform government policy development processes. Questions are raised throughout the document, and collated as a questionnaire to assist your response at the end of the Discussion Paper. If possible, please email your response to William Jolley at wjolley@bigpond.com . Your response is requested by **Monday 23 April 2001**. Responses may also be sent to 20 Wadham Parade, Mount Waverley VIC 3149.

PROJECT AIMS

Specifically, the Consultant Group seeks your assistance to provide DETYA, at the conclusion of the project, with the following:

- a critical analysis of the issues regarding literacy and numeracy acquisition by students who are blind or vision impaired;
- identification of impediments to literacy and numeracy acquisition for those students;
- evaluation of the claims made about the need for braille and about difficulties in accessing braille instruction;
- an analysis of the relative strengths and weaknesses of current approaches to literacy and numeracy acquisition; and
- identification and evaluation of practical approaches to overcome impediments that have been identified.

The Discussion Paper is presented in three sections:

- Section One discusses definitions in the acquisition of literacy and numeracy skills by students who are blind or vision impaired.
- Section Two addresses student-centred issues in the acquisition of literacy and numeracy skills by students who are blind or vision impaired.

- Section Three addresses critically important systemic policy areas, for example, service delivery approaches and personnel preparation are addressed.

Each section is subdivided into focal areas identified by issue number. You are requested to respond to the questions that are presented throughout the document. These are compiled into a questionnaire, for ease of response, in Section Four.

SECTION 1: THE CONCEPTUAL FRAMEWORK OF THE PAPER

The following discussion is offered as an aide to clarifying the meaning of important concepts and terms used in this Discussion Paper:

Blindness and Vision Impairment

Students with vision impairments can be broadly defined as children and youth who experience impairments of the eye and visual system that affect their ability to learn. The most commonly considered vision impairments are those involving acuity of vision (sharpness or clarity), visual fields and colour vision (Lamb, 1995). In the educational system, two distinct terms are used to classify these students. They are generally termed:

a) 'blind' if they have little or no useful sight, and

b) 'vision impaired' if they have visual difficulties which limit their ability to access the regular school curriculum.

Since it is generally accepted that as much as 80% of learning is acquired through vision, the difficulties experienced by students so impaired are compounded with regard to their literacy and numeracy acquisition (Corn, Hatlen, Huebner, Ryan & Siller, 1995). Based on the number of students receiving support services due to their disability, it is estimated that there are some 3,000 students of school age who are blind or vision impaired in Australia (Verick, 2000).

Australian Bureau of Statistics data indicate that in 1993, approximately 18% of the Australian population claimed to have one or more disabilities and that 9% of those who had responded had a sight disability of one sort or another (Australian Bureau of Statistics, 1993). For persons less than 15 years of age, 0.4% of the total Australian population was estimated to have a sight disability. This suggests a figure for the school-age population of 10,000. However, for the majority of these students, their sight disability is not educationally significant. In the population under 15 years of age, data indicate that males and females with vision impairment are of approximately even proportion.

For students with an educationally significant vision impairment as a group, vision ranges from total sight loss to an upper limit of 6/18 visual acuity or 20 degrees visual field. The term 'low vision' is commonly used interchangeably with 'vision impaired'. In an educational context, the term 'blind' generally refers to those students whose preferred reading medium is braille, whereas those whose preferred medium is print may be referred to as 'vision impaired'.

Increasing numbers of students are reported to have additional or multiple disabilities. In Queensland up to half of the population of students with vision impairments have one or more additional disabilities (Bevan & Lovie-Kitchen, 1990). Anecdotal information suggests that measurements of the cognitive abilities of children with vision impairments do not follow the normal statistical curve, but cluster at either end of the range (Chorniak, 1984). It has been estimated that between 40 – 60% of children with a vision impairment also have additional disabilities (Gates & Kappen, 1985; Kirchner, 1990; Rogow, 1998).

Target Group for this study

Because of the effects of intellectual disability on literacy and numeracy acquisition, the target group for this research project has been limited to students who are blind or vision impaired and who do not have an intellectual disability that precludes them from developing reading, writing and numeracy skills using braille or print.

QUESTIONS

1. i. How many students who are blind or vision impaired receive service from your system or agency?

1. ii How many of these students, in your opinion, fall into the target group for this study? That is do not have an intellectual disability that preclude(s) them from using print or Braille to attain literacy and numeracy

1. iii What proportion of the student population of your system (or school) falls into the target group? For example, if the total state student population is 900 000 and there are 500 students on your service and 300 of them fall into the target group for this study, the proportion would be 0.03%.

1. iv Please provide data on the numbers (by age and gender) of students taught in each of the following settings:

a) solely in mainstream classes;
b) specialist classes;
c) a mix of mainstream and withdrawal classes; or

d) other arrangements (please specify).

Literacy

The acquisition and use of literacy and numeracy skills can, for many Australians with disabilities, be the means by which they more actively participate in society, become personally empowered, and learn to advocate for themselves. People with disabilities who are literate and numerate, as van Kraayenoord, Elkins, Palmer and Rickards (2000) have pointed out, have greater opportunity to integrate within their communities; to have better access to educational, employment, housing, transport and leisure opportunities than those who are not.

Because of their critical importance to the lives of Australians with disabilities, literacy and numeracy are generally considered a fundamental or “basic” right. In understanding the issues related to literacy and numeracy for students who are blind or vision impaired, it is essential to determine what is meant by “literacy” and “numeracy”.

Conceptualisations of literacy

Literacy as skills to be mastered or literacy as a social practice

Conceptualisations of literacy in Australia range from understanding literacy as a skill or set of skills that a person develops over time to an understanding that literacy is a social practice. The former view of literacy suggests that these skills belong to the reader and are inherent. The idea that literacy comprises skills is predicated on the idea that there is a sequence of subskills that must be mastered. Research in reading and writing (Adams, 1990) has emphasised the important role of phonemic awareness so that students can understand the alphabetic principle that lies behind the orthography of English. From a skills viewpoint such early reading and writing components are seen as prerequisite to higher order skills such as comprehension and critical reading.

The view of literacy as a social practice suggests that literacy develops in a social context and changes as a consequence of the interactions with others, the material being used, the purposes, and the consequences of the activities. Literacy is learned as students strive to create meaning in authentic contexts which constitute a strong motivational force for persevering with a difficult learning task. This view holds that the texts (books, environmental print, film, TV, etc.) draw on the student's prior knowledge and experiences. Students use cognitive and metacognitive strategies to make sense of their prior knowledge in relationship to new information presented in texts.

While these two conceptualisations of literacy are not necessarily contradictory positions, each requires teachers to adopt different stances. The first is as "instructor", providing information and correcting errors, while the latter views the teacher as a supporter/facilitator of learning that is under the control of the student. Skilful teaching recognises that both approaches are valuable at particular stages in students' development.

Literacy as reading, writing, speaking, listening and viewing

Literacy is thought to comprise reading, writing, listening, speaking and viewing. This is similar to the definition used by DEETYA (1991) which states:

> *Literacy involves the integration of speaking, listening and critical thinking with reading and writing. Effective literacy is intrinsically purposeful, flexible and dynamic and continues to develop throughout an individual's life time. (p. 9)*

The term "literacies" (plural) is also becoming more common, indicating that many types of literacy can be employed, depending on the cultural context, specific social situations, the mode and medium of communication, and those participating in the interaction.

Literacy as processing and understanding symbols

Literacy is about processing and understanding symbols. Symbols include letters, words, pictures, graphs, maps, film, video and the use of alternate symbol systems. The recognition that literacy is about "symbol systems" (not just print orthography) is evident in a recent Queensland statement about literacy in *Literate Futures* (2000). This document states:

> *Literacy is the flexible and sustainable mastery of a repertoire of practices with the texts of traditional and new communications technologies via spoken language, print, and multimedia. (p. 9)*

Increasingly students are being required to interpret pictorial/spatial information in association with printed materials and other media. In our view, it is therefore important that a definition of literacy should include viewing and interpreting pictorial/spatial information. This issue has particular salience for students with vision impairments and blind students.

It is also important to note that one never just reads – one always reads something, and one never just views – there is always a purpose or audience involved. However, some students with vision impairments or blindness may be hampered by the lack of appropriate texts and access to media.

The most current conceptualisation of literacy that has widespread recognition in Australia is the Four Resources Model (Freebody & Luke, 1990; Luke & Freebody, 1999a, 1999b). This model applies to all aspects of literacy including reading, writing, speaking, listening, and viewing. Freebody and Luke (1990) suggest that successful readers must develop a series of literacy practices which relate to four roles:

- Codebreaker (How do I crack this text?);
- Text participant (What does this mean?);
- Text user (What do I do with this text?); and
- Text analyst (What is this text trying to do to me?).

It is important to note that Freebody and Luke (1990) did not view the roles as organised hierarchically by age or ability. They do not suggest that young, beginning readers are only able to decode text and that only more mature or sophisticated readers are able to undertake critical or analytical reading. Rather, they argue that the practices associated with all four roles are necessary and are typically employed in an overlapping and coordinated way. They are also used in flexible ways with a range of expertise according to the nature of the text and the task.

Competencies in literacy

There are a number of lists of competences or cotinua that document suggested sequences of development in literacy.

A continuum of children's development in early reading and writing (Years K to 3) appears as part of a joint position statement of the International Reading Association (IRA) and the National Association for the Education of Young Children (NAEYC), which was adopted in 1998. The position paper is entitled: "*Learning to read and write: Developmentally appropriate practices for young children*." The literacy goals and their meanings, as presented in this continuum, follow:

Continuum of children's development in early reading and writing

Phase 1: Awareness and exploration (goals for preschool)

Children explore their environment and build the foundations for learning to read and write.

Children can

- enjoy listening to and discussing storybooks
- understand that print carries a message
- engage in reading and writing attempts
- identify labels and signs in their environment
- participate in rhyming games
- identify some letters and make some letter-sound matches
- use known letters or approximations of letters to represent written language (especially meaningful words like their name and phrases such as "I love you")

Phase 2: Experimental reading and writing (goals for kindergarten)

Children develop basic concepts of print and begin to engage in and experiment with reading and writing.

Kindergartners can

- enjoy being read to and themselves retell simple narrative stories or informational texts
- use descriptive language to explain and explore
- recognise letters and letter-sound matches
- show familiarity with rhyming and beginning sounds
- understand left-to-right and top-to-bottom orientations and familiar concepts of print
- match spoken words with written ones
- begin to write letters of the alphabet and some high-frequency words

Phase 3: Early reading and writing (goals for first grade)

Children begin to read simple stories and can write about a topic that is meaningful to them.

First graders can

- read and retell familiar stories
- use strategies (rereading, predicting, questioning, contextualising) when comprehension breaks down
- use reading and writing for various purposes on their own initiative
- orally read with reasonable fluency
- use letter-sound associations, word parts, and context to identify new words
- identify an increasing number of words by sight
- sound out and represent all substantial sounds in spelling a word
- write about topics that are personally meaningful

- attempt to use some punctuation and capitalisation

Phase 4: Transitional reading and writing (goals for second grade)

Children begin to read more fluently and write various text forms using simple and more complex sentences.

Second graders can

- read with greater fluency
- use strategies more efficiently (rereading, questioning, and so on) when comprehension breaks down
- use word identification strategies with greater facility to unlock unknown words
- identify an increasing number of words by sight
- write about a range of topics to suit different audiences
- use common letter patterns and critical features to spell words
- punctuate simple sentences correctly and proofread their own work
- spend time reading daily and use reading to research topics

Phase 5: Independent and productive reading and writing (goals for third grade)

Children continue to extend and refine their reading and writing to suit varying purposes and audiences.

Third graders can

- read fluently and enjoy reading
- use a range of strategies when drawing meaning from the text
- use word identification strategies appropriately and automatically when encountering unknown words
- recognise and discuss elements of different text structures
- make critical connections between texts
- write expressively in many different forms (stories, poems, reports)
- use a rich variety of vocabulary and sentences appropriate to text forms
- revise and edit their own writing during and after composing
- spell words correctly in final writing drafts.

(Selected sections from The International Reading Association (IRA) and the National Association for the Education of Young Children (NAEYC), 1998, pp. 8 – 9)

Drawn from these documents and from Wixson and Dutro (1998) there appear to be a number of elements necessary for literacy that are particularly important:

- Oral language
- Phonemic awareness
- Concepts of print
- Experiences with media of communication
- Letter knowledge
- Meaning-based word recognition strategies

- Spelling-sound word recognition strategies
- Sight words
- Fluency
- Prior knowledge
- Comprehension strategies
- Vocabulary
- Experiences with literature
- Genre: understanding various forms, purposes and features
- Motivation, habits and attitudes

The Oral Language Developmental Continuum – First Step Series (Evans, 1994) may be useful in the area of oral language. However, guidance about competencies for viewing appears to be lacking.

Most Australian States and Territories have statements of learning outcomes (variously called syllabuses, curriculum frameworks, etc.) that are similar to these competencies and that extend to Year 10. The statements of outcomes refer not only to literacy in the Key Learning Area of English, but also to literacy in the other Key Learning Areas, such as the reading, writing, speaking, listening and viewing outcomes expected in Studies of Society and the Environment or in Science.

Other considerations

There are several other elements that influence the development of literacy including:

- Motivation
- Reading, writing, speaking, listening and viewing are more than only functional. Positive attitudes, interests, and habits lead to a desire to engage with various media of communication, as well as derive enjoyment or pleasure from them.

In discussing young learners, Dombey (1993) has highlighted a number of elements that she refers to as attitudes that students need to learn on entering primary school. They have been applied to all the strands and media forms. They are:

- pleasure and satisfaction (to see media as powerful sources of enjoyment, information and understanding;
- confidence (a firm belief that they will learn to read, write, view etc.);
- concentration and persistence;
- tolerance of uncertainty (preparedness to accept that what a symbol means or why a particular situation in a piece of text or film has arisen and be prepared to find the answer); and
- tentativeness (a willingness to correct errors and revise ideas and understandings about the text (adapted from p. 3).

For many older students, these attitudes also to need to be promoted so that they are willing to take up and continue engaging with a variety of media. In addition, students need to see that reading and the like have personal value, that is that they are affirmed as people by the experiences they have with various media, and with reading, writing, speaking, listening, etc.

Metacognition

Metacognition is defined as “cognition about one's own thinking”. It involves the ability to think about and regulate one's own thinking and learning processes. Most current researchers in the field of metacognition also refer to the role of motivation in thinking and behaving metacognitively. Learning to think metacognitively is important in learning in many areas of the curriculum.

Metacognition appears to be developmental, with younger children being less metacognitively aware, and frequently failing to spontaneously apply metacognitive strategies when compared to older children (for example in memory: Flavell & Wellman, 1977; Schneider & Pressley, 1997; and reading: Garner, 1987; Myers & Paris, 1978).

Metacognitive knowledge may also be unstable until Years Three or Four (Bouffard, 1996). It appears that the procedural aspects of metacognition (planning, monitoring, checking, evaluating and revising) are particularly important elements of metacognition when applied in contexts involving reading, speaking, listening, writing and viewing. It is well known that teaching students to think metacognitively does result in improved learning and performance (Paris & Oka, 1986; Pressley & McCormick, 1995).

Shared Experiences

It is generally recognised that students from other cultural backgrounds, or for whom English is not their native language, may need additional support in the development of English language literacy. Some students from Aboriginal and Torres Strait Islander communities may also need additional support in fostering their English language literacy.

Similarly, it is important to recognise that students with visual impairments/blindness may have restricted experiences as a foundation for literacy learning. For example, they may have limited understanding of environmental print and of the social practices that demonstrate to the students why literacy is a valued competency. Thus these students may need to develop shared experiences as part of their development of literacy.

What might literacy be for students with vision impairments or who are blind?

The goal of literacy instruction for students with vision impairment/blindness should be the same as for other children. We believe that the goal for all students should be the ability to communicate effectively with others about ideas, situations, and experiences that are important in their lives, using all media of communication. For braille users, everyday informal communication is likely to be through the medium of oral language. Access to braille and taped materials are crucial for the wider academic success of students who use braille. Computer technology may enable braille users to produce printed or spoken output, thereby increasing their ease of communication with sighted individuals. For other students with visual impairments, low vision aids will be necessary for them to access handwriting, print and other media.

Conclusion

Literacy education is one of the main responsibilities of teachers. Whether students are educated in inclusive, integrated or separate settings, competence in literacy is a key outcome. Teachers who have a broad conceptualisation of literacy, such as has been suggested in this section – who have a repertoire of teaching strategies which includes knowledge and use of adaptive technology, and who are provided with a wide range of

media – will be able to assist their students to become effective and motivated literacy learners.

Numeracy

Many issues of literacy development relate also to the acquisition of numeracy. However, there are also numeracy-specific issues.

There has been much recent debate about the relationship between mathematics and numeracy. Johnston (1994) has proposed that to be numerate is more than being able to manipulate numbers, or even being able to 'succeed' in school or university mathematics. Numeracy is a critical awareness which builds bridges between mathematics and the real world, with all its diversity (p. 11). Numeracy tends to be developmental and sequential (Crawley & Miller, 1989) which implies that problems with early level skill acquisition may create difficulties in mastering other or later developing skills. Just as problems with reading can influence a child's self-image, failure at mathematics can lead to negative attitudes at school and a general feeling of low self-esteem (Foreman, 1996).

The Use of Braille

The acquisition of literacy and numeracy by students who are blind is complicated by the need to substitute, in many instances, printed text with braille. There a number of important issues that emerge in relation to the use of braille by the current generation of blind and vision impaired students:

- Until the 1970s, blind or vision impaired children received braille instruction as part of literacy development programmes in specialist primary/secondary schools. More recently, inclusion/integration policies and a focus on new technologies have seen a shift away from the use of braille.
- Reliance on technologies using aural skills, which do not develop students' understanding of written structures and conventions, is considered to have the unintended consequence of leading to functional illiteracy. This is thought to have affected many children with severe vision impairment over the last 25 or so years.
- Braille is viewed by many specialist educators as the key to literacy for students with vision impairments. Literacy and numeracy development are highly visual for most of the population; tactile skills replace, or augment, sight in those who are blind or severely vision impaired. New technologies make the preparation of braille materials simpler than ever before, yet fewer braille publications are available. Australia is further hampered by the use of a system of braille that differs from those in the United States and the United Kingdom, although a universal braille code is expected to be introduced in 2003.
- As is the case with all students in schools, students who are blind or severely vision impaired need to develop functional literacy and numeracy for independence in life and work.

By analysing information obtained through the present research project, the study aims to evaluate the above claims and examine impediments to literacy and numeracy acquisition that will support the enhancement of functional literacy and numeracy for Australian students with vision disabilities.

Systemic issues

There currently appear to be few comprehensive national data on the prevalence of blindness and vision impairment among Australian school students. Furthermore, it appears that definitions of blindness and vision impairment used in Australian educational agencies vary. This diversity is possibly because States and Territories have responsibility for the administration and delivery of school education.

There are a number of factors which influence the provision of educational service to students with disabilities, including those who are blind and vision impaired.

Integration, inclusion and mainstreaming

The terms “integration” and “inclusion” are used interchangeably in much of the current literature (McCrae, 1996). “Integration” is generally used as a broad term to refer to a child’s attendance at a regular school. The term also refers to the process of transferring a student to a less segregated setting (Foreman, 1996). “Mainstreaming”, however, occurs when a student is enrolled in, or participating in, a regular class (Foreman, 1996). By way of further clarifying the terms, it is possible, for example, that a student might attend an integrated special class in the morning, and be mainstreamed in the afternoon. Terms such as “full inclusion”, “inclusive education” and “progressive inclusion” have evolved from the American “mainstream movement” of two decades ago (Stainback & Stainback, 1992). The concept of inclusion is based on the notion that schools should, without question, provide for the educational needs of all children in their community, whatever the level of their ability or disability (Kochhar & West, 1996; McCoy, 1995; Putnam,1993; Reynolds, Wang & Walberg,1992). Inclusive schools celebrate diversity in ability as well as in cultural, racial, ethnic and social background (Giorcelli,1995).

The curriculum

In Australia, most students who are blind or vision impaired receive their schooling in community school settings with the assistance of some specialist intervention and support services. The extent and quality of support services appears to vary widely between the States and Territories. In some States (e.g. Victoria and New South Wales) there are multiple service systems, while students in many rural and remote areas appear to receive comparatively low levels of support.

While all students (disabled or otherwise) seek to complete most elements of the core curriculum in the nation’s schools, students who are blind or vision impaired must additionally undertake an “expanded core curriculum” which equips them with knowledge and skills specific to the requirements of their disability, but which must articulate with the core curriculum. Thus, for the students who are the focus of this project there is an additional workload and a level of complexity in learning and in completing work assignments than is the case for non-disabled students. The main elements of the expanded core curriculum for acquiring literacy and numeracy skills are compensatory academic skills, including communication modes; technology; and visual efficiency skills. Communication modes may refer to a combination of braille, large print, tactile and audio skills, as well as to the mastery of electronic and low vision devices.

Students with significant vision impairments are further disadvantaged because they are generally slower than their sighted peers in carrying out routine learning tasks, and because they often require individualised support and the provision of assistive technology to facilitate information access.

While the additional workload inherent in learning to read and write in braille is readily apparent to all who teach these students, others with low vision who use large print or low vision aids can also experience significant disadvantage in acquiring literacy and numeracy skills. For example, they may read more slowly and may be susceptible to eye strain and tiredness. For some students with significant vision impairments, the availability of choice in using print or braille (or a combination of the two) is a particular issue.

The development of literacy and numeracy skills by students who are blind or vision impaired is improved by the use of a combination of access media, for example, braille and audio, large print and audio, and braille and large print. For such students, access to electronically-produced documents through braille, synthetic speech or large print has become regarded as a necessity.

Braille code developments

Australia has inherited the British tradition in braille from its colonial past. History and relative isolation has created a divergence from the British and other braille codes. These differences are particularly evident with the mathematics code. To remedy these differences, Australia has been exploring the adoption of the impending Unified English Braille Code (UEBC), a project of the International Council on English Braille (ICEB).

Professional development

Teachers of students who are blind or vision impaired need specific knowledge and skills. Just as sighted students enjoy the right to learn from trained teachers who have appropriate skills, students who are blind or vision impaired may be deemed to be entitled to learn the curriculum from teachers who are appropriately trained in vision education. To support these students in increasingly integrated settings, these teachers require specialised training that cannot be easily obtained through generic professional preparation avenues.

SECTION 2: ISSUES OF LITERACY AND NUMERACY ACQUISITION FOR STUDENTS

This section of the Discussion Paper addresses nine student-centred issues that directly affect the acquisition of literacy and numeracy skills by students who are blind or vision impaired. These issues are:

5. Reading and Writing;
6. Numeracy;
7. Braille code and teaching standards;
8. Appropriate media for students with low vision;
9. Curriculum access;
10. Tactile graphics;
11. Technology;
12. Assessment and benchmarking; and
13. Parents as partners.

This Discussion Paper does not deal exhaustively with each issue. Our purpose is to provide readers with an overview of each issue, identifying impediments and practical approaches, then ask questions to elicit your considered response.

STUDENT ISSUE 1: Reading and Writing

The issues

Students who are blind or vision impaired form two significantly different groups with differing needs: those who can access print, large print and/or low vision devices, and those who cannot. This second group of students have traditionally used braille. A further, smaller group of students may use a combination of print and braille. Whatever the medium used by these students, they can be disadvantaged in the acquisition of literacy by their lack of exposure to the print environment (Wormsley, 2000), and by the paucity of materials available in alternative formats (Australian Braille Authority, 2000). Students who use braille do not always have access to teachers who are fully conversant with the braille code or in the use of low vision devices and computer hardware and software. Also, as Palmer has stated, with the increase of technology, the use of braille has decreased and the issue of whether listening is literacy has emerged (Palmer, 2000, p. 130).

Impediments

As stated earlier in this paper, for students who are blind or vision impaired there are deficits in several phases of the identified developmental competencies for the acquisition of literacy (IRA NAEYC, 1998).

Children who are blind or vision impaired are restricted in their ability to learn by visual imitation. Lamb (1996) states that they have fewer opportunities than do sighted children for incidental learning; may acquire different concepts; have limited experiences, including those with books; and have less access to role models for reading and writing (Lamb, 1996, pp. 185-186). In the early phases of acquiring competence children who are blind or who have very low vision do not have access to the wealth, enjoyment and reading cues of the picture storybooks which so greatly assist their sighted peers in learning to read. Young braille-using students are disadvantaged by the complex task of decoding braille symbols. The braille code may mask, confuse or contradict the cues that normally allow the beginning reader to encode the language patterns that facilitate efficient reading (Rex, Koenig, Wormsley, & Baker, 1994, p. 31). Children must also learn the special requirements for touch reading (Lamb, 1995).

In the acquisition of Phase 2 competencies (IRA NAEYC, 1998), students with vision impairments may be disadvantaged in their ability to use descriptive language (Gale, 1999). Due to their lack of experience and their inability to make sense of the world around them, these students may use the language of sighted people that is not real to them (Lowenfeld, 1973, Warren, 1994). Students may also be restricted in the range of topics available for them to write about due to their lack of experiences.

The acquisition of spelling skills is often impeded by the complexity of braille, the lack of instant reinforcement from a teacher who knows the braille code, the restricted access to the wide variety of reading materials available to sighted students and the over-dependence on audio material. The insistence on the use of correct braille contractions can impede writing development and the student may come to believe that writing is a tedious undertaking whose purpose is to get ‘all the dots right’ (Rex et. al, 1994, p. 108). Students with low vision seldom have clear images of word patterns. Word recognition can be enhanced by enlarged print, font selection and the use of low vision devices.

Learning to research through reading identified in Phase 4 (IRA NAEYC, 1998) is a further impediment to students with vision impairments. Students with sight can scan library

shelves to select appropriate texts. Not only is the student with a vision impairment disadvantaged by being physically unable to do this but there is not the choice of texts available to students working in alternative formats (Gale & Cronin, 1998). While information on the Internet is an option for research, some sites are inaccessible to people who are vision impaired. The student may only listen to the information and fail to access the spelling of new words.

The skills of drafting, revising and editing identified in Phase 5 (IRA NAEYC, 1998), present difficulties to a student using braille. Rex et. al have stated that writing with a braillewriter is less flexible and less 'recursive' than is writing in print. Both the revision and editing of a paper are more cumbersome with a brailler, and feedback from the regular classroom teacher is less readily accessible to the student (1994, p. 56). For a student with low vision the task is often laborious.

Unless students use computer word processing or braille computers, such as the Mountbatten Brailler, to produce their work, it is difficult for them to share their work with their peers. It is even more difficult for their peers to reciprocate and share their work with the student who is blind, other than aurally.

Controversy has existed for over a quarter of a century over the most effective instructional approaches for teaching reading (Palmer, 2000, p. 111). Lamb (1995) and Swenson (1999) have identified the whole language approach to literacy as one that works well for braille-using students while Rex et. al (1994) have stated that a more and middle of the road approach has emerged. Regular schools vary in their teaching approaches to literacy and the teaching/learning methods used may not always be those best suited to students who use braille. As for other students, blind or vision impaired students will vary in their preferred learning styles.

Effective and practical approaches

We are continually reminded that children are our future. Early childhood programmes can have an important in physical and mental development. They can also enhance the performance and progress of children in schooling, which is, in turn, associated with important changes in the skills and outlooks that affect adult behaviour. As Rogoff pointed out 20 years ago, schooling helps build skills such as the ability to organise knowledge into meaningful categories, to transfer knowledge from one situation to another, and to be more selective in the use of information (Rogoff, 1980).

Young braille-using students require a high degree of specialised assistance in the early stages of learning:

> *Learning to read braille is a time-consuming and complex process that requires daily instruction by a teacher of visually impaired students. This frequent intensive level of intervention is necessary to provide young students with consistent access to adapted classroom materials and to give them sufficient practise to master the braille code and correct braille reading techniques* (Swenson1999, p. 8).

Assisting a child at this early stage of learning must be based on the unique needs of the individual student and delivered by a professional who fully understands the impact of vision loss on learning, is an expert in braille, and trained to teach braille. Such a professional must also have the 'knowledge of the perceptual and cognitive processes of braille reading and writing and be familiar with techniques for teaching reading' (Palmer, 2000, p. 136).

The advent of computers and word processing packages has greatly assisted students in the writing process. It enables them edit their work with comparative ease and to produce a hard print copy of their work that can be read by their teachers and peers. It is an important benefit for students to have access to this technology.

QUESTIONS

2. 1.i What competencies do students in the target group require for the acquisition of literacy, which are additional to, or different from the competencies required by their sighted peers?

2. 1.ii What impediments are faced by teachers in enabling students in the target group to achieve satisfactory literacy outcomes?

2. 1.iii What teaching/learning approaches, being used by your agency, are proving efficacious?

STUDENT ISSUE 2: Numeracy

The issues

Difficulties in teaching mathematics to blind and vision impaired students include time constraints, lack of knowledge of the braille mathematics code, and the increasingly visual nature of mathematics texts (Gale & Cronin, 1998).

Mathematics is considered one of the most important key learning areas in today's curriculum (Booty, 1998). To perform at the same mathematical level as sighted peers, students with vision impairments need the support of teachers who have both an understanding of the mathematics syllabus and a sound knowledge of the braille mathematics code.

Impediments

In Australia, specialist teachers of students who are blind or vision impaired continually voice their concerns about the difficulties of teaching maths to students with vision problems, and the level of attainment of these students (personal communication, visiting teachers' meeting, RVIB October 2000). However, little has been reported in the Australian professional literature on this issue.

Time Constraints

One impediment for students who are blind or vision impaired is that work often takes longer to complete compared to their sighted peers (Round Table, 1999). In the area of mathematics and science, the focus of work is often very visual and students who are blind or vision impaired may require extra time to complete work or a modified workload (Gale & Cronin, 1998). Telec, Boyd and King (1997) have acknowledged that there are difficulties in the area of mathematics with 'time constraints for the student with additional equipment', indicating that problems with the use of 'esoteric materials can be eased by setting additional maths questions' (section 2, p. 38). Further, it is suggested that additional time and exposure to learning materials will be necessary to allow the student to develop mathematical concepts (Education Queensland & Griffith University, 1997).

Increasing visual nature of maths

Teaching material is becoming more visual and this places demands upon the supply of appropriately adapted resources that are accessible to children who are blind or vision impaired (RNIB, 1998). Mathematical symbols can present major problems (Telec, Boyd & King, 1997, section 2, p. 38).

Limitations of voice output software

All electronic screen readers – for example, JAWS for Windows or Window Eyes – read information in a linear fashion. As a consequence, they are unable to interpret mathematical notation or the vertical layout of mathematical equations (personal communication, L. Kumutat, December 2000). This has serious implications for students who are not proficient braille readers but who wish to study mathematics through voice output software. The use of voice output software is impractical for arithmetic and mathematics, not simply because all information is presented linearly, but also because it cannot cope with the graphical symbols used by word processors for mathematics. Specialist software has been developed for accessing mathematics through a screen

reader, but it is oriented to advanced mathematics and its initial application has been beyond the scope of numeracy acquisition. This is not to say that the work may have a wider application for use by both primary and secondary school students. Raman (1994) describes the development of an Audio System for Technical Reading. The system takes a mathematics document written in LaTeX and reads it aloud using synthetic speech and audio cues such as pitch variation to show deviations above and below the baseline. The approach and its application is summarised by Hayes (1996).

Competency levels - students

Overseas literature has voiced concerns about the competency levels of numeracy in students who are blind or vision impaired. A review of literature by Kapperman, Heinze & Strickens (1997) found a low level of literacy in mathematics for students who are blind or vision impaired.

Competency levels – teachers

Students with vision impairment may perform poorly in mathematics due inadequate levels of competency of their teachers. DeMario & Lian (2000) reported on teachers' lack of abilities in the maths code when quoting a study by DeMario, Lang & Lian (1998). Teachers in the United States indicated that they felt much better prepared using the literary braille code than using the American Nemeth mathematics code, and their attitude toward the Nemeth code was 'not as positive as was their attitude toward literary braille' (p. 7). Gentle (2000) found that 53% of vision support teachers (VST) across Australia were knowledgeable of the braille mathematics code, although actual proficiency levels in terms of teaching or transcription were not investigated. The study found varying levels of knowledge of the braille mathematics code across States and Territories and across educational sectors (government, independent and Catholic).

Changing maths curriculum

Today's perpetually changing maths curriculum presents increasing difficulties for students with vision impairments. Clamp (1997) has stated that as the curriculum has become more practical, investigative, constructive and more individually creative, it has in fact become more labour intensive for the student who is visually impaired. This is also the case for the teacher who has to provide suitable mathematical experiences to facilitate understanding in these active learning situations (p. 234).

Difficulties with concept acquisition

There are other impediments in the vital initial acquisition of concepts. The Texas School for the Blind stated that numeracy requires a sound concept base in order to perform at the same mathematical level as peers; students with vision impairments must develop concepts to a comparable standard (Texas School for the Blind: http://www.tsbvi.edumath/teaching, 2000). Clamp (1997) reported that lack of visual experiences impedes concept development and for pupils who have a visual impairment all aspects of mathematical concept formation rely on the consolidation of experiences mediated by the use of real objects and appropriate relevant language in everyday situations. Limited spatial awareness and poor manual dexterity may delay the development of geometrical, graphical, and time-distance concepts (p. 234).

The Texas School for the Blind (2000) has reported that one of the most difficult challenges it has faced has been teaching concepts involving three-dimensional objects. Three-dimensional problems are found in all levels of mathematics. They are often difficult

for students with vision impairments to understand, especially when trying to depict 3-D objects in a 2-D drawing. Such a drawing, even when tactually raised, makes no sense without sighted `perspective`. Chapman (1978) commented that most mathematics is presented in a visual, two dimensional, and non-linear form, which clearly presents an access problem to people who are visually impaired (p. 105).

Compounding problems:

Cahill, Linehan, McCarthy, Gbormans and Engelen (1996) noted that as a result of a limited visual pattern and problems with object relationship and shape experiences, students with vision impairments often experience difficulties with maths presentations. Further, Sims (1967) has provided a list of difficulties in comprehending and replicating diagrammatic work and general speed of calculation (except in the case of mental arithmetic). The results of the Cahill et al. survey suggest that the low number taking higher-level mathematics examinations is associated with mathematical access difficulties rather than any conceptual or cognitive problem. The speed of manipulation and memory overload cause students the most difficulty.

Mathematics equipment

Rapp and Rapp (1992) reported that teachers encounter continuing difficulties in providing materials and equipment, or rely upon ineffectual maths equipment. Tactile measuring devices in some cases have weaknesses and inaccuracies built into the apparatus. These weaknesses not only create problems for the pupil, but place restrictions on the tasks which the teacher can prescribe (Texas School for the Blind: http://www.tsbvi.edumath/teaching, 2000). As well as the challenge of keeping up with mathematics technology tools for sighted students, the scientific graphic calculator is increasingly becoming a required tool in mathematics and science classrooms. They are also becoming necessary to complete coursework and standardised tests. Students who are blind can solve the majority of set problems without a scientific graphic calculator, but are at a disadvantage if they must do everything 'manually' (Texas School for the Blind).

Effective and practical approaches

Ahlberg and Csocsan (1999) have written persuasively on the ways in which children who are blind or vision impaired experience numbers. They propose that teaching arithmetic skills to such children should not focus on counting on the fingers or creating finger patterns. Instead, a way of resisting developmental delay is to provide opportunities to group elements and numbers through hearing and touch (p. 559). They further assert that children who are blind require training to perceive their fingers as objects to be connected with number words.

Rapp and Rapp (1992) have suggested that teachers attempt to bring school administrators up-to-date on any new technology or equipment that is available for students taking mathematics courses, in order to bring about improvement in the area of mathematics for braille users. Administrators also need to become aware of the extra time requirements necessary for students with vision impairments, and to encourage and permit teachers to participate in professional skills updating. They also suggested that efforts to develop software to transcribe maths into braille should be a priority.

DeMario and Lian (2000) suggest that to provide successful mathematics instruction, a standard needs to be set for training teachers in the braille maths code at the university level. They propose that this should be taught separately from the literacy unit. They also suggest that more research is required to develop effective instructional strategies to teach

students with severe vision impairments and increase their achievement levels, particularly at the higher levels of maths.

Other recent research has addressed maths instruction for students with vision impairments, in particular Dick and Kubiak (1997); Kapperman, Heinze and Stricken (1997) and Kapperman and Stricken (1998). These authors have suggested that many of the currently available mathematics resources and materials for teachers and students are inadequate.

QUESTIONS

2. 2.i What competencies do the students in the target group require for the acquisition of numeracy, which are additional to, or different from the competencies required by their sighted peers?

2. 2.ii What impediments are faced by teachers in enabling students in the target group to achieve satisfactory numeracy outcomes?

2. 2.iii What teaching/learning approaches being used by your agency are proving efficacious?

STUDENT ISSUE 3: The Braille Code and Teaching Standards

The issues

Literacy and numeracy acquisition for students with vision impairments is affected by:

a) the complexity of the braille code;

b) the difficulty of teaching braille in a regular school classroom setting;

c) an absence in Australia of widely accepted standards for the teaching of braille literacy and numeracy (Gentle, 2000).

The Australian Braille Authority (ABA,1999), has asserted that braille services in Australia are, arguably, among the poorest in the western world, and lag behind those available in some developing countries (p.1). Examples cited by the ABA include the virtual absence in Australia of braille magazines and the difficulties faced in obtaining specific titles if the request is not linked to the subject requirements of specific students.

The perceptions of classroom teachers about the difficulties associated with learning braille and the complexity of the braille code, impact upon their willingness to reinforce braille skills during the specialist teacher's absence (Mosen & Small, 1996; Swenson, 1999). In turn, these perceptions impact upon the student's motivation and enthusiasm to master the braille code. As Swenson (1999) has stated, "I want my students to be motivated less by a desire to please me than by a love of books and an eagerness to communicate their ideas in writing. These are the attitudes that will be with them for a lifetime" (p. 161).

The ABA has also stated that since the first [recent series] international English Braille conference in 1982, there has been growing recognition that the general decline in levels of braille literacy and the erosion of the status of braille as the primary communication medium for blind people is problematic. This decline has been partly attributable to the inconsistencies and complexities of the braille system itself (1999, p. 9). The Unified Braille Code (UBC) Research Project initiated in the United States in 1991, aims at developing 'a single, unified braille code that will encompass all subject areas with the exception of music, while preserving the basic symbology and structure of standard English Braille' (p. 10).

Impediments

Learning based on the tactile complexity of braille may result in the student being out of phase with his/her sighted peers in literacy development in the early years of school (H. Grainger, personal communication November 2000). Swenson (1999) has stated that learning the braille code adds another layer to the already complex process of learning to read. This is not simply due to use of the tactual rather than the visual medium, but also because the learning of Grade II braille requires mastery of short-forms, abbreviations and their rules, in addition to the basic rules of English spelling and grammar.

Lamb (1995) stated that children who are blind have limited experiences, including those with books, and have less access to published materials and role models for reading and writing (pp. 185-6). They are not exposed to icons and signs, for example, 'McDonalds' 'Coca Cola', street signs or the constantly changing array of classroom display material. Because there is less material available for braille readers than for print readers, many students with vision impairments come to school less well prepared in their experiences in the written medium than do print readers. Many will require a certain amount of direct

instruction with skills-oriented activities, controlled vocabulary, and repetition (Wormsley & D'Andrea, 1997, pp. 9 & 82).

Students benefit from access to a variety of braille reading material for use at home and at school, both in the classroom and school library, with provision matching the supply of print books to sighted readers. Itinerant/visiting teachers and teachers/integration aides experience challenges in the production of tactile-braille books and tactile graphics to match the pace of provision of books to sighted readers (Telec, 2000).

Two recent American small-group studies of the reading rates of adolescent and adult print and braille readers (Trent & Truan, 1997; Wetzel & Knowlton, 2000) have shown significant differences in print and braille reading rates. Those authors found that proficient braille adult readers were 30% to 60% slower than proficient sighted readers across oral, silent and study reading tasks. This result is widely supported in the literature (Mason & McCall, 1997; Scholl, 1986). Slower reading rates are associated with limitations in the size of the perceptual unit to group (chunk) symbols in Braille (Lamb, 1995).

Braille has been developed to allow the literature of almost every conceivable subject to be rendered in braille (Australian Braille Authority, 1999, p. 7). However, there currently exists a lack of consistency between the various braille codes used in different countries, as well as a lack of consistency with the codes used in individual countries. Adoption by Australia of the Unified English Braille Code (UEBC) will solve some of these problems. However, the introduction of UEBC will be disruptive in the short-term for both students and teachers, particularly with regard to mathematics, where the code will be different from the present Australian Mathematics code (Australian Braille Authority, 1999).

Effective and practical approaches

Rex, Koenig, Wormsley and Baker (1994) provided a short list of the basic components necessary for teaching students who are blind:

a) individualism;

b) concreteness;

c) unified instruction;

d) additional stimulation; and

e) self activity.

Learning to read braille is, as Spungin (1996) has indicated, a time-consuming and complex process that requires daily instruction by a teacher of vision impaired students. Frequent, intensive intervention is needed, as Swenson (1999) has asserted, in order to provide young students with consistent access to adapted classroom materials and give them sufficient practice to master the braille code and correct their reading techniques (p. 8). It is important, therefore, that a braille reader receives daily intervention from a qualified teacher of students with vision impairments to build the literacy foundation necessary to compete with sighted peers. The challenge is to ensure that the mainstreamed child masters all competencies without missing part of the general education curriculum.

The Australian Braille Authority (1999) listed the following as fundamental changes that must take place in the near future if Australia is to reverse its isolation from the rest of the braille-using world:

1. *Need for more effective production:* Producers of braille material are experiencing a growth in the demand for material with complex formats, due partly to the

increasingly graphical nature of printed material. All production-quality software currently used in Australia is optimised for American braille codes and practices.

2. *Need for consolidated documentation:* Braille is currently being taught predominantly in mainstream environments. With a growing proportion of braille being produced by smaller organisations and individual teachers in schools, the task of obtaining, maintaining and updating resource materials and documentation is becoming unmanageable for such voluntary organisations as the Australian Braille Authority.
3. *Need for teaching resources:* Because Australian braille usage is based on a mixture of British and American braille codes, it is only possible to use teaching materials produced in these countries with substantial modifications.
4. *Developments in the delivery of braille material:* With the advances in information technology such as the Internet, it is now possible to provide on-line repositories of braille material that can be accessed by braille users world-wide. As much of this material is being produced in the USA, Australian braille users are likely to be increasingly disadvantaged by reliance on braille codes and practices that are significantly different from those used in other countries.
5. *Access to braille translation software:* There is an urgent need for the availability of computerised braille production software, which has the potential to bring about substantial time- and cost-savings in the production of Mathematics and Science codes. The version of the Duxbury Braille Translator released early in 2001 includes modules for translation into the United States (Nemeth) and British braille mathematics codes, but not the Australian braille mathematics code.

QUESTION

2. 3.i Has your system or agency observed any trend over the past two decades in the use of braille relative to other methods for encoding/decoding text? For example, increased use of audio taped material and computer speech output.

Please provide details.

STUDENT ISSUE 4: Appropriate Literacy Media for Students with Low Vision

The literature recommends a flexible approach to the selection of literacy media, in which braille and print are valued equally (Mosen & Small, 1996; Jennings, 1999; Swenson, 1999).

The perceptions of parents, teachers and students with low vision impact upon the choice of literary medium, print or braille. Societal attitudes towards blindness, whether conscious or unconscious, are associated with dependency and inferiority (Mullen, 1990). Braille is often equated with blindness, and children with significant vision impairments or unstable, deteriorating eye conditions, may be influenced by this negative view of blindness when making decisions about learning to read in large print or braille (Spungin, 1996). This may result in limited or delayed access to the most appropriate medium for educational needs (Committee to Develop Guidelines for Literacy, 1991; Mosen & Small, 1996).

The choice of literacy media for students with low vision involves consideration of a variety of factors, including child-related factors as

- age,
- cognitive and educational level, and
- eye condition.

Other areas of concern include:

- mechanical factors (quantity and quality of assignments, ability to take notes in chosen medium, reading age and accuracy); and
- social factors (portability, availability and cost of reading medium, child's motivation to use the medium, family or teacher perceptions of child's needs) (Craig, Priest, Harnack 1997).

Impediments

Koenig & Holbrook (1995) discussed the issue of an emphasis on print by educators (whether general or specialist) as the major educational medium in many or most school settings. This practice may be to the detriment of students with low vision who are not, in consequence, being encouraged by their teachers to use braille.

Effective and practical approaches

Corn and Koenig (1996) have stated that the attainment of literacy by students with low vision requires high quality services and trained professionals, guided by recognised standards in the field of vision impairment. These professionals should maintain an ongoing direct involvement in student literacy programmes. These authors specify a number of guiding principles for professionals, including:

- ensuring that young children have a wealth of basic life experiences and direct access to early literacy events;
- ensuring that students develop academic literacy skills that allow for reading with efficiency, stamina, comfort, and enjoyment during the school years; and
- teaching persons with low vision multiple strategies for gaining independent and ready access to information.

QUESTIONS

2. 4.i What reading/writing (encoding/decoding) systems do students in the target group use and what is their proportion or percentage of the total number of blind and vision impaired students your system or agency serves:

a) braille;

b) braille and print;

c) regular print;

d) large print; or

e) other methods? Please specify.

2. 4.ii What methods are preferred and/or used by your students for accessing and creating text? For example, Perkins Brailler, Eureka, laptop computer, CTTV, etc.

2. 4.iii What do you consider are the relative advantages and disadvantages of the various encoding/decoding methods available to people who are blind or vision impaired?

STUDENT ISSUE 5: Curriculum Access

The issues

Students with vision impairments are entitled to receive access to the same curriculum as their sighted peers. This curriculum, in some views, should include access to books and resource material of equal quality and clarity, in the appropriate format (for example, braille, large print, electronic text and audio), at the same time and at the same level, including the same book edition (Kelley & Gale. 1998; Mason & McCall, 1997; Mosen & Small, 1996; RNIB, 1998).

Corn et al (1995) consider that access to educational services should include the provision of instructional materials to students in the appropriate media and at the same time as their sighted peers. There is a need for special legislation or regulation to ensure that this takes place.

Kelley & Gale (1998) and Ryles (2000) have stated that literacy and numeracy skills should provide access to knowledge skills and understandings through the medium of braille across all learning areas to the same level of proficiency expected of the student's sighted peers. Students should be exposed to braille in a range of contexts, such as environmental print, factual and fictional texts and the full range of text types/genres (F. Telec, personal communication, October 2000).

Impediments

Problems associated with the delivery of texts in alternate formats have been widely seen as a major impediment by vision support teachers (personal communication, visiting teachers' meeting, RVIB October 2000). Spungin (1996) reported difficulties in finding braille that is produced on a timely basis (p. 271). The problem is apparently not a new one. The current President of the New South Wales Royal Blind Society, Graeme Innes (now also Deputy Disability Commissioner for the Human Rights and Equal Opportunity Commission), commenting on his education some 30 years ago, asserted that "one of my enduring memories of school is sitting in class waiting, waiting, waiting for the braille version of my textbook to arrive. While I sat there, wasting my time, my classmates got on with the work" (personal communication, report of article in *The Australian*, Round Table on Information Access for People with Disabilities Listserv, 2000).

Mosen and Small (1996) reported that the provision of work material in the appropriate format in New Zealand was affected by the student's geographical location, the organisation of the student's teacher or tutor and whether the material was already available in alternative format. Making do with a different textbook or an earlier (often inferior) edition of a textbook can seriously disadvantage learners in today's competitive environment (Mosen & Small, 1996, www.abcnz.org.nz/braille.htm).

Current teaching practice in Australia involves flexible use of a wide range of texts. This, however, has consequences for students who require texts in accessible formats, because of the time it takes to produce textbooks in formats such as braille or large print.

Effective and practical approaches

The State Legislature of Connecticut (1996) has had before it a Model Braille Literacy Bill, which was jointly proposed by the National Federation of the Blind of Connecticut and the Connecticut Council of the Blind and recommended by the Braille Literacy Task Force.

The intent of the legislation was to ensure that students with vision impairments are able to access books and resources at the same time as sighted peers. Such an act may have an unintended detrimental impact on strategies available to teachers of blind and vision impaired students in mainstream classes.

The State of Massachusetts has a similar Braille Literacy Act (Massachusetts Board of Education, 2000). The law in that State requires initial certification of teachers of students who are blind or vision impaired and the development of a teacher competence certification test. Under the Act, the State is required to periodically review and monitor its vision resource library programme and to develop guidelines to assist school districts in the timely ordering of braille materials, to ensure availability of material in the appropriate format at beginning of the school year. There is, further, a requirement under law to assess the need for braille instruction and to identify a braille assessment protocol.

The adoption of the Unified English Braille Code (UEBC), if ratified by the International Council on English Braille General Assembly in 2003, will improve the usage of Braille in Australia by making significant changes to Australian braille codes and practices. The UEBC will allow more cost-effective production of braille by Australian producers, as well as allowing access to a greater quantity of braille produced in other countries (Australian Braille Authority, 1999).

QUESTION

2. 5.i Are there any concerns you wish to raise or advice you wish to proffer on the issue of curriculum access?

STUDENT ISSUE 6: Tactile Graphics

Issues

Recent years have seen a dramatic increase in graphical information in school texts, resulting in the need to produce and teach tactile graphics. The ability to make and read graphics will lead to better communication skills, better educational and employment opportunities, better orientation and mobility, and thereby a better quality of life (Parkes, 1998). This notion is also supported by Mason and McCall (1997), who stated that tactual skills may transfer to other areas of academic study and to daily living skills. However, there are difficulties with the production and interpretation of tactile graphics.

Wild, Hinton & Hinton (1997) state that as today's world of information transfer becomes increasingly visual there is the danger that the blind student with no concept of or access to the visual media will find it more and more difficult to come to grips with modern courses (Wild, Hinton & Hinton, 1997). Gale (1998) suggests that if printed graphical information is not presented to students with vision impairments, they have been denied essential academic data (p. 153).

Impediments

An impediment allied with numeracy, but one that continues to increasingly permeate the spectrum of all educational enterprise, is the explosion of graphical information and communication. Students are increasingly faced and must grapple with this relatively new and difficult medium. d'Apice (1998) has stated that gathering information presented in graphical form is one of the most challenging skills for students with vision impairments. It is also imperative for students to learn to produce their own graphics.

Lack of knowledge by vision support teachers in the production and interpretation of tactile graphics was seen as an impediment (F. Telec, personal communication, November 2000). Although teachers have been assisting students to interpret and produce tactile graphics, systematic teaching programmes are not yet available (Gale, 2000).

Effective and practical approaches

Gale (1999) has made the following recommendations at a tactile graphics workshop presented to educators of students with vision impairments in New South Wales:

- Tactile graphics should be introduced to children who are blind at a very early age, with the provision of continuing intensive exposure to and ongoing training in the interpretation of tactile graphics.
- People who are blind need to develop an awareness of shape, direction and distance before they can correlate pictures, maps or other raised representations with any kind of external reality.
- Students who are blind will only be able to read graphical material if they are constantly provided with the material and taught the interpretation skills to make use of tactual graphics.
- To develop a comprehensive understanding, students must be encouraged to both read and interpret graphical material as well as to create and produce their own graphics.
- People who are blind must be continuously introduced to graphics prepared from a wide range of tactual media.

QUESTION

2. 6.i Are there any concerns you wish to raise or advice you wish to proffer on the issue of Tactile Graphics?

STUDENT ISSUE 7: Technology

Issues

Rapidly escalating technological change has brought with it issues related to the availability, range, choice and cost of technological support for literacy and numeracy. There is also a perception that electronic technology can replace braille (Kelly, 1998). The efficiency of any approach which avoids the learning of an encoding method should be measured in the light of understanding of fundamental literacy skills it enables in the student.

Current professional literature features a debate over the efficacy of audio options for literacy development as this affects children with vision impairments. A perspective emerging in the literature is that technology should enhance literacy development in braille or print, with text-to-speech systems and audiotapes augmenting reading and enabling access to material not available in braille (Halliday, 1999; Indiana Department of Education, 1997; Mason & McCall, 1997; Wittenstein, 1994;). Audio options may be preferred over braille or large print in particular situations. In this regard, Halliday (1999) stated that speech is a more efficient form of reading basic text and of reviewing what one writes. However, the more complex the formatting becomes, the greater the need for spatial access, which is best accomplished either visually or tactually (p. 4).

The strengths of the electronic media relate to the volatile or changeable nature of data access. Braille and audiocassette tapes are examples of fixed media, whereas electronic text is accessible via synthesised speech or electro-mechanical braille display (Halliday, 1999). For this reason, computers and computerised note-takers are ideal for storing, retrieving and organising information. Halliday (1999) recommended the combination of a computer, speech synthesiser, scanner and special software to access books and articles that are not available in Braille or large print. Equality of access to the curriculum, research facilities and future employment opportunities are becoming increasingly dependent upon skills in the use of multi-media. Teachers of students with vision impairments play an important role in the teaching of skills and knowledge necessary for efficient and effective access to multimedia options (Kelley & Gale, 1998).

Impediments

The computer revolution has raised general expectations and benchmarks. There is a significant additional load for students who are blind or vision impaired in learning to use computers and the assistive technology required for their access. Furthermore, an efficient student who is blind is likely to be significantly slower in carrying out word-processing or at accessing the Internet than a sighted peer. This is because access is generally more complex via voice output software and the use of keyboard commands rather than the mouse (W. Jolley, personal communication, December 2000).

The need for professional training of vision support teachers in the use of new technologies, and their ability to teach and support students in the use of computers and electronic braille note-takers, is a significant issue. One major challenge for educators, according to Downie (Kelly, 1998), is that no individual can hope to keep fully abreast of innovations. Itinerant/visiting teachers must be trained to the point of proficiency in new technologies in order to promote their use by students with vision impairments.

The Australian Braille Authority (1999) stated that for subjects such as mathematics, statistics, computing and phonetics, braille was – and still is – the only way of gaining access to study material (p. 5).

Effective and practical approaches

Kelley (1998) stated that to facilitate effective use of new technologies by students, vision support teachers (VST) must be able to evaluate and select appropriate technology, have the skills to introduce it to the student, and have the knowledge which allows the VST to remain current with changes in technology' (p.218). It is essential that VST receive professional development in the range and variety of technology available and the information technology skills required for effective instruction of students in the use of such technologies (Kelley, 1998).

QUESTION

2. 7.i What assistive technology (including software) is used to develop literacy and numeracy skills in your system or agency by students in in the target group? For example, Perkins Brailler, laptop computer with JFW software, Mountbatten Brailler with speech output, audio tapes and tape recorder, CTTV, etc.

a) How many of your students in the target group use each of these aids or adaptive software?

b) What impediments, in your opinion, prevent students from using the technology or adaptive software to its maximum efficiency?

STUDENT ISSUE 8: Assessment and Benchmarking

Teachers of students with vision impairments must ensure that appropriate qualitative assessment underpins instructional planning and programming in literacy and numeracy. A range of appropriate assessments will enhance communication and reporting of student achievement by teachers and specialist teachers (Rex, Koenig, Wormsley, & Baker, 1994). The Missouri Department of Elementary and Secondary Education (1999) recommended the use of assessment tools such as the learning media assessment, functional literacy assessment, and information technology and adaptive technology assessments. The importance of clear, useful records, passed on in a timely manner to the next setting, was emphasised (RNIB, 1998).

Corn, Hatlen, Huebner, Ryan and Siller (1995) consider that educational and developmental goals, including instruction, should reflect the assessed needs of each student in all areas of academic and disability-specific core curricula.

H Grainger points out that limitations and impediments in the assessment of students with vision impairments in all Australian States and Territories have prevented the establishment of benchmarks comparable to those established for literacy and numeracy acquisition of sighted students (Personal communication, October 2000).

Impediments

In a preliminary braille literacy survey of teaching methods currently being used in New South Wales Department of Education and Training schools, itinerant teachers reported a range of difficulties associated with standardised tests. These tests include, for example, the Basic Skills Test (Year 3 and Year 5) and the ELLA test (Year 7) undertaken by braille-using students. Comments reported included (Telec, 2000):

- Academically able students are overwhelmed by time constraints, even though they were capable of completing the work. One student reportedly cried through frustration with the 'tyranny of time'.
- Time allocated for test completion was often not sufficient, as it is time-consuming accessing information that sighted children see 'at a glance'.
- It was reported that some students took up to two days to complete the assessment. It was noted that one student guessed the answers towards the end of the day, resulting in a below average performance.
- Tactile graphics were frequently complex and required additional time to interpret.
- Written descriptions made tasks less exciting and more arduous.
- The Year 3 level Basic Skills Test is presented in Grade 2 braille. Students would be disadvantaged if they have not yet learned the entire Grade 2 code and associated rules.
- Some students were presented with the Basic Skills Test as an oral test. This impacted upon the interpretation of student results in relation to the performance of sighted peers.
- No alterations or modifications can be made to the Basic Skills tests, ELLA test or SNAP test when converting to alternate formats, as compared with the School Certificate (T. d'Apice, personal communication, December 2000).

Effective and practical approaches

Since the adoption of the National Goals for Schooling by the Australian Ministers of Education in 1989, there has been a move towards competency-based assessment and the development of national profiles for the assessment of attainment for all students in the major areas of learning (Blatch, Nagel & Cruickshank, 1998).

The educational policy statement of Blind Citizens Australia (1999) included the principle that assessment procedures should include provision for reasonable accommodation, taking into account a person's specific needs and the preservation of academic standards (p. 10).

'Hands-on' pre-test training workshops are an option to assist students with vision impairments in completing standardised tests in braille. These should include training in effective braille scanning techniques to locate information, braille transcription procedures for test layout in braille, and opportunities to explore the format in which information will be presented in braille (Blatch, Nagel & Cruickshank, 1998). St. Lucy's School, New South Wales, offers holiday workshops for braille-using students on the Basic Skills Test, literacy, numeracy and the disability-specific skills. Relatively small numbers of students currently attend these four-day residential workshops offered twice-yearly to students in Years 3 –4 and Years 5 – 6 (T. d'Apice, personal communication, December 2000).

QUESTIONS

2. 8.i How do your students perform on State/Territory or National tests of literacy and numeracy compared to their fully sighted peers? If possible, please also provide a breakdown of students according to their age group and the reading/writing format and methods they use.

2. 8.ii What impediments do students who are blind or vision impaired face in achieving literacy and numeracy outcomes consistent with the Agreed National Goals of Schooling?

STUDENT ISSUE 9: Parents as Partners

Issues

In the view of Corn, Hatlen, Huebner, Ryan & Siller (1995), there is a need for policies and procedures to ensure the access of all parents to full participation and equal partnership in the education process.

Kelley & Gale (1998), Koenig & Farrenkopf (1997) and Swenson (1999) all report the value placed on parent participation in the education of their children. Swenson stated that the involvement of parents also enhances students' opportunities for success. Parents who take the time to learn braille, supervise homework, and become involved in the school programme communicate the importance of braille literacy to their child (p. 8). Parents have an important role in exposing young children with vision impairment to early experiences that promote literacy development through the daily experiences of routine activities with family and friends around the home and within the community (Rex et al., 1994; Wormsley, 1997).

Impediments

Parental concerns raised in the Royal Blind Society and the Royal Institute for Deaf and Blind Children research project (1999) included the added difficulties experienced at high school level, where the number of teachers involved in the education of children increases, together with the difficulty level and complexity of school work. Homework tasks, such as projects and mathematics, take longer for a student with vision impairment than for a sighted student, and this requires negotiation for extra time or other arrangements.

Effective and practical approaches

Hartshorne (2000) recommends training to help professionals learn to establish rapport and generate confidence in family members, to learn to work with all family members, to provide clear and accurate information, and to provide appropriate feedback to parents, and to enlist the help of other parents (p. 47).

QUESTION

2. 9.1 Are there any concerns you wish to raise or advice you wish to proffer on the issue of Parents as Partners?

SECTION THREE: ISSUES OF LITERACY AND NUMERACY ACQUISITION FOR POLICY DEVELOPMENT

This section of the Discussion Paper addresses four issues that directly relate to support systems which affect the acquisition of literacy and numeracy skills by students who are blind or vision impaired. These issues are:

1. Professional preparation;
2. Specialist teachers and resource provision;
3. Australian national level data; and
4. National Agenda.

This Discussion Paper does not provide exhaustive coverage of each issue. Our purpose is to provide respondents with an overview of each issue, to identify impediments and present practical approaches and provide prompts or cues for your response to our questions.

Australia's States and Territories have responsibility for the administration and delivery of school education within their area of jurisdiction. The result for students who are blind or vision impaired is significant variation between systems.

Your response will aid in the construction of a useful report to DETYA on each issue. As an aid to the task, each of the numbered issues is presented on a new page.

SYSTEMIC ISSUE 1: Professional Preparation

Students who are blind or vision impaired may learn differently from other students in accessing the core curriculum. For example, students who are blind may need to be assisted to explore objects tactually, or have concepts or objects explicitly explained or described to them. Thus teachers need appropriate knowledge and skills to effectively support students who are blind or vision impaired.

What level and kind of support is needed by each student who is blind or vision impaired? This particular systemic issue will be explored in more detail during later stages of the research project.

A specialist teacher of students who are blind or vision impaired needs to have the following skills and knowledge:

- a foundation in regular education (including methodology);
- techniques for curriculum adaptation; and
- skills to deliver the expanded core curriculum (Hazekamp et al., 1993).

Lamb (1997) has developed a list of competencies for Australian vision education teachers. These include knowledge in the areas of:

- vision;
- educational management;
- braille media;
- resources and technology;
- orientation and mobility;
- assistive technology; and
- professional issues/administration.

This means that specialist teachers of students who are blind or vision impaired require specific training. It is not feasible for them to receive this specific training as part of a pre-service under-graduate teacher training course, where there is only enough time for elementary knowledge and skills to be acquired. The necessary knowledge and skills are best obtained through training in graduate courses. If they are lacking in knowledge, resources or confidence, this impacts on the quality of their service delivery.

There are currently no national level data on specialist teacher education, including initial training, in terms of course content, teacher development, subsequent in-service, and award bearing professional development (Gentle, 2000).

Professional training is not uniform across the States and Territories, and some Government-funded university programmes have been cut in recent budgets. Most often, staff training is of the in-service variety provided by one or other of the major specialist community sector organisations. Australia is not alone in this predicament. Reports from colleagues attending overseas conferences indicate a similar response to training needs (Steer, 1998).

The optimal development of literacy and numeracy skills for students with vision impairments in alternate formats (for example, braille, moon and large print) requires student access to experienced specialist teachers, professionals who are skilled in the

provision of intensive, consistent, quality instruction and teaching strategies during all stages of literacy development (Koenig, 1995; Koenig & Farrenkopf, 1997; Mullen, 1990; Swenson, 1999; Verick 1999). Deciding in which area a student needs adaptations, either in skill training or modifications, and which intervention would be most effective is an essential task for the teacher, parent or carer, IST(V), other professionals and the student (Telec, Boyd & King, 1997).

In addition, access to specialist teachers who are competent Braille users and strong advocates for the use of Braille by students who are acquiring literacy and numeracy in braille is an important issue (Lamb, 1995; Mosen & Small, 1996). Mason and McCall (1997) have stated that the success of children learning to communicate through braille is determined to a large extent by the teaching expertise made available to them. It can also be attributed to the teachers' 'enthusiasm for braille, their knowledge of the code and of the perceptual and cognitive processes of braille reading and writing, and their familiarity with techniques for the teaching of reading' (p. 152).

Teachers also need to be acquainted with the resources available, and possess the skills to adapt and interpret these resources to best facilitate literacy and numeracy acquisition (Lamb, 1998b).

Much of the support to students who are blind or vision impaired is apparently provided by untrained personnel (teacher/integration aides) who lack expertise in braille teaching and an understanding of the ways in which children who are blind or vision impaired learn. Mosen & Small (1996) and Gentle (2000) report that teacher aides are not well qualified in braille.

A joint research project of Royal Blind Society and Royal Institute for Deaf and Blind Children (1999) emphasised the importance families place on knowledge, expertise and professionalism in the area of sensory impairment at the school administration level, classroom level (teachers and teachers' aides), and itinerant/visiting teacher level. The research project reported high variability in the quality of education received by children with vision impairments in New South Wales and Australian Capital Territory schools.

Impediments

There are some major obstacles to teachers accessing specialist training in Australia. For example, teacher training (vision impairment) is only available in Queensland, New South Wales and South Australia. People in other States only have access to teacher training via the emerging distance education programmes. The training is costly and funded cadetships are not generally available.

The net result appears to be fewer trained teachers specialising in blindness or vision impairment. This means, for example, that increasing numbers of students who are blind are taught braille by teachers who have a limited knowledge of the code and little knowledge of appropriate teaching methods.

The range and quality of continuing professional development varies widely for teachers in vision education throughout Australia. This continuing professional development is critical for visiting/itinerant teachers supporting students who are blind or vision impaired in integrated environments, because:

- they necessarily work in isolation;
- they benefit from information exchange and networking;

- computer technology is changing rapidly, and assistive technology is increasing in complexity (especially software); and
- teachers need opportunities to update and reinforce their specialist knowledge and skills.

No standardised braille teaching methods or national level teacher certification in braille exist in Australia (Gentle, 2000). There has been a decrease in specialist teacher training courses and. Consequently, a loss of expertise and trained personnel (Gale, 1998, Verick, 1999). Similar concerns are also reported from the United States (Mason, McNerny, Davidson & McNear, 2000). Gentle (2000) emphasised the need for on-going professional development in the literary and mathematics codes. She also raised concerns about the low levels of knowledge of the music, chemistry and computer braille codes across all States and Territories and all educational sectors.

Gentle (2000) and Rapp & Rapp (1992) commented that teachers trained in braille may not have a braille-using student for several years and lose skills and expertise. The infrequent number of braille users may mean that years can go by before the teacher has another braille student, during which time the teacher may lose proficiency in braille.

Effective and practical approaches

In 1991, the New Zealand Qualifications Authority released a discussion paper entitled *Designing the Framework.* This discussion document recommended a unified, logically planned and systematic approach to the restructuring of national educational and vocational awards, qualifications and credentials (Blatch, Nagel & Cruickshank, 1998).

The Blindness Literacy Study of the Missouri Department of Elementary and Secondary Education (1999) recommended that teachers of students with vision impairments receive support at the state and regional level. This would be to enable them to acquire pre-service and professional development training in:

- the use of learning media assessments;
- the needs of students with multiple disabilities;
- competencies in the use of assistive technology; and
- methods of evaluating the assistive needs of students with vision impairments.

Spungin (1996) has pointed to the need in the USA for more standardised braille teaching methods and better quality assurance methods to ensure higher braille teaching standards. British researchers Mason and McCall (1997) assert that in Britain, as in Australia at the present time, there is no provision in law requiring teachers of braille to hold recognised braille qualifications. In New Zealand, there are currently recommendations before Government that promote and advocate legislation to ensure that braille (and access to braille literature of all kinds) is a “right” of all people who are blind. The professional literature on braille teaching generally affirms the need for standards in training programmes, including a greater emphasis on methodology of teaching braille, as well as the need for follow-up examinations (Mosen & Small, 1996; Wittenstein & Pardee, 1996). Allman and Holbrook (1999) also emphasised the need for more teacher aide training. However, they point out that training teachers only in the braille code is analogous to training teachers of print reading by teaching them the alphabet and expecting that this minimal competence will prepare them for the complex task of teaching reading (p. 524).

Recent New Zealand policy conferences on braille literacy proposed the development of an *incentive-based programme* designed to improve the braille skills of people of all ages, similar to programmes operated by the National Federation of the Blind in the United

States (Mosen & Small, 1996). The American programme includes remuneration for teacher aides who attain braille qualifications.

QUESTIONS

3) 1.i What qualifications are required in your service of teachers teaching literacy and numeracy skills to students in the target group?

3) 1.ii How many teachers on your service are proficient in the several braille codes?

For example:

a) literary code;

b) maths code;

c) computer code; or

d) music code

3.1. iii. What teacher professional development and support services are available?

SYSTEMIC ISSUE 2: Specialist Teachers and Resource Provision

There are currently widely varying levels of specialist teacher and resource support nationally (Gale, 1998). States and Territories operate independently with regard to educational service provision. The quality of service provision may be reduced or limited for students with vision impairment who:

a) are geographically isolated or live in rural communities;

b) come from socio-economically disadvantaged areas;

c) belong to indigenous or non-English speaking ethnic groups; or

d) experience poverty and abuse.

(Gale, 1998; P. Pagliano & H. Grainger, personal communication, October 2000).

Impediments

Itinerant/visiting teacher caseloads vary remarkably across Australian States and Territories. For example, Riley (2000) reported that 450 students are supported by 6.2 itinerant/visiting teachers in South Australia, and three itinerant/visiting teachers support 70 students in the Northern Territory (D. Schwartzkoff, personal communication, November 2000). These student-teacher ratios are inadequate for delivery of quality programmes. Given differences in service delivery due to the rural and remote demands of the Northern Territory, there appears to be some inequity of service to students who are blind or vision impaired across the country. Verick (1999) has reported that 'services to students who are blind or vision impaired in the Northern Territory are to be the victims of massive funding cuts' (p. 2).

In a recent national survey of specialist teachers of students who are vision impaired (Gentle, 2000), the Head of the Tasmanian vision impairment services commented that the State had difficulty recruiting and retaining trained braille teachers, because many were attracted to mainland teaching positions.

Effective and practical approaches

The Tasmanian vision impairment service has implemented a statewide professional development plan to address the skills of resource staff, the specialist curriculum needs of braille-using students and the need to develop skills and knowledge in the teaching of braille literacy. The networking of experienced and inexperienced teachers through video-conferencing was implemented as a temporary solution to the problem (Gentle, 2000).

QUESTIONS

3. 2.i What student-teacher ratios apply in your administration/agency for students in the target group?

3. 2.ii To what extent has your service been able to recruit sufficient and adequately trained teachers? How might any difficulties in this area be addressed?

SYSTEMIC ISSUE 3: Australian National Level Data

Issue

Little national level data currently exists on a wide variety of matters relating to literacy and numeracy acquisition by students who are blind or vision impaired. It may be statistically useful given the low incidence of blind and vision impaired students in Australia, to collect data pertaining to these students at national level.

Impediments

Koenig (1992) reported concern regarding the fundamental gaps in knowledge about reading levels of students with vision impairments in the United States. These same challenges appear to be relevant to Australia in 2000 (Australian Braille Authority, 1999). Koenig described the following impediments:

- The most recent study of reading achievements and reading rates for students who are functionally blind and use braille as a primary reading medium was by Lowenfeld, Abel and Hatlen (1969).
- There are currently in the professional literature, virtually no large-group data on reading achievement and reading rates for students with low vision who use print as their primary reading medium. This was similarly reported by Rapp and Rapp (1992).
- The efficacy of instructional practices for teaching reading to students with vision impairments, in either print or braille, has no extensive empirical basis (other than *Patterns*, which has undergone extensive field trials).
- The efficacy of teaching reading in braille to students who are legally blind has never been empirically established or empirically disputed.
- The efficacy of concurrently teaching reading in both braille and print for students with low vision has never been empirically established or disputed.

Effective and practical approaches

Mechanisms for rigorous and sustained research are required (Koenig,1992) to provide an empirical base for understanding the various facets of literacy and numeracy and for future planning.

QUESTIONS

3. 3.i What data would assist with planning and policy development in relation to students who are blind or vision impaired?

QUESTIONS

3. 4.i What issues at system level impede the acquisition of literacy and numeracy by students who are blind or vision impaired?

3. 4.ii What information on other significant issues than those presented above should be considered in the preparation of advice from the field to DETYA on the acquisition of literacy and numeracy skills by students in the target group for this research project.

3. 4.iii Please provide examples of effective policies or practices which could inform practices in other jurisidictions or agencies.

SECTION FOUR: QUESTIONNAIRE

These questions have been formulated in consultation with DETYA. Please email your response to William Jolley at wjolley@bigpond.com by **Monday 23 April 2001**.

Name: ……

Organisation:. ……..

Contact Details: …….

(In case we wish to contact you to clarify or obtain further information).

SECTION ONE: The Conceptual Framework of the Paper

Target Group for this Study

1. i How many students who are blind or vision impaired receive service from your system or agency?

1. ii. How many of these students, in your opinion, fall into the target group for this study - that is do not have an intellectual disability that preclude(s) them from using print or braille to attain literacy and numeracy?

1. iii. What proportion of the total student population of your system (or school) falls into the target group? For example, if the total state student population is 900,000 and there are 500 students on your service and 300 of them fall into the target group for this study, the proportion would be 0.03%.

1. iv. Please provide data on the numbers (by age and gender) of students taught in each of the following settings:

a) solely in mainstream classes;

b) specialist classes;

c) a mix of mainstream and withdrawal classes; or

d) other arrangements (please specify).

SECTION TWO: Issues of Literacy and Numeracy Acquisition for Students

Reading and Writing

2.1. i. What competencies do students in the target group require for the acquisition of literacy, which are additional to, or different from the competencies required by their sighted peers?

2.1. ii. What impediments are faced by teachers in enabling students in the target group to achieve satisfactory literacy and numeracy outcomes?

2.1.iii. What teaching/learning approaches, being used by your agency, are proving efficacious?

Numeracy

2.2. i. What competencies do the students in the target group require for the acquisition of numeracy, which are additional to, or different from the competencies required by their sighted peers?

2.2. ii. What impediments are faced by teachers in enabling students in the target group to achieve satisfactory numeracy outcomes?

2.2. iii. What teaching/learning approaches, being used by your agency, are proving efficacious?

The Braille Code and Teaching Standards

2.3. i. Has your system or agency observed any trend over the past two decades in the use of braille relative to other methods for encoding/decoding text? For example, increased use of audio taped material and computer speech output.

Please provide details.

Appropriate Literacy Media for Students with Low Vision

2.4. i. What reading/writing (encoding/decoding) systems do students in the target group use and what is their proportion or percentage of the total number of blind and vision impaired students your system or agency serves:

a) braille;

b) braille and print;

c) regular print;

d) large print; or

f) other methods? Please specify.

2.4. ii. What methods are preferred and/or used by your students for accessing and creating text? For example, Perkins brailler, Eureka, laptop computer, CTTV, etc.

2.4. iii. What do you consider are the relative advantages and disadvantages of the various encoding/decoding methods available to people who are blind or vision impaired?

Curriculum Access

2.5. i. Are there any concerns you wish to raise or advice you wish to proffer on the issue of Curriculum Access?

Tactile Graphics

2.6. i. Are there any concerns you wish to raise or advice you wish to proffer on the issue of Tactile Graphics?

Technology

2.7. i. What assistive technology (including software) is used to develop literacy and numeracy skills in your system or agency by students in in the target group? For example, Perkins Brailler, laptop computer with JFW software, Mountbatten Brailler with speech output, audio tapes and tape recorder, CTTV, etc.

a) How many of your students in the target group use each of these aids or adaptive software?

b) What impediments, in your opinion, prevent students from using the technology or adaptive software to its maximum efficiency?

Assessment and Bench Marking

2.8. i. How do your students perform on State/Territory or National tests of literacy and numeracy compared to their fully sighted peers? If possible, please also provide a breakdown of students according to their age group and the reading/writing format and methods they use.

2.8. ii. What impediments do students who are blind or vision impaired face in achieving literacy and numeracy outcomes consistent with the Agreed National Goals of Schooling?

Parents as Partners

2.9. i. Are there any concerns you wish to raise or advice you wish to proffer on the issue of Parents as Partners?

SECTION THREE: Issues of Literacy and Numeracy Acquisition for Policy Development

Professional Preparation

3.1. i. What qualifications are required in your service of teachers teaching literacy and numeracy skills to students in the target group?

3.1. ii. How many teachers on your service are proficient in the several braille codes?

For example:

a) literary code;

b) maths code;

c) computer code; or

d) music code

3.1. iii. What teacher professional development and support services are available for your teachers?

Specialist Teachers and Resource Provision

3.2. i. What student-teacher ratios apply in your administration/agency for students in the target group?

3.2. ii. To what extent has your service been able to recruit sufficient and adequately trained teachers? How might any difficulties in this area be addressed?

Australian National Level Data

3.3. i. What data would assist with planning and policy development in relation to students who are blind or vision impaired?

Other Questions

3.4. i. What issues at system level impede the acquisition of literacy and numeracy by students who are blind or vision impaired?

3.4. ii. What information on other significant issues than those presented above should be considered in the preparation of advice from the field to DETYA on the acquisition of literacy and numeracy skills by students in the target group for this research project.

3.4 iii Please provide examples of effective policies or practices which could inform practices in other jurisidictions or agencies.

REFERENCES

Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, MA: The MIT Press.

Ahlberg, A., & Csocsan, E. (1999). How children who are blind experience numbers. *Journal of Visual Impairment & Blindness,93*(9), 549–560.

Allman, C. B., &Holbrook, M.C. (1999). Providing a braille refresher course for teachers of students with visual impairments, *Journal of Visual Impairment & Blindness, 93*(12), 770–777.

Australian Braille Authority, (ABA). (1999). *Braille 2000: Meeting the challenges of the new millennium.* Melbourne: Royal Victorian Institute for the Blind.

Australian Bureau of Statistics. (1994). *Disability, ageing and carers: Visual impairment*. Canberra: Authors.

Bevan, J., & Lovie-Kitchen, J. E. (1990). *Ophthalmic characteristics of a paediatric low vision population.* Paper presented at the conference of the Australian and New Zealand Association of Educators of the Visually Handicapped, Perth.

Blatch, P., Nagel, G., & Cruickshank, L. (1998). Current practices and future directions. In P. Kelley & G. Gale (Eds.), *Towards excellence: Effective education for students with vision impairments* (pp. 17–32). Sydney: North Rocks. Press.

Blind Citizens Australia (1999). Policy statement: Education for people who are blind or vision impaired. Prahran, VIC.: Authors

Booty, J. (1998). Curriculum adaptations: Mathematics. In P. Kelley & G. Gale, (Eds.), *Towards excellence: Effective education for students with vision impairments.* Sydney: North Rocks Press.

Bouffard, T. (1996, August). *A developmental study of the relationship between reading development and the self-system.* A paper presented at the International Congress of Psychology, Montreal, Canada.

Cahill, H., Linehan, C., McCarthy, J., Gbormans, G., & Engelen, J. (1996). Blind and partially sighted students' access to mathematics and computer technology in Ireland and Belgium, *Journal of Visual Impairment & Blindness, 90*(2), 105–114.

Chapman, E. K. (1978). *Visually handicapped children and young people*. London: Routledge & Kegan Paul.

Chorniak, E. J. (1984). Conceptualizing the gifted blind child. In A. Skyanda (Ed.), *Insights in sight: Proceedings of the Canadian interdisciplinary conference on the visually impaired child* (pp.175–190). Vancouver, BC: Canadian National institute for the Blind. (ERIC Document Reproduction Service No: ED 260 566).

Clamp, S. (1997). Mathematics. In H. Mason & S. McCall (Eds.), *Visual impairment: Access to education for children and young people*. (pp. 218–235). London: David Fulton.

Committee to Develop Guidelines for Literacy. (1991). Selecting appropriate learning media for visually handicapped students. *RE:view*, 23(2), 64–66.

Commonwealth of Australia. (1992). Disability discrimination act. Canberra: Australian Government Publishing Service.

Corn, A. L., & Koenig, A. J. (Eds.). (1996). *Foundations of low vision.* New York: AFB Press,

Corn, A. L., Hatlen, P., Huebner, K. M., Ryan, F., & Siller, M. A. (1995). *The national agenda for the education of children and youth with visual impairments, including those with multiple disabilities*. New York: AFB Press.

Craig, C. J., DePriest, L., & Harnack, K. (1997). Teachers' perspectives on selecting literacy media for children with visual impairments. *Journal of Visual Impairment & Blindness, 90*(6), 539–545.

Crawley, J. F., & Miller, J. H. (1989). Cross sectional comparison of the mathematics performance of children with learning disabilities: Are we on the right track for comprehensive programming? *Journal of Learning Disabilities, 22*(4), 250–254.

d'Apice, P. (1998). Human society and its environment. In P. Kelley & G. Gale (Eds.), *Towards excellence: Effective education for students with vision impairments* (pp. 157–163). Sydney: North Rocks Press.

DeMario, N. C., & Lian, J. (2000). Teachers' perceptions of needs for and competency in transcribing braille materials in the Nemeth Code. *Journal of Visual Impairment & Blindness, 94*(1), 7–14.

DeMario, N. C., Lan, S., & Lian, M.G. (1998). Teachers' self assessed competence and attitudes toward literary braille and the Nemeth code. *Journal of Visual Impairment & Blindness, 92*(5), 354–357.

Department of Employment, Education and Training. (1991). *Australia's language. The Australian language and literacy policy.* Canberra, ACT. Author.

Dick, T., & Kubiak, E. (1997). Issues and aids for teaching mathematics to the blind. *Mathematics Teacher, 90*(5), 344–349.

Dombey, H. (1993). What children need to learn and how teachers can help them. *Reading, 27*(3), 2–9.

Education Queensland & Griffith University. (1997). *Teaching students with disabilities: Vision impairment.* Brisbane: The State of Queensland (Department of Education).

Evans, J. (1994). *Oral language developmental continuum*. Melbourne: Longman.

Ferrell, K. A. (1986). Infancy and early childhood, in G. Scholl (Ed.) *Foundations of education for blind and visually handicapped children and youth: Theory and practice* pp. 119–135. New York: American Foundation for the Blind

Flavell, J. H., & Wellman, H. M. (1977). Metamemory. In R.V. Kail & J.W. Hagen (Eds.), *Perspectives on the development of memory and cognition* (pp. 3–33). Hillsdale, NJ: Erlbaum.

Foreman, P. (1996). *Integration & inclusion in action*. Sydney: Harcourt Brace.

Freebody, P., & Luke, A. (1990). Literacies programs: Debates and demands in cultural context. *Prospect, 5*, 7–15.

Gale, G. (1995). Addressing the disability specific needs of students with vision impairment: or where do we think are and what can we do about it? *Newsletter of the Australian and New Zealand Association of Educators of the Visually Handicapped* 33 (1), 17–18.

Gale, G. (1998). The teacher and the teacher aide. In P. Kelley & G. Gale (Eds.), *Towards excellence: Effective education for students with vision impairments* (pp. 77–88). Sydney: North Rocks Press.

Gale, G. & Cronin, P. (1998). The school years. In P. Kelley & G. Gale (Eds.), *Towards excellence: Effective education for students with vision impairments* (pp. 118–136). Sydney: North Rocks Press

Gale, G. (1999). *Tactile graphics.* Workshop notes presented at the NEW SOUTH WALES Department of Education and Training IST(V) Conference: Education in Change.

Gale, G. (2000*). Educational guidelines for teaching the interpretation and production of tactile graphics*. Unpublished paper. Melbourne: Royal Victorian Institute for the Blind.

Garner, R. (1987). *Metacognition and reading comprehension.* Norwood, NJ: Ablex Publishing.

Gates, C., & Kappen, G. (1985). Teacher preparation in the education of visually impaired children: A multi-competency approach. *Journal of Visual Impairment & Blindness, 79,* 306–307.

Gentle, F. (2000). *Braille literacy: Report of an Australian national survey of braille teachers and support staff*. Unpublished paper. Sydney: Renwick College and St Edmund's School for the Blind and Vision Impaired.

Giorcelli, L. (1995). *An impulse to soar: Sanitization, silencing and special education*. Keynote Papers from the 19th Annual Conference, Australian Association of Special Education, Darwin.

Grieve, I. (1999). Regional report to the Australian and New Zealand Heads of Services meeting. Sydney: Royal Institute for Deaf and Blind Children.

Halliday, J. (1999). Braille versus speech: Making sense of the debate. http://www.closingthegap.com/cgi-bin/lib/libDsply.pl?a=1178b=2&c-2

Hartshorne, T. S. (2000). *The relationship between parents and teachers of young children with disabilities: Outcomes for children and families*. Sydney: North Rocks Press.

Hayes, B. (1996). *Speaking of Mathematics*. Computing Science, March-April 1996.

Indiana Department of Education. (1997). Functional literacy assessment: Guidelines for students who are blind or visually impaired, Field test edition, 1996/97 school year. Indiana Dept of Education, Division of Special Education http://web.indstate.edu/soe/iseas/blind.html:

International Reading Association (IRA) and the National Association for the Education of Young Children (NAEYC). (1998). *Learning to read and write: Developmentally appropriate practices for young children*. Newark, DE. Author.

Jennings, J. (1999). Print or braille: Decision-making in the choice of the primary literacy medium for pupils with a severe visual impairment. *The British Journal of Visual Impairment, 17*(1), 11-16.

Johnston, B. (1994). Critical numeracy. *Fine Print***,** *16*(4), Summer, 11–12.

Kapperman, G., & Stricken, J. (1998) The braillewriter as a calculation tool. *RE:view,* 30, 65–83.

Kapperman, G., Heinze, T., & Stricken J. (1997). Strategies for developing mathematic skills in students who use braille. Sycamore, IL: Research and Development Institute.

Kelley, P. (1998). Technology. In P.Kelley & G.Gale, (Eds.),*Towards excellence: Effective education for students with vision impairments* (pp. 218–226). Sydney: North Rocks Press.

Kelley, P., Gale, G., & Blatch, P. (1998). Theoretical framework. In P. Kelley and G. Gale (Eds.), *Towards excellence: Effective education for students with vision impairments* (pp. 33–40). Sydney: North Rocks Press.

Kelley P., & Gale, G. (Eds.). (1998) *Towards excellence: Effective education for students with vision impairments*. Sydney: North Rocks Press.

Kemp, D. (1999). *The Adelaide declaration on national goals for schooling in the twenty-first century.* Adelaide: Government Printer.

Kirchner, C. (1990). Trends in the prevalence rates and numbers of blind and visually impaired school children*. Journal of Visual Impairment & Blindness, 84*, 478–479.

Kochhar, C. A., & West, L. L. (1996). *Handbook for successful inclusion*. Gaithersburg, MA: Aspen Publications.

Koenig, A. J. (1992). A framework for understanding the literacy of individuals with visual impairments, *Journal of Visual Impairment & Blindness,86*(7), 277–284.

Koenig, A. J. (1995). Can reading and writing braille be taught effectively on an itinerant basis? *Journal of Visual Impairment & Blindness, 89*(2), 101–106.

Koenig, A. J., & Farrenkopf, C. (1997). Essential experiences to undergird the early development of literacy. *Journal of Visual Impairment & Blindness, 91*(1), 14–24.

Koenig, A. J. & Holbrook, M. C. (1995). *Learning media assessment.* Austin, TX: Texas School for the Blind and Visually Impaired.

Lamb, G. (1998a). Communication. In P. Kelley, & G. Gale (Eds.), *Towards excellence: Effective education for students with vision impairments.* Sydney: North Rocks Press.

Lamb, G. (1998b). Dots for tots: Emergent literacy and braille reading. *The British Journal of Visual Impairment, 16*(3), 111–115.

Lamb, G. (1997). Teacher competencies: An evaluative checklist for teachers of learners with vision impairments. Melbourne: Royal Victorian Institute for the Blind.

Lamb, G. (1995). Fingerprints: *A whole language approach to braille literacy.* Auckland: Homai Vision Centre.

Lowenfeld., B., Abel, G. L., & Hatlen, P. H. (1969). *Blind children learn to read.* Springfield, IL: Charles C. Thomas.

Luke, A., & Freebody, P. (1999a). A map of possible practices-further notes on the four resources model. *Practically Primary, 4*(2), 5–8.

Luke, A., & Freebody, P. (1999b). Further notes on the four resources model. *Reading Online,* www.readingonline.org

Luke, A., & Freebody, P. (2000). Literate futures: Report of the Literacy Review for Queensland Sate Schools. Brisbane: Queensland Government, Education Queensland. http://education.qld.gov.au

Mason, H., & McCall, S. (Eds.). (1997). *Visual Impairment: Access to children and young people.* London: David Fulton.

Mason, C., McNerny, C., Davidson, R., & McNear, D. (2000). *National plan for training personnel to serve children with blindness and low vision.* http://www.cec.sped.org/nw/nptp.html

Massachusetts Board of Education. (2000). Braille Literacy Advisory Council, http://dns.doe.mass.edu/boe/sac/councils/braille.html:

McCall, S., & McLinden, M. (1997). Towards an inclusive model of literacy for people who are blind and have additional learning disabilities. *The British Journal of Visual Impairment, 15*(3), 117–121.

McCoy, K. M. (1995). *Teaching special learners in the general education classroom: Methods and techniques* (2nd ed. pp. 13–20). Denver, CO: Love Publishing.

McCrae, D. (1996). *The integration/inclusion feasibility study*. Sydney: NSW Department of School Education.

Missouri Department of Elementary and Secondary Education (1999). Missouri blindness literacy study 1999 presented to the Missouri legislature www.dese.state.mo.us/divspeced/blindliteracy.html

Mosen, J., & Small, J. (1996). Braille literacy Report to conference briefing paper. Aukland, NZ: Homai Vision Centre, www.abcnz.org.nz/braille.htm:

Mullen, E.A. (1990). Decreased braille literacy: A symptom of a system in need of reassessment. *RE:view, 22*(3),164–169.

Myers, M., & Paris, S. G. (1978). Children's metacognitive knowledge about reading. *Journal of Educational Psychology, 70,* 680–690.

Palmer, C. (2000). Chapter 2A: Literacy and students with vision impairment. In van Kraaynoord, C., Elkins, J., Palmer. C., & Rickards, F., Literacy, numeracy and students with disabilities, vol 2: The literature reviews (pp. 95-141). Nathan, Queensland: DETYA Clearinghouse.

Paris, S. G., & Oka, E. R. (1986). Children's reading strategies, metacognition and motivation. *Developmental Review, 6,* 25–56.

Parkes, D. (1998). Tactile audio tools for graphicacy and mobility: A circle is either a circle or it is not a circle. *The British Journal of Visual Impairment* 16(3), 99–104.

Pressley, M., & McCormick, C. (1995). *Advanced educational psychology for educators, researchers and policy makers.* New York: Harper Collins.

Putnam, J. (1993). Coop*erative learning and strategies for inclusion: Celebrating diversity in the classroom.* Baltimore: Paul H. Brookes.

Raman, T. V. (1994). Audio System for Technical Readings. *Ph.D. Dissertation*. Cornell University. Audio edition distributed by Recordings for the Blind, order number FB190.

Rapp, D. W. & Rapp, A. J. (1992). A survey of the current status of visually impaired students in secondary mathematics. *Journal of Visual Impairment & Blindness, 86*(2), 115–117.

Rex, E. J., Koenig, A. J., Wormsley, D. P., & Baker, R. L. (1994). *Foundations of braille literacy.* New York: AFB Press.

Reynolds, M. C., Wang, M. C., & Walberg M. J. (1992). The knowledge base for special and general education. *Remedial & Special Education*, *13*(5), 6–10.

Riley, H. (2000). Visiting teacher service in South Australia in *Reports of Heads of Educational Services meeting*, Brisbane. Unpublished paper.

RNIB (1998). Numeracy matters: Preliminary report of the numeracy task force: Response from RNIB, Jan–March, www.rnib.org.uk/wedo/campaign/numer.htm

Rogoff, B. (1980). Schooling and the development of cognitive skills. In H. Triandis & A. Heron (Eds.), Handbook of cross-cultural society*. Boston: Allyn-Bacon.*

Rogow, S (1998*). Helping the visually impaired child with developmental problems: Effective practice in home, school and community.* New York: Teachers College Press.

Royal Blind Society of New South Wales & Royal Institute for Deaf and Blind Children. (1999). *The needs of children and young people (0–19 years) with vision impairment in New South Wales and ACT*. Sydney, NSW: North Rocks Press.

Ryles, R. R. (2000). The impact of braille reading skills on employment, income, education and reading habits. Website: http://www.nfb.org/bm980204.htm

Schneider, W., & Pressley, M. (1997). *Memory development between two and twenty* (2nd ed.). Mahwah, NJ: Erlbaum Associates.

Scholl, G. T. (Ed.). (1986). *Foundations of education for blind and visually handicapped children and youth: Theory and practice.* New York: American Foundation for the Blind.

Sims, A. M. (1967). Modern mathematics in a secondary school. In *The teaching of science to the blind.* Royal National Institute for the Blind. London: Royal National Institute for the Blind.

Spungin, S. J. (1996). Braille and beyond: Braille literacy in a larger context. *Journal of Visual Impairment & Blindness, 90*(3), 271–274.

Stainback, W., & Stainback, S. (1992). *Controversial issues confronting special education: Divergent perspectives*. Needham Heights, MA: Allyn & Bacon.

Steer, M. (1998). Australian teacher education in vision impairment. *The Visual Field, 17*(2), 6–7.

Swenson, A. M. (1999). *Beginning with braille*. New York: American Foundation for the Blind.

Telec, F. (2000). Untitled document. Sydney: New South Wales Department of School Education.

Telec, F., Boyd, A., & King, J. (1997). *Vision impairment: A reference for schools*. Sydney: New South Wales Department of School Education.

Texas School for the Blind (2000). Website: http://www.tsbvi.edu/math/index.htm

Trent, S. D., & Truan, M. B. (1997). Speed, accuracy, and comprehension of adolescent braille readers in a specialized school. *Journal of Visual Impairment & Blindness, 91*(5), 494–500.

van Kraayenoord, C., Elkins, J., Palmer, C., & Rickards, F. (2000). *Literacy, numeracy, and students with disabilities.* Canberra, ACT: Department of Education, Training and Youth Affairs. http://www.deet.gov.au/schools/publications/index.htm

Verick, M. (2000). Braille: The forgotten “language”. Paper presented at the National ACROD Convention. Canberra, 23 October.

Verick, M. (1999). *Getting back on the literacy agenda.* Background paper submitted to the Department of Education, Training and Youth Affairs, ACROD and the Australian Blindness Forum.

Warren, D. H. (1994). *Blindness and children: An individual differences approach*. Cambridge. NY: Cambridge University Press.

Wetzel, R. & Knowlton, M. (2000). A comparison of print and braille reading rates on three reading tasks. *Journal of Visual Impairment & Blindness, 94*(3), 146–154.

Wild, G., Hinton, D., & Hinton, R. (1997). The design of microcapsule diagrams for visually impaired students on distance learning courses. *The British Journal of Visual Impairment 15*(1), 23–27.

Wittenstein, S. H. (1994). Braille literacy: Preservice training and teachers' attitudes. *Journal of Visual Impairment & Blindness, 88*(6), 516–524.

Wittenstein, S. H. & Pardee, M. L. (1996). Teachers' voices: Comments on braille and literacy from the field. *Journal of Visual Impairment & Blindness, 90*(3), 201–209.

Wormsley, D. P. (2000). *Braille Literacy Curriculum.* Philadelphia: Towers Press.

Wormsley, D. P. (1997). Learning to read, reading to learn: Teaching braille reading and writing. In D. P. Wormsley & F. M. D'Andrea (Eds.), *Instructional strategies for Braille literacy* (pp. 57–109). New York: American Foundation for the Blind.

Wormsley, D. P., & D'Andrea, F. M. (Eds.). (1997). *Instructional strategies for Braille literacy.* New York: American Foundation for the Blind.

Wixson, K, K. & Dutro, E. (1998*). Standards for primary-grade reading: An analysis of state frameworks*. Ann Arbor, MI: Center for the Improvement of Early Reading Achievement, University of Michigan School of Education.